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Integrated Quality Assurance and Control Framework for BIM Models during Design, Construction and Operation Andrijana Djukic

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Universidade do Minho Escola de Engenharia

Integrated Quality Assurance and Control Framework for BIM Models during Design, **Construction and Operation**



European Master in Building Information Modelling



Universidade do Minho Escola de Engenharia

Andrijana Djukic

Integrated Quality Assurance and Control Framework for BIM Models during Design, **Construction and Operation**



BIM A H European Master in Building Information Modelling

Master Dissertation European Master in Building Information Modelling

Work conducted under supervision of: Helder Sousa José Carlos Lino **Bruno Caires (Tutor in Company)**



September, 2023

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STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration.

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RESUMO

A implementação do BIM na indústria da Arquitetura, Engenharia e Construção (AEC) reinventou o modelo de negócio deste sector, alterando a forma tradicional de gerir os projetos. Esta transformação teve um impacto significativo na colaboração e comunicação de dados. No entanto, a transição digital trouxe inúmeras questões sobre a Gestão da Qualidade neste novo contexto.

O modelo BIM assumiu um papel central no ambiente digital. Com todas as informações essenciais no modelo, a qualidade do modelo tornou-se crucial, o que significa que quaisquer deficiências podem causar consequências significativas, afetando o processo de colaboração global. Como resultado, a fiabilidade de todo o projeto depende diretamente da integridade do modelo em termos de qualidade. Apesar da variedade de ferramentas de verificação de modelos disponíveis no mercado, falta uma abordagem integrada à Garantia da Qualidade e ao Controlo da Qualidade que apoie a entrega do projeto desde o seu início até à entrega da obra, considerando as utilizações e os requisitos BIM definidos e reconhecendo os dados e as normas da indústria. Este trabalho revela as metodologias existentes e fornece uma análise das diretrizes e ferramentas que abordam a Garantia/Controlo da Qualidade no mercado.

A principal preocupação na obtenção da qualidade do modelo consiste em assegurar que o modelo contém todas as informações necessárias e está em conformidade com os requisitos definidos pelas partes responsáveis. No entanto, a investigação mostra que a definição inadequada dos requisitos e a conformidade do modelo com esses requisitos constituem um dos maiores obstáculos a uma colaboração efetiva entre os clientes e os fornecedores. Este estudo centra-se na exploração dos métodos atualmente utilizados para a especificação de requisitos, procurando soluções de melhoria. Para colmatar esta lacuna, esta investigação propõe uma metodologia abrangente de Garantia/Controlo da Qualidade concebida para garantir a conformidade do modelo com os requisitos específicos da entidade adjudicante. Os objetivos principais são três: em primeiro lugar, a criação de uma ferramenta que aborda a Garantia de Qualidade durante o processo de criação do modelo; em segundo lugar, os procedimentos de verificação do Controlo da Qualidade integrados na metodologia proposta; e, em terceiro lugar, a exploração das possibilidades de automatização. Além disso, este estudo estabelece as bases para investigação futura sobre o aumento da qualidade do modelo, centrando-se na automatização da especificação de requisitos.

Palavras-chave: BIM, Garantia da Qualidade, Controlo da Qualidade, Especificação de Requisitos, Verificação de Modelos.

ABSTRACT

Implementing BIM in the Architecture, Engineering and Construction (AEC) industry has reinvented this sector's business model, changing the traditional way of handling projects. This transformation had a significant impact on collaboration and data communication. However, the digital transition brought up numerous questions about Quality Management in this new setting.

The BIM model has taken a central role in the digital environment. With all essential information within the model, the quality of the model became crucial, meaning that any deficiencies can cause significant consequences, impacting the overall collaboration process. As a result, the reliability of the whole project depends directly on the integrity of the model in terms of quality. Despite the variety of model checking tools available on the market, there is a lack of an integrated approach to Quality Assurance (QA) and Quality Control (QC) that would support project delivery from its commencement to handover, considering the defined BIM uses, requirements and acknowledging industry data and standards. This work discloses existing methodologies and provides a review of the guidelines and tools addressing QA/QC on the market.

The primary concern in achieving model quality lies in assuring that the model contains all needed information and aligns with the requirements defined by the appointing parties. However, research shows that inadequate definitions of requirements and the model's compliance to these requirements, present one of the biggest obstacles to effective collaboration of clients and appointed parties. This study focuses on exploring currently used methods of specifying requirements while seeking improvement solutions. To bridge this gap, this research proposes a comprehensive QA/QC methodology designed to guarantee model compliance with the appointing party's specific requirements. The primary objectives are threefold: first, creating a tool that addresses QA during the model creation process; second, the QC verification procedures integrated into the proposed methodology; and third, exploring the possibilities of automation. Furthermore, this study lays the groundwork for future research on enhancing the model quality by focusing on automating the requirements specification.

Keywords: BIM, Quality Assurance (QA), Quality Control (QC), Requirements Specification, Model Checking.

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1. INTRODUCTION

In recent years, the Architecture, Engineering, Construction and Operation (AECO) industry has undergone a significant digital transformation, primarily driven by the adoption of Building Information Modelling (BIM). BIM is a methodology that manages project and building design information digitally (Penttilä, 2006). Creating a virtual environment replicates the construction project and allows the creation of precise digital models of the building. Its implementation completely reshaped the traditional business model of project development and delivery, facilitating changes in not only the creation process but the way how stakeholders collaborate and manage project information as well.

The main facilitator of this transformation is the BIM model, which carries all project information, including both physical and alphanumerical characteristics (Azhar et al., 2008). All processes and extraction of essential views are based on the digital model, making it a key factor in the use of BIM (Andrich et al., 2022). Recognising that all project information derives from the model underscores the importance of assuring its quality. The high quality of the model ensures the correctness and reliability of the information contained within it, eliminating issues and misunderstandings. One of the biggest issues with quality is inaccurate, incomplete, and inconsistent information, causing decreased efficiency, design errors, and issues in the later stages of the project. Poorly defined information leads to deficient outcomes and project delays, affecting the overall process (Berard, 2012). Furthermore, low quality limits the uses of BIM model and produces inaccurate deliverables affecting all aspects of decision-making, scheduling and quantification among other uses.

This necessity highlights the significance of the implementation of Quality Assurance (QA) and Quality Control (QC) processes within the BIM Process. Technological improvement and high customer expectations in the construction industry, increased the demand for the development of QA and QC methodologies (Kerkar and Salvi, 2020). QA as a measure of prevention assuring the quality and QC as the process of verification and identifying the issues (ISO 9000:2015, 2021). The integration of these aspects ensures the accuracy, reliability of the BIM model and quality of its deliverables.

Currently, there are more than a few software solutions that integrate some level of quality verification (Cann et al., 2020). However, these tools are usually focused on addressing specific aspects of quality, therefore lacking the integrated QA/QC approach that would support project delivery considering all requested BIM Uses, Requirements and stakeholders throughout the entire project life cycle.

1.1. Objectives

Current fragmentation in the implementation of QA and QC processes leads to inefficiencies and mistakes. Moreover, it is performed involving a lot of manual or semi-automated work, wasting valuable human workforce and time resources.

As such, the primary goal of this study is to propose a methodology that could seamlessly integrate QA and QC procedures into the workflow of the company. The created methodology will be twofold: firstly, addressing QA by establishing requirements that align with both industry and company specific

standards, and secondly, tackling QC through verification of the model's compliance with the predefined Requirements.

Furthermore, the created methodology will aim to address the possibilities of automation of these processes as well. This will be achieved through answering the following objectives: understanding the process of Quality Management, identifying current status of QA/QC in the BIM, decomposition of the Model checking in order to understand its parts, proposing a methodology for enhancing model quality by integrating QA/QC processes, addressing QA through the creation of a Requirements Specificator and testing out possible QC methods through verification of a case study.

1.2. Collaborators in Dissertation

This research seeks to answer the needs for assuring quality of the models delivered to the appointing parties. It was developed in close collaboration with BIMMS – BIM Management Solutions, as a direct response to the company's necessity to elevate the quality of the deliverables. BIMMS is an international company specialized in developing and managing digital models. Working closely within company's environment was crucial to understand what the current practices are and how they can be improved. Additionally, expertise of company's professionals and their support provided needed guidance and resources to conduct this study.

1.3. Dissertation Structure

This dissertation is organized into six chapters as illustrated below (Figure 1).

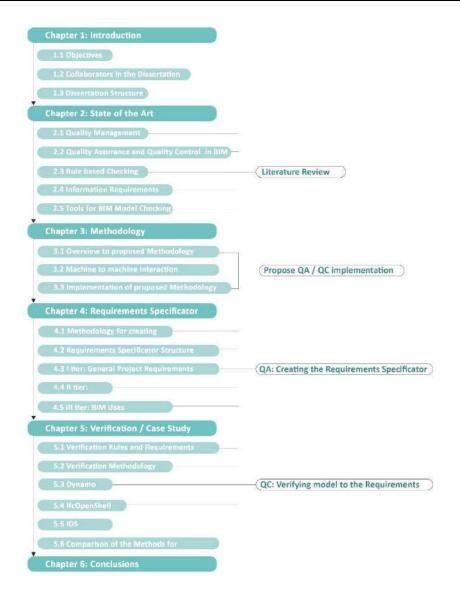


Figure 1 – Dissertation Structure

First chapter introduces the overall topic of the study, highlighting the questions it aims to address. It provides an overview of the research methodology, objectives, involved partners and an explanation of the research structure.

Second chapter dives into the state of the art. It consists of five sections aiming to address the context of model quality and current practice (Figure 2). First section provides an overview of concepts of the Quality and Quality Management, and more importantly, raises the question of managing quality in Industry 4.0. Sequentially, second section dives into the specifics of the Quality Management in BIM. It addresses two key processes which are Quality assurance and Quality Management. Through researching of the content of QA/QC guidelines, it aims to assess the current state of the quality processes in the industry. Moreover, tries to understand which aspects constitute Model checking methodology. Relying on the key factors of Model checking: rules, information and software, following sections dive into each of these specifically. Third section addresses the rule-based checking, providing an overview of the concept. Additionally, it addresses the topic of rules classifications, organization and representation, aiming for a better understanding of how the rules are specified. Forth section provides

an insight into the second aspect of Model checking which is information contained within the model. It aims to understand fundamentals of defining information requirements and reflects on the Level of Information (LOIN) concept. Fifth section of this paragraph addresses the model checking tools available on the market. It evaluates four checking tools through several components: templates and functionalities embedded in the tool, rule creation process and visualization of the results.



Figure 2 – Visualization of the information flow in State of the Art

Third chapter explains the proposed methodology and how it deals with the issue of model quality. The purpose of this chapter is to address some of the issues company encounters in the process and define new workflow that integrates QA and QC in the process of defining requirements and verifying model compliance.

The fourth chapter presents the development of Requirement Specificator. Firstly, it explains the methodology of creation and resources used. Secondly, it reflects on the logic of structuring the information. Additionally, it dives into the three sections, based on the tier structure of the Specificator. Each section further addresses each tier, explaining the creation process, requirements and content.

Fifth chapter focuses on validation and testing out the proposed framework. It evaluates three possible methods of checking the model compliance. The evaluation is conducted with the collaboration of the BIMMS company, where an ongoing project is used as subject of the checking. Each section of this chapter explains the process of conducting the checking and displays results of each verification.

Last chapter presents the conclusion of the conducted research and proposes future development.

2. STATE OF THE ART

2.1. Quality Management

In order to delve into the topic of quality assurance and quality checking of the BIM model, it is essential to break down the concept of quality and quality management first.

2.1.1. What is Quality?

There have been more than a few attempts to define the meaning of quality. Although the term is used daily among academics and practitioners, no interpretation is widely accepted. Most definitions are closely tied to the discipline they refer to, giving rather ambiguous explanations if analysed independently. Despite that, there is much consensus about the truthfulness of the statement: "Quality is what makes the difference between things being excellent or run-of-the-mill" (Sallis, 2002, p.15).

Depending on the context, definitions of quality have several approaches. Some of the definitions are as follows:

"Quality is fitness for use" (Juran, 1999, p.21).

"The first erroneous assumption is that quality means goodness, or luxury, so shininess, or weight. We must define quality as conformance to requirements if we are to manage it". (Crosby, 1979, p.1)

"Quality means freedom from deficiencies" (Badr, 2011, p.7).

The widely accepted term is the one proposed by Philipp B. Crosby. He defines quality as conformance to requirements (Crosby, 1979). This rather simple concept means that every product that reproduces planned design specifications is of high quality.

According to Garvin (1987), quality cannot be a single variable but rather multifaceted. He proposes eight dimensions (Figure 3) according to which quality can be assessed:

- 1. Performance key operational feature;
- 2. Features additional benefits;
- 3. Reliability likelihood of product breakdown;
- 4. Durability product's lifespan;
- 5. Conformance meeting with specifications;
- 6. Serviceability easiness of maintenance;
- 7. Aesthetics attributes appealing to senses;
- 8. Perceived Quality perceived by customers.



Figure 3 – Garvin's Eight Dimensions of Quality (based on Garvin, 1987)

2.1.2. Concept of Quality Management

The need for a certain quality of product or service inaugurated the need for quality management. The simplest explanation of Quality Management would be that it is a control over the characteristics that make up the quality of a product or a service. In other words, quality management is a set of different actions that are taken in order to provide quality that fits the given requirements.

According to ISO 9000:2015 (2021), quality management consists of four aspects which are Quality planning, Quality assurance, Quality control and Quality improvements (Figure 4).

Quality planning is related to the planning stage in which the quality objectives are set. Quality assurance involves assuring that requirements will be fulfilled. Quality control involves comparing the actual performance with the planned one and taking actions if they do not align. Lastly, Quality improvements deals with increasing the ability to fulfil quality requirements, through improving both planned and control processes based on the results from the control stage.



Figure 4 – ISO 9000 Quality Management Aspects (based on ISO 9000:2015, 2021)

Achieving quality through quality management and following standards can be seen as mandatory in not only providing viable product on the market but being a competitive advantage as well (Carvalho et al., 2021). In other words, managing quality should not represent just a routine activity of the company, but should be seen as a strategic imperative that contributes to overall success and competitiveness on the market.

Crosby (1979) defines The Four Absolutes of Quality Management as (1) the definition of quality is **conformance to requirements**, (2) the system of quality is **prevention**, (3) the performance standard is **zero defects**, and (4) the measurement of quality is the **price of non-conformance**.

He puts clients' requirements and needs as imperative, which goes along with his explanation that quality is compliance with requirements. Secondly, he states the importance of prevention, believing in eliminating error before happening. Through the Zero defects policy, Crosby promotes an approach of not having allowable number of mistakes at all. Lastly, managing quality is directly connected to financial aspect, where non-conformance stands for the cost of failure.

2.1.3. Costs and benefits of maintaining quality

Approaches to managing quality are diverse, depending on the discipline and main focus. Nevertheless, advantages that can be accomplished in terms of business objectives are vastly the same. Through Quality Management and setting a recognized standard, quality can be the main differentiator from competitors' offers.

Benefits of Quality Management (Sannassee and Kawthar, 2013) can be evaluated through three contexts: Internal, External and Financial.

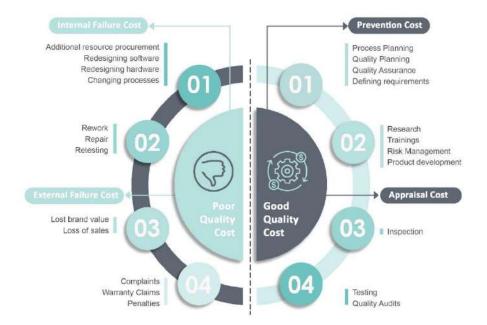
Internal benefits are related to improvements within an organization, whereas external refer to enhancements that can be accomplished in relation to the client and on the market (Table 1).

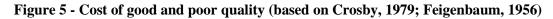
Table 1 - Quality Management Benefits based on literature review of conducted studies(Zgirskas et al., 2021; Casadesus et al., 2001; Sannassee and Kawthar, 2013)



When it comes to the cost of applying quality, Crosby (1979) defines two types of cost. The Sum of price of conformance to requirements and the Sum of price of non-conformance.

In other words, he defines the cost of good and the cost of poor quality (Figure 5). The first one includes all planning activities needed to assure compliance to the requirements. On the opposite, if these preventive actions are not taken, there is a cost of poor quality as a result of a defective product.





2.1.4. Evolution of Quality Management

There is a common misconception that the development of quality management started with the Industrial Revolution and development of mass production. The truth is that the concept of quality can be traced much further back in time, originating in the ancient period. One of the first legal documents, The Code of Hammurabi, addresses the importance of quality in several codes: "If a shipbuilder builds a boat for someone, and do not make it tight, if during that same year that boat is sent away and suffers injury, the shipbuilder shall take the boat apart and put it together tight at his own expense" (Hammurabi, 1750-1755 B.C.). It is known that Ancient Egyptians implemented a systematic quality control while building pyramids, which is shown through the structured manner and precision they were built with (Hellman and Liu, 2013).

During medieval ages, expansion of both craftsmen and manufacturing guilds contributed significantly to the development of manufacturing processes, hence quality control as well. They implemented quality controls within guild not only as a method of assuring the quality of their own product, but for comparing it to other competitors as well. (Richardson, 2004) By marking the product, the craftsman would provide proof of quality, which was acknowledged throughout the Europe.

However, a big milestone when it comes to quality management system came with the development of production methodology during the Industrial revolution. Worker's main objective became providing the product that corresponds to the sample or specification (Juran, 2010). Since both processes and products became more complex, it developed the need for checking the product quality after production. Manufacturing factories had special departments who were in charge of inspecting goods and finding faulty ones (Report et al., 2012).

Conducting quality control became a well-established part of the manufacturing process, but at the late 19th and beginning of 20th century, more attention was devoted to it from scientific and legislative side. Frederick W. Taylor (1911) developed the idea of scientific management, which was a role model for the approaches developed during 20th century. Unlike previous methods that were focused only on the final product, Taylor devoted more attention to the process and workers themselves, developing key principles for enhancing quality (Dooley, 2010).

Big attention to providing quality of production was given during II World War. The need for larger and faster production demanded the quality assurance system. Along with complexity, the need for high quality and safety was imperative so this period birthed quality guides and standards (Juran, 2010). The post-war period is considered to be the beginning of the Total Quality Approach. W. Edvards Deming and Joseph M. Juran were the founding fathers of new methodology developed for the Japanese market. It can be concluded that they heavily relied on Taylor's theory of managing quality, not only of the product but of the process and services as well. Evidently, this approach showed as very successful, bringing Japanese products to the top of the list when it comes to the quality, in just a short period of time.

Last milestone when it comes to quality management is an ongoing process still, dealing with quality in digitized manufacturing sector. Technological advancement at the beginning of 21st century fundamentally changed the business model, starting the period of 4th Industrial Revolution, otherwise

called Industry 4.0. Digital transformation brought into focus the use of digital copies of real world (Turk and Klinc, 2019) which generated Quality 4.0, a branch of quality management using digital technologies.

Given timeline (Figure 6) provides an insight into the progress that quality concept experienced during different time periods, confirming its volatility and need to adapt in order to conform. This raises a question of what the future trends are and how they will influence the evolution of managing quality.

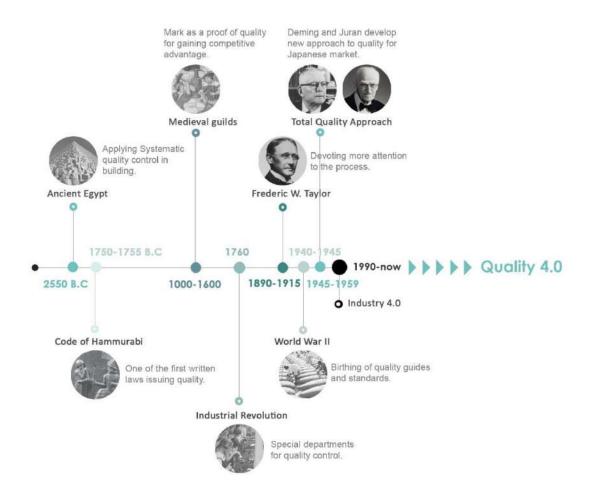


Figure 6 - Quality Management Timeline

2.1.5. Automation of quality

As indicated previously, Quality 4.0 is a concept concerned with managing the quality in the Industry 4.0. It can be defined as a "combination of new technologies, standard quality tools and methods in order to achieve superior performance, higher operational excellence and optimal innovation" (Antony et al., 2022, p. 8).

The main advantage of this approach to quality management is that it is focused on the use of digital tools that allow intensive monitoring of all activities. Focus is being put on the use of machine learning, minimizing human intervention and replacing it with computer-based solutions.

As underscored by Milunovic et al. (2019), foundation of Quality 4.0 is based on the use of advanced technologies such as Artificial Intelligence, Big Data, Blockchain, Deep Learning, Enabling technologies, Machine Learning and Data Science (Figure 7).

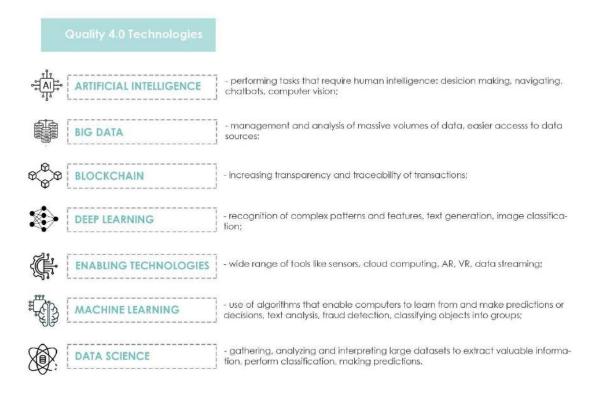


Figure 7 - Description of Quality 4.0 Technologies and Tools (based on Radziwill, 2018)

Embracing the capabilities offered by these technologies would elevate the process of quality control beyond traditional methods and boundaries, reshaping the standard industry procedures.

Moreover, there are more than a few benefits that can be detected with automatization of quality management. Radziwill (2018) groups them into seven categories: Augmentation of human intelligence; Improving quality and speed of making decisions; Increasing transparency, traceability and auditability; Predicting changes and adapting to new circumstances; Be adaptable to new situations and knowledge, anticipate changes, and expose irregularities; Constant improvement and developing of new business models through advancement of relationships and the concept of trust; Knowledge by developing one's capacity for self- and other awareness.

In conclusion, the range of benefits that automating quality brings is perceived as a necessary step in aligning with the digital transformation of the industry.

2.2. Quality Assurance and Quality Control in BIM

2.2.1. General Overview

The question of managing quality in the construction industry is significantly more complex compared to other industries. It includes not only the quality of the building, which is the final product, but all the

processes occurring during the project phases. Use of BIM already downsized the percentage of usual drawbacks significantly but raised the issue of managing construction quality in digital environment.

Data quality management consists of two concurrent processes (Doukari and Motamedi, 2022): **Quality** Assurance (QA) and **Quality Control (QC)**.

Both QA and QC represent tools for digital Quality Management, and very often, they are mistaken. So, first of all, it is necessary to acknowledge the meaning of each concept.

As defined by ISO 9000:2015 (2021) **Quality Assurance** is part of quality management that is focused on providing confidence that the quality requirements will be fulfilled. Its application has two main objectives (COBIM, 2012): Internal, focused on improving design and External, improving the exchange of information between different parties. It is a set of systematic and planned activities that ensure integration of the quality at the beginning of the project.

ISO 9000:2015 (2021) defines **Quality Control** as part of Quality Management focused on fulfilling those requirements. QC is based on comparing different data with established standards and analysing the differences between them. Controls are based on different types of checks which are grouped into subsets depending on their purpose.

In other words, QA is the process aligned with creating deliverables, whereas QC is the verification of those deliverables (ViBIM, 2020) (Figure 8).



Figure 8 - Difference between QA and QC (based on Rogers, 2023; Stanton, 2022)

2.2.2. The status of QA/QC Guidelines for BIM

Since quality checking represents one of the essentials of BIM, there are more than a few guides and manuals dealing with this topic. Some guidelines refer to it explicitly, whereas others address certain aspects, such as modelling requirements, that are an integral part of quality assurance process. The objective of the study in this paragraph is to evaluate the level of information on this subject available

in the market. This research involves compiling and assessing a collection of documents provided by various sources. The selection criteria were as follows:

Date of publishing: To assure that reviewed content remains current, documents published from 2012 were selected for research;

Guidelines content: Given that the research primary focus is on the model and quality checking, documents that cover these topics were selected.

In the following table (Table 2), a list of the evaluated guidelines is provided, followed by a short description of the quality content of each one.

Document Name	Publishing Organization	Publishing Country	Publishing Year
GSA BIM Guide	U.S. General Services Administration	USA	2016
BIM Essential Guide	Building and Construction Authority	Singapore	2013
NATSPEC National BIM Guide	Construction Information Systems	Australia	2022
Singapore BIM Guide Version 2.0	Building and Construction Authority	Singapore	2013
COBIM Series 6	COBIM	Finland	2012
Statsbygg BIM Manual 1.2.1	Statsbygg	Norway	2013
GSFIC BIM Guide Series 01	Georgia State Financing and Investment Comission	USA	2013
The New Zealand BIM Handbook	BIM Acceleration Committee	New Zealand	2019
CIC BIM Standards General	Construction Industry Council	Hong Kong	2021
AEC (UK) BIM Technology Protocol	AEC (UK)	UK	2015

Table 2 – Evaluated guides information

GSA BIM Guide 07 (2016) tackles the topic of quality in two ways: addressing the general requirements for modelling and quality control procedures. It provides practical guidance for modellers, which implicitly leverages overall quality of the model, preventing the common irregularities that appear due to bad modelling practices.

BIM Essential Guide - For BIM Execution Plan (2013) is a set of documents designed for different stakeholders: architectural consultants, MEP consultants, Civil and Structural consultants and others. It addresses the quality level needed for each phase and provides modelling guidelines for each discipline, differing the requirements depending on the project milestone.

NATSPEC National BIM Guide (2022) brings QA and QC in relation to information management and modelling standards: "model to standard, check to a standard". It provides general modelling guidelines on data structure and sharing of the model but lacks detailed information.

Singapore BIM Guide Version 2.0 (2013) indicates the responsibility of the BIM Manager in defining the Quality Assurance Plan which should specify data requirements and performed checks. The guide provides a list of aspects that should be taken into consideration: Modelling Guidelines, Dataset Validation, Interference Check and Validation of data used in cross-disciplinary coordination.

COBIM Series 6: Quality Assurance (2012) divides QA into two main categories: checking and analysis. The first one as a method of verifying the BIM file and information it contains, and second as producing information refined from the BIM.

Statsbygg BIM Manual 1.2.1 (2013) does not explicitly delve into the topic of QA and QC but provides modelling guidelines that can be referenced when defining requirements. It sorts them according to discipline and stage, following the IFC schema from project information to more specific.

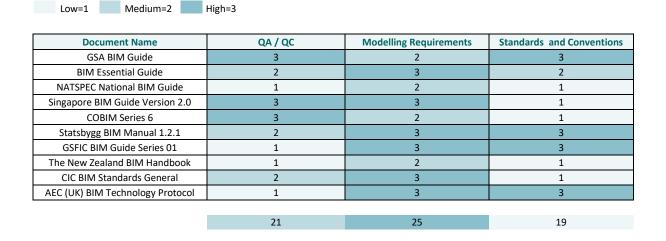
GSFIC BIM Guide Series 01: Model Analysis and Validation (2013) is a guide mainly intended for Architects and Engineers. It provides guidelines regarding both geometrical and non-geometrical data but is reserved only for Design requirements.

The New Zealand BIM Handbook – Appendix A – Modelling and Documentation Practice (2014) is a short document listing general modelling guidelines and quality control measures.

CIC BIM Standards General (2021) goes through the concept of QA and BIM Audit, grouping the checks into several categories. Modelling requirements are provided in detail, containing even the guidelines referring to annotations and line weights.

AEC (UK) BIM Technology Protocol (2015) points out the importance of quality throughout the document but lacks any further details on the topic. It provides detailed guidelines for project information, naming convention and classification following BS.

Each reviewed document covers a variety of subjects related to BIM. The objective of this research is to assess the current status of QA/QC content within the industry guidelines, so the evaluation presented below focuses on these aspects. The idea is to illustrate to which extent and detail these topics are covered in the selected manuals. In the assessment process, all aspects associated with achieving model quality are taken into consideration. They are classified into three sections: QA / QC, Modelling requirements and Standards and Conventions. Depth by which each topic is processed is classified by three levels: low=1, medium=2 and high=3.





Results of the analysis of provided BIM guides (Table 3) show the overall attitude towards QA and QC which is that majority of them point out the importance of quality but lack detailed methodology and requirements. This only confirms the need for creating a guideline that would specify thorough requirements for assuring the quality of the model.

2.2.3. BIM Model checking and QA/QC

BIM Model checking represents a pivotal part of Quality Assurance and Quality Control processes, being the necessary step in ensuring compliance with the requirements (Eastman, 2012). As stated in COBIM - Series 6 (2012), only 5-10 % of project information is systematically checked in a standard process.

Model checking consists of three components (Seib, 2019): **Rule sets**, **Information** contained within the model and **Software** (Figure 9).

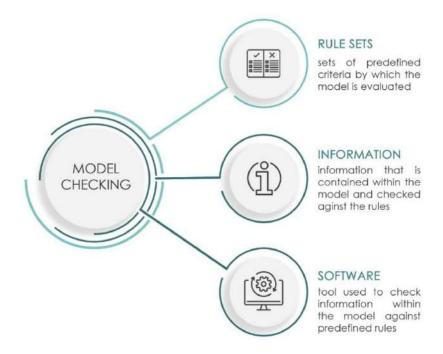


Figure 9 – Model checking components

Level of performed checks is directly influenced by all three variables that are dependent on each other. Software's functionalities need to support performing developed rules. Tool must be capable of executing the established rules properly, but also access and process the information within the model. At the same time, rules must be designed, taking into consideration how information is stored and what are the checking possibilities of the software. Thus, all three components need to be aligned for accurate and reliable model checking.

Hjelseth (2016) classifies model checking's into following types: Validation checking, Model content checking, Smart object checking and Design option checking.

Validation checking is a set of checks based on verifying compliance of design to the predefined rules. The content of rules is diverse and can be based on different standards and regulations. Depending on the type of data that is being checked, it is grouped into two subsets: geometry-based checking like Clash Detection and information-based checking like Code Compliance (Hjelseth, 2015).

Model Content checking is intended for verifying the content of the model, i.e., the relevance of provided information for the intended use (Hjelseth, 2015). It is based on the Exchange Information Requirements

(EIR) through which are defined geometric and alphanumerical information required in the model (ISO 19650-1:2018, 2018). Content checking enables having required data and avoiding information waste.

Adaptive model checking is based on the use of smart objects that are able to automatically adapt to changes in design based on predefined rules embedded in them (Hjelseth, 2015). Although the application of this type of checks is not widely applicable, it is fairly common with the use of parametric objects. The level of their adaptability depends on the amount and type of rules controlling the behaviour.

Guidance or otherwise known as Design option checking is a type of check that serves as a guideline providing designer with several solutions. It is more complex comparing to other types of checking because it is based on predefined rules and a list of possible solutions (Hjelseth, 2015).

In their research Mirarchi and Pavan (2019) address data quality within the models, focusing on three key dimensions which are **Accuracy** – data being correct and reliable, **Consistency** – correct use of semantic structure and **Completeness** – information structure satisfying requirements.

Accuracy of the information is vital since inaccurate data can compromise the project outcome. Consistency simplifies data interpretation and avoids making incorrect assumptions. Completeness guarantees that the model fulfils its intended purpose. They present the foundation of model integrity, meaning that quality assurance and model checking procedures should be focused on addressing these three dimensions.

2.2.4. Challenges of applying BIM Model checking

Despite the continuous emphasizing of the importance of performing BIM model checking, there are still many difficulties being faced in this matter. Although the majority of research focuses on technical challenges, the number of existing model checking tools implies that this is not an only challenge. Depending on the nature of the obstacles, several types of issues can be observed e.g., technological, societal, commercial, etc.

One of the main issues with model checking is creating the rulesets, in other words, interpreting humanreadable rules to machine learning. Hjeslseth (2015) conducted a study focused on processing of rules based on BIM-guidance from Statsbygg. Results showed that only a third can be automatically interpreted, whereas the rest must involve manual processing. In relation to this, as mentioned previously, one of the biggest drawbacks is lacking specific guidelines that would intelligibly state rules that need to be implemented, hence simplifying the process of interpreting.

The problem with large number of tools, though the situation is changing in past few years, is that they use "black-box" approach, restricting users of model checking according to their customized rules. Hard-coded approach does not adapt to changes and not only limits users, but affects relevancy of the checking as well e.g., assessing design according to latest standards (Gade and Svidt, 2021).

Societal challenges are usually seen as irrelevant but present a large drawback in efficient model checking. Murphie and Potts (2017, cited in Gade and Svidt, 2021, p.3) state that the relationship between technology and society is not just cause-and-effect formula, but rather an interplay, where

technology operates and is being operated in a complex social field. The biggest issue regarding the user's aspect is that the more comprehensive the process is, user is less likely to understand it. Consequently, being reluctant to trust the process and results, the user will more likely return to previous methods in which he can rely.

2.3. Rule Based checking

Rule based checking refers to the process of BIM model checking, where information within the BIM model is checked based on the conditions specified by predefined rule sets.

2.3.1. Background on rule checking

Rule-based checking systems are systems that assess design through applying rules or constraints, giving pass, fail, warning or unknown as a result (Eastman et al., 2009). Eastman et. al. (2009) state that rule checking process consists of four stages: Rule interpretation, Building model preparation, Rule execution and Rule check reporting stage.

Rule interpretation stage is part of translating the human-interpretable rules to computer-processable form. This step is vital for the automation of the process (Sydora and Stroulia, 2020). A common method is creating a table consisting of parameterized rules (Zhang et al., 2012). Model preparation stage consists of insuring that the building model is adequate for performing the check. In other words, that it provides needed information in appropriate structure e.g., object name, attributes, relationships et al. (Zhang et al., 2012). This usually includes following guides that specify modelling requirements for certain check e.g., Singapore BIM Guide (2013). Other method is using model view definitions (MVD) to assure the existence of needed parameters (BuildingSMART, 2019). Execution stage consists of two parts (BuildingSMART, 2019): mapping in-between model and created rules; and actual performing of the check. Final step of the process is reporting the results which can be graphical or textual.

Zhang et al. (2022) state that there are three main topics related to rule-based checking: Rule Classification, Rule Organisation and Rule Representation.

2.3.2. Rule Classification

Majority of papers dealing with the topic of rule-based checking proposes some classification method for grouping the rules. Solihin and Eastman (2015) classify rules according to the complexity of their processing into four categories:

Class 1—Rules that require a single or small number of explicit data;

Class 2—Rules that require simple derived attribute values;

Class 3—Rules that require extended data structure;

Class 4—Rules that require a "proof of solution".

2.3.2.1. Class 1 – Rules that require a single or small number of explicit data

This class checks "explicit attributes and entity references" (Eastman, 2015) focusing on a single or small amount of data. This group of rules is the simplest one to process considering the availability of information that needs to be assessed. Hence, it is retrieved directly from the entity, extracting relevant attributes and properties, or through parsing its relationships.

Rule example: Railing height shall be 900 mm or more.

Explanation: This rule falls under Class 1 as it involves a straightforward verification of an explicit property. The rule checks the height property of a railing entity. If the height is equal to or greater than 900 mm, the rule is satisfied.

2.3.2.2. Class 2 - Rules that require simple derived attribute values

This class of rules is a bit more complex than the previous one, since it cannot be assessed directly, but the values are derived using different relationships. This class does not generate new data structures but uses a combination of multiple values in order to check the required one. Unlike the Class 1 where values are explicit, this type of rules often require calculations including different measurements and distances.

Rule example: If the ramp landing has direct entrance, landing width needs to be 1200 mm plus the clearance space of the door.

Explanation: This rule belongs to Class 2 as it requires derived values. It checks the landing width, which is calculated by adding 1200 mm to the clearance space of the door. The calculation involves use of multiple attribute values to assess compliance.

2.3.2.3. Class 3 - Rules that require extended data structure

This group is significantly more complex than the previous two since it requires extended data structure, retrieving data that is stored externally e.g., topological, geometrical and other properties. It requires creating spatial structures that will hold the information about paths, distances etc. This methodology is usually used for complex requirements such as fire safety exits and code checking.

Rule example: Maximum distance between Fire Alarm Call Points

Explanation: This rule falls under Class 3 as it requires extended data structure. It creates a spatial structure to identify distance between points and then checks calculated distance against specific standard.

2.3.2.4. Class 4 - Rules that require a "proof of solution"

This classification differs from the rest since it is not a standard verification rule but a proof of solution. Meaning it focuses on the ways how the criteria can be satisfied, rather than if it is satisfied. Usually, it involves modifying the model with temporary data needed to find solutions. Solutions are provided from the knowledge base. Rule example by Estman and Solihin (2016): "Design columns with holes at 21 and 42" (0.53 - 1.06 m) above the floor level to provide support locations for lifelines and guardrails"

Explanation: This rule belongs to Class 4 as it requires proof of solution, meaning that the software uses knowledge-based system to create design that complies to the requirements stated in the rule.

2.3.3. Rule Organisation

Rule organisation represents a process of structuring rules in systematic and logical manner enabling effective execution and management. Although it is a crucial aspect when dealing with rule-based systems, as Zhang et al. (2016) explain, only a small number of studies take into consideration the rule dependencies and relationships. One of the most common methodologies is organizing rules into thematic groups, based on the subject. This type of organization ensures that the related rules are grouped together, making it easier for users to navigate and understand them. Another effective way of organizing is using hierarchical structure. It involves structuring in a tree-like manner, where rules are placed on different levels. This approach addresses hierarchy relationships between the rules, where higher level tiers address general principles, whereas lower levels provide more specific details. For the systems where the order of execution is important, dependency organization can be involved. This approach organizes rules based on their interdependencies, so they are performed sequentially, one rule relying on the completion of the other. In their research Zhang et al. (2016) reflect on some of the proposed strategies for organization, such as object-oriented organization and SASE (Standards Analysis, Synthesis and Evaluation) methodology. Object-oriented approach is based on organizing rules around objects, so the rules that deal with the same objects, are structured together. This method connects the rules to specific entities they apply to, making it easier to manage them. While objectoriented organization focuses on the interaction of rules and objects, SASE methodology addresses overall structure and relationships. For bigger number of rules, this approach can be difficult to manage. It includes two main networks, Organizational and Information. Organizational one focuses on the overall structure and order, whereas information network provides connections between the rules.

2.3.4. Rule Representation

Rule representation is pointed to the use of computer-readable method to represent building rules without changing the meaning of the native text (Soliman-Junior et al., 2021). In other words, rule representation refers to the way rule is expressed within a system. There are different methodologies addressing this. Solihin and Eastman (2016) list four main categories: production rule, semantic rule structure, logic-based implementation and language driven approach.

Production rule is considered to be one of the earliest methods, using the "if<conditions>then<actions>" structure. Zhang et al. (2016) point out that the main advantage of this approach is the simplicity of application. However, limitations are that it deals only with explicit data and is not able to illustrate relationships between the rules. This methodology is focused on the direct condition-action relationship, whereas semantic rule structure considers the underlying context, offering broader understanding of the rule. The main methodology built on this approach is RASE, developed by Hjelseth and Nisbet (2011). This method is based on four operators: Requirement, Applicability, Selection and Exception. It keeps the original text but adds interpretive mark-ups during the process to enable automatic system

understand rules more effectively (Zhang et al., 2016). Since its main purpose is defining semantic rule structure, it needs additional method for rule execution. Another method based on semantic approach is Semantic web. Standard language of semantic web is Resource Description Framework (RDF) graph structure, meaning it uses the triple form also known as RDF triplets. This structure follows a subjectpredicate-object format. Pauwels et al. (2010) explain that RDF graphs can be further enhanced by applying specialized vocabularies and ontologies using RDF Schema vocabulary (RDFS). RDFS enables augmentation of basic RDF statements, expressing relationships between entities and specifying constraints. As the complexity of structure grows, a more advanced mechanisms are employed. For more complex ontologies RDF graphs are built with Web Ontology Language (OWL), otherwise known as OWL ontologies. An OWL ontology can include descriptions of classes, properties and instances, allowing specification of more complex rules. Logic-based methodologies are used by commercial software's such as Solibri and represent black-box approach that is difficult to maintain. Language driven approaches include domain-specific languages and visual programming languages. One of this type is BERA language (Building Environment Rule and Analysis Language) which is domain specific language intended for querying information from the model (Eastman et al., 2015). Unlike generic programming languages, this language is user-friendly and intuitive for industry professionals. Its main limitation is that it cannot support more complex rules beyond its predefined syntax.

2.4. Information Requirements

In the process of BIM model checking, managing the level and quality of information is crucial, as data quality directly affects the accuracy of any analysis conducted using that data (Mirarchi and Pavan, 2019). Using suitable information not only prevents under and over production of data but allows automation of checking as well.

2.4.1. Defining Information Requirements

Information requirements are defined as "the request for explicit information to be delivered at a given time of the project to an indicated recipient, in a prescribed method and for a given purpose" (Tomczak et al., 2022, p. 2). Based on its use, Information Requirements can be organised into: Organizational Information Requirements (OIR), Project Information Requirements (PIR), Exchange Information Requirements (EIR) and Asset Information Requirements (AIR), which can further be detailed in the BIM Execution Plan (BEP) among other documents.

In order to utilize delivered information, it is critical to understand the purpose for which it is intended. BS EN ISO 19650 (2020) states that beforehand of considering information itself, should be understood why information is needed, describing it across four main factors: **Purpose**, which is the need that should be fulfilled, **Content**, which can be an overall content of the information or geometrical or alphanumerical information of an object, **Form**, which is the way how it is being presented e.g., drawing; and **Format**, which is the way it is being encoded e.g., IFC.

Providing appropriate Information Requirements, hence enabling successful information exchange and use, is directly dependant on defining the correct level of information that is being used.

2.4.2. Level of Detail vs. Level of Development vs. Level of Information Need

There are many different approaches to define information requirements and many confusions about the same. In context of defining necessary level of information, for a long time, two terms have been used interchangeably, Level of detail (LoD) and Level of development (LOD). It can be concluded that LOD was built upon the LoD definitions, following the five-level hierarchy (Abualdenien and Borrman, 2022). Although there is a great misconception that the meaning is the same, Level of detail stands for how much detail is included in the model element, as an input to the element itself, whereas Level of development stands for the degree to which both geometrical and alphanumerical information has been thought through, being a reliable output (New Zealand BIM Handbook, 2014). On international level these approaches caused misunderstandings and improper use causing information overload and overall inefficiency. If there were ten experts in the field explaining the LOD of the same element, there would have been ten different explanations (Bolpagni, 2020). By introducing Level of Information Need it was intended to overcome LOD limitations and focus on the data required to perform a specific task like Energy Analysis or Quantity Take Off (QTO). According to ISO 19650 (2018) Level of Information Need is determined by the minimum amount of information that is needed to comply to relevant requirement and anything beyond this minimum is considered a waste. Unlike LoD and LOD that derive on explicit levels, Level of Information Need considers this approach to be too constraining for capturing information requirements.

2.4.3. Level of Information Need

BS EN ISO 19650-4 (2020) defines Level of Information Need as a framework for defining quality, quantity and granularity of information requirements. As it was already mentioned, Level of Information Need was developed with a goal of overcoming inefficient use of LOD levels, as a lean approach focused on client's needs. The most important aspect of Level of Information Need is that it is purpose driven, based firstly on defining the use of information.

EN 17412-1 (2020) lists four main prerequisites () needed to define information context: **Why** is the information needed? – Purpose, **When** is the information needed? – Information delivery milestone, **Who** requires and delivers information? – Actors and, **What**? Object within breakdown structure – The requirement is connected to (Figure 10).

Integrated Quality Assurance and Control Framework for BIM Models during Design, Construction and Operation

O Purpose	Infromation Delivery Milestone	Actor	[͡∯] Object
WHY?	WHEN?	WHO?	WHAT?
BIM Model Uses	Brief Schematic Design Detailed Design Construction Operation	Owner Designer General Contractor Trade Vendor	IfcColumn IfcBeam IfcCovering
W?			
ometrical requiremer	nts detail dimensionality	location appearance	ce parametric be

Figure 10 - Level of Information Need structure (based on Bolpagni, BIM CPH, 2022)

In order to closely define information, firstly it is needed to understand its purpose, interpreting it through specific BIM Model use. Secondly, defining in which project phase information is being delivered, connecting the information to 'when' instance can in large portion determine the type and quantity of required data like Energy Analysis in planning phase based on mass vs. creating complex Energy model in construction phase. Thirdly, distinguishing for whom the information is provided like a contractor or facility manager; and lastly, consider the objects within a breakdown structure.

Level of Information Need specifies three sub-divisions of information requirements (BS EN ISO 19650-4, 2020):

- **Geometrical information**, Geometrical information is specified through following aspects: Detail, Dimensionality, Location, Appearance and Parametric behaviour.

- **Alphanumerical information**, Alphanumerical information is specified through: Identification and Information content.

- **Documentation**. Types of documents include: Reports, Specifications, Manuals, Photographs, Handdrawn sketches, Signed documents and Hard copies.

As stated by Bolpagni (2022), the purpose of using Level of Information Need is to: avoid waste, provide the right information to the right actor at the right time and enable automatic compliance checking.

2.4.4. Methods for specifying Information Requirements

Despite the obvious demands for defining methodologies that would be used for specifying Information Requirements, there is a lack of scientific research on this subject. Majority of effort has been put from the side of BuildingSMART (BuildingSMART, 2022) to provide needed consistency and automation in this field. Methodologies evaluated below are part of the list of methods for specifying information requirements created by Tomczak et al. (2022).

The most frequently used method for specifying Information Requirements is still text-based and usually includes text files that explain requirements (Tomczak, 2022). These files can be generated in multiple ways, using text editors or tools provided by different vendors. Though this method can be seen as outdated it is still widely used due to its simplicity. More advanced method of specifying information associated with building products is using Product Data Templates (Martins and Costa, 2018). Standardized structure allows easy exchange between providers and users, as well as processing by different software applications. This enables data to be easily extracted, displayed and integrated into the model or software tools. Another method, as explained in the previous chapter, is Level of Information Need, which is a standard that specifies Information Requirements through defining geometrical requirements, alphanumerical requirements and documentation needed for specific use. One of the ways to define computer interpretable exchange requirements is by using Model View Definition (MVD). MVD presents a specific implementation level of Industry Foundation Classes (IFC), defining a subset of information that should be included in the model, as well as the way it is structured. It allows user to filter out the information needed for specific use. Although it is possible to create custom MVD which is tailored to specific requirements, there are several concerns addressing this. Firstly, it requires good understanding of the IFC schema, and it should be ensured that provided IFC files can be interpreted by other software applications, complying with industry standards. To overcome these limitations, Information Delivery Specification (IDS) format has emerged. IDS is an XML-based exchange format that defines information requirements. This format enables defining different type of information that needs to be contained within the model or specific entity, allowing user to specify accurate values or their restrictions. Limitation of IDS is that it addresses alphanumerical information and is not intended to specify certain rules or design requirements. Although they cannot be addressed explicitly, value constraints can be used to deal with this type of requirements. Important aspect of IDS is that it can be used as complementary specification to the Level of Information Need, allowing alphanumerical requirements to be expressed in computer-interpretable way, enabling automated compliance checking (Figure 11).

Example 1.Textual file explaining the requirement.

Source: Statsbygg's SIMBA (https://sites.google.com/view/simba-bim-krav)

Wall				
The wall represents a vertical construction that bounds or subdivides spaces. Wall are usually vertical, or nearly vertical, planar elements, often designed to bear structural loads. A wall is however not required to be load bearing. NS3451: IFC 4 Add2: IfcWall	2	AR .		
Level of Information (LOI)	83.1	B3.2	B4.1	85.1
LoadBearing	x	x	x	x

Example 2. Product Data Template version of the example above

Template Category	Wall				
Information Category	Parameter Name	Value	Units	Reference	Notes
Structural	LoadBearing			00123	Should be True or False

Example 3. Part of the MVD with the LoadBearing requirment defined with TemplateRule



Example 4. IDS requirement for LoadBearing parameter defined with restriction in XML



Example 5. Same IDS requirement but displayed in a user interface (own graphic).

1.	Wall must be load bea	ring or not. 🧷		~	2X3	:	1
All ele	ments of:						
entity	y IfcWall 🤞 🗖	8					
Should	d have a:						
			of value = true 1	false x	10 2	00	

Figure 11 - 5 Examples of specifying information requirements (Tomczak et al., 2022)

In their research of methodologies for specifying Information Requirements Tomczak et al. (2022) conclude that IDS is the most advantageous method when it comes to automated validation of the alphanumerical information content within the model.

2.5. Tools for BIM Model Checking

In BIM model checking process, tools serve as essential instruments for execution of the rules, assuring that the BIM model complies to predefined requirements and standards. The objective of this chapter is to assess some of the model checking software's that are currently available on the market. The aim is to lay out comprehensive overview of the software functionalities and provide an insight on how they address the critical aspects of QA / QC. Hence, the research addresses three topics: functionalities and templates embedded within the tools; rule creation process and visual representation of the verifications.

Throughout the research of the selected tools, their possibilities, as well as constraints shall be acknowledged. This assessment was made only for academic purposes and can't be used for commercial purposes and its conclusions and methodology are restrained to the knowledge experience and availability of the researchers involved, so it can't be considered exhaustive for all the possible evaluations. This assessment was done under the sole intention of framing this state of the art and under the ethical principles of this academic work without any bias for any of the products.

2.5.1. Brief overview of selected tools

Tools selected for evaluation are: Revit Model Checker, Solibri, Navisworks and usBIM.Checker. Criteria for selection of the tools was based on the fact that: they are widely used in the model checking; they address various aspects of model validation and they offer users the flexibility to create customized rules for meeting specific requirements.

Revit Model Checker, unlike other standalone tools is a plugin designed for model checking within the Revit environment. It is directly integrated in the Revit workspace allowing seamless verification process without the need for external software. It is aimed for performing different type of verifications.

Solibri is one of the most widely adopted tools for BIM model checking. It provides wide range of verifications, addressing different aspects of BIM model quality. It encompasses not only geometrical and spatial checking, but alphanumerical and code validation as well. It is mainly used for checking IFC files.

Navisworks is another widely used tool. It is focused on model coordination and clash detection. It supports wide range of file formats, so can be used for checking both Revit and IFC files.

usBIM.Checker is relatively newer addition designed for verifying properties and data content within the BIM models. It is specifically designed for checking the IFC files.

Revit Model Checker	Solibri	Navisworks	usBIMChecker
Autodesk	Solibri, Inc.	Autodesk	ACCA Software
Free Tool within Paid Software	Paid Tool	Paid Tool	Paid Tool
Plugin within Revit environment	Individual software	Individual software	Individual software
File formats: Revit	File formats: IFC, IFCzip, Solibri native (SMC, SMV, SMCT), DWG	File formats: IFC, RVT, 3DS, FBX, STEP, STL, Naviswork native (NWF, NWC, NWD)etc.	File formats: IFC

Table 4 – Selected tools information overview

2.5.2. Templates and Functionalities

Each of the selected software's has a template file containing a list of rules. Majority of users actually use only functionalities within these predefined rules as it is the simplest and fastest way to perform model checking. Limitations with using these templates is that they provide more generic type of checking and usually cannot satisfy all of the project specific requirements.

Revit Model Checker contains a public library with more than 30 templates. Besides the rule sets embedded within the plugin, many institutions such as U.S. General Services Administration (GSA) offer their templates for model checking that can be used with this tool. Exploration of given templates showed that majority of the rules focus on the alphanumerical information, whereas geometry is seen in only a small portion, regarding the unplaced rooms and spaces. University templates are very specific in the requirements for property presence and naming conventions, whereas Revit templates deal more with the requirements that assure more efficient working process. In project specific scenarios, majority of templates is not fully applicable because of their level of specificity, so the solution is in their configurability. It offers the user possibility of selection which rules from the template are going to be performed, omitting the unwanted ones from the process. This enables aligning the tool more closely to project specific requirements. In summary, for a comprehensive BIM model checking, the user would have to combine rules from different templates, enabling both alphanumerical and geometrical checks to be performed.

Solibri offers large repository containing different type of rule sets. These rules are organized according to disciplines and types of checking, although this structure can cause a slight confusion for the user. For example, the criteria that applies to all elements, such as rule concerning Global unique Identifier (GUID), is contained within Architectural checking. Majority of rules are focused on geometrical accuracy of the model, though there are rules concerning the alphanumerical requirements, such as required property sets for Mechanical, Electrical & Plumbing (MEP) elements. Similarly, to previously mentioned tool templates, some of the preconfigured rules are very specific in defining values, which can be an issue if they collide with specific project requirements. Nevertheless, Solibri allows adjusting these values by user.

Navisworks does not contain predefined templates, so all rules need to be created manually. It allows loading and storing the externally created files, but it is predominantly created for Clash Detection. Hence, it can be used to address certain aspects of quality, but specifying this type of checking is much more difficult comparing to other tools.

usBIM.Checker does not have integrated rules. The limitation of this checker is that it can only address alphanumerical information, allowing users to formulate their own property requirements and values. Considering this, it can be used to assure that information contained within entities comply to specified requirements, but not to evaluate the overall quality of the model.

2.5.3. Rule Creation

Revit Model Checker does not contain functionality for creating rules within the plugin itself. Autodesk provides another standalone application called Model Checker Configurator where rules can be formulated. Configurator offers three ways to configure the ruleset: Advanced Check Builder, Wizard Check Builder and Pre-built checks. For inexperienced users the easiest way is to use Wizard, since the interface is user-friendly, and process is relatively straightforward. Advanced Check Builder offers possibilities of formulating more complex rules, whereas pre-built section contains already defined rules that can be included into the set. Big advantage of using configurator is that Autodesk provides sample files that can be easily modified to fit the user's needs.

Solibri offers Ruleset Manager which users can use to customize existing or create their own rule sets. It provides separate libraries containing different type of rules that can be used as templates and modified by users or enables creating the rules from start. The process of creation is more complicated comparing to the Configurator but allows formulating more complex rules. Additionally, rulesets are automatically updated into the checking environment, and can be assessed from there as well, with any changes saved automatically to Rule Set Manager.

Navisworks offers two possible approaches to performing checks, either by Find Items or using Clash Detective. Find Items functionality allows performing alphanumerical check, since it can be used to check if there are entities that contain certain property value. Nevertheless, using this approach can be very time-consuming especially if the model contains large number of entities. Geometrical checking can be performed by Clash detective, but only to certain extent. It can be used to check elements intersection or duplication, but not more complex checking such as clearances. The process of creating rules within Navisworks is relatively easy, but since its main functionality is to detect clashes, possibilities of detecting other quality issues are very limited.

usBIM.Checker provides a functionality for checking properties and their values. Unlike previously evaluated tools which share the common logic of formulating rules, this tool functions similarly to IDS editors. It provides two sections, one where the evaluated entities are filtered and the other where property values are specified. It allows limitless possibilities when it comes to checking the content of the properties, but almost none in terms of other quality aspects, even the alphanumerical e.g., duplicated room naming (Figure 12).

Revit Model Checker:

ld I	ilter						
	Operator	Criteria	Property	Condition	Value		
1		Category -	OST_Doors •	Include 👻	✓ Code: True	×	
Ŧ	Exclude -	Parameter -	Height -	< •	 Code: 2000 mm 	×	

Solibri:

PARAMETERS				Severity Parameters
Components to Check				
State	Component	Property	Operator	Value
Include	Door			
Exclude	Door	Building Elements - General	One Of	[Hatches]
Requirements				
Requirements State	Component	Property	Operator	value
State	Component	Property Height	Operator ≥	
State	CONTRACTOR AND A DESCRIPTION OF A DESCRI	1.000.000.000	z	Value 166'-8"
State	CONTRACTOR AND A DESCRIPTION OF A DESCRI	1.000.000.000	z	Value
	CONTRACTOR AND A DESCRIPTION OF A DESCRI	1.000.000.000	≥ Activ	Value 166'-8"

Navisworks:

0.000	tegory		Property	Condition	Value Doors	
Y	Element		Category	=	Doors	
	Element		Door Height	<	2.00	
		~				

usBIMChecker:

	OBJECT SE	LECTION FILTERS					Î		+
REQUIREMENTS	ATTRIBUTE	PropertySET	Property	Тіро	OPERATOR	VALUE			
LIST 2 Check 1	ifcClass				equal	IfcDoor		1	5
						Add a New OR Cond	ition	(-
	PROPERTY	CHECKS							+
	NOTE	PropertySET	Property	Тіро	OPERATOR	VALORE			
	Door Height	Qto_DoorBaseQuan	Height	Ifcinteger	equal to or gr	2		1	=

Figure 12 - Door Height rule creation in the analysed tools

2.5.4. Visualization of results

Revit Model Checker displays results as a summary of the overall verification with a list of all the checking's and their results. A report shows a total count of passed and failed verifications with an overall percentage. Additionally, with each failed rule it provides a list of elements and their name and ID, enabling their identification. Along with that, it enables showing the issue directly in the model,

allowing easier navigation and tracking the issue. Verification report can be exported as a HTML or Excel file (Figure 13).

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Figure 13 - Display of verification results by Revit Model Checker

Solibri shows results in checking environment as a list of verifications with a mark of their severity. It provides an extended description of failed results, classifying them in four categories: rejected, low, moderate and critical severity. Furthermore, it provides an issue count and density, as an additional measure of quantifying, as well as their visualization. The disadvantage of the way Solibri display results is that it does not provide additional data about elements which would enable their identification within proprietary software. It allows exporting the report to PDF, Excel or RTF format, as well as creating BCF (Figure 14).

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Figure 14 - Display of verification results by Solibri

Navisworks primarily uses Clash detective to display results, though other methods are possible as well. It parses the results by elements, listing the failed checks along with their description. Additionally, it highlights the elements within the 3D viewer providing visualization of the issues. Exporting the report allows user to select which information should be exported, as well as report type and format that can be HTML, XML, text or viewpoints (Figure 15).

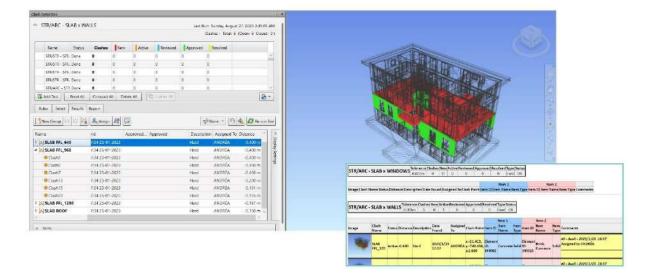


Figure 15 - Display of verification results by Navisworks

usBIM.Checker displays results in the checking environment, providing a list of failed elements along with their identification data. With a selection of each check, it highlights the element within the viewer. It allows exporting the report as Comma Separated Values (CSV), BIM Collaboration Format (BCF) or Excel (Figure 16).

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Figure 16 - Display of verification results by usBIM.Checker

2.5.5. Comparison of the selected tools

Medium=2

Low=1

High=3

Evaluation of selected software tools provided several conclusions. Regarding the type of data that can be assessed, Solibri demonstrates great versatility, handling various checking's relatively easy. On the other hand, Revit Model Checker shows limitations in dealing with certain aspects of geometry checking such as intersections and distances. Navisworks can be used to address both alphanumerical and geometrical checks, but it is limited, and creation process is time consuming and very complex. As already mentioned, usBIMChecker deals only with property content. Downsize of rule creation process for Revit Model Checker is that it cannot be done within the plugin, but requires a separate Configurator. Nevertheless, process of creation is very straightforward, especially using the Wizard. Furthermore, it addresses issues within proprietary platform, avoiding the time-consuming export to IFC. In contrast, Navisworks offers compatibility with large range of file formats. When it comes to visualization of the results, all tools offer more or less same possibilities along with the export of reports.

In the table below (Table 5) results and conclusions of conducted study are visually displayed addressing several investigated aspects. Three levels are used for evaluation: low, medium and high.

Functionality	Revit Model Checker	Solibri	Navisworks	usBIMChecker
Geometry Checks	Low	High	Medium	х
Clash Detection	х	High	High	х
Alphanumerical checks	High	High	Low	Low
Parameter value checks	High	High	Low	High
Naming Conventions	Medium	High	Х	High
Classifications	High	High	Low	Medium
Building Code checks	Medium	High	Х	Х
Simplicity of rule creation process	High	Medium	Low	High
Complexity of rules	Medium	High	Medium	Medium
Visualization of results	High	High	Medium	High

Table 5 - Results of the evaluation of selected tools

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3. METHODOLOGY

The research on Quality Assurance and Checking of the BIM model led to several conclusions. Among the many discussions on this topic, a common thought is shared, and that is the connection of consistency and accuracy of the model data with its quality. Addressing this idea, in order to enhance the quality of the company's deliverables, it is crucial to understand what the causes of discrepancy are. A recurring thought becomes apparent: model quality is directly connected with the initial definition of the requirements. Reflecting on the earlier defined hypothesis, that the quality is conformance to requirements, brings out the obvious need to properly address them.

In many interviews conducted with company's professionals, one of the repetitive issues they all reflected on, was that clients often struggle how to explain what their needs are. They provide required documentation for information requirements, but it is often copied from project to project, not actually fitting current use. These poor inputs lead to the output of lower quality. The consequences of wrongly defined and insufficient requirements are multiple: miscommunication among involved parties, design errors, absence of valuable information etc. This results in further delays and deficiencies, affecting the quality of the whole process.

This confirms the need for creating the methodology that would facilitate seamless data specification and delivery. The aim is to handle the process of requirements specification, reducing misunderstandings and overcoming the usual challenges.

3.1. Overview of Proposed Methodology

Proposed methodology integrates QA and QC processes in the following way: firstly, addressing QA through creating a Requirements Specificator that would be used as a guideline for specifying BIM model requirements, and secondly, addressing QC through the BIM Model Verification process.

The appointing party would create a subset of requirements from the Specificator, adapting it to the personal needs, making a subset of requirements specific for the project. Created requirements are then given to the appointed party. Using the directions given in the requirements, appointed party creates the model. This model is then exported to the IFC format, used for the exchange between the parties. Then the process of backward engineering is facilitated. The created IFC file is then returned to the appointing party. When the client receives IFC file, the verification is conducted. Verification process includes checking if the delivered IFC file complies to the requirements given by the appointing party. Proposed methodology encompasses cyclical process. It starts with specifying the requirements, moves on to using those requirements for creating the model and then verifies the model to previously specified requirements (Figure 17).

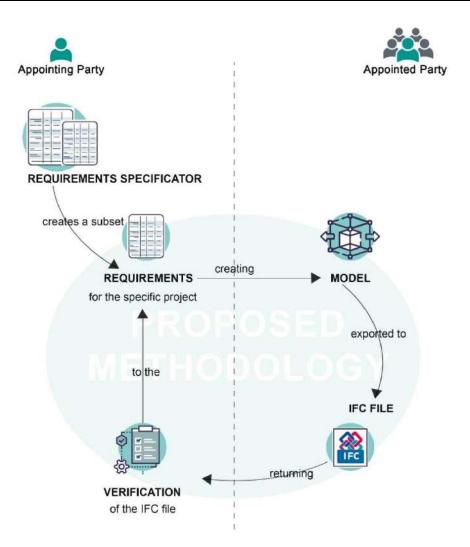


Figure 17 – Illustration of proposed methodology

3.2. Machine to machine interactions

One of the main ideas encompassing the created methodology is that it should answer the current and future industry tendencies. This concept is aligned with the principles elaborated in the previous overview on the topic of quality in Industry 4.0. As elaborated in the research addressing Quality 4.0, traditional processes of quality assurance and checking should be elevated using advanced technologies, particularly automation. Translating this vision into the methodology, the potential for automation of the requirements creation and validation is recognized. The key element in facilitating automation would be the Specificator, which would represent central repository. This repository would include all essential rules and requirements, from which the tailor-made requirements would be generated to match project specific needs. Subsequently, it would be used in the process of verification, where the compliance of the model to the requirements would be done using automated mechanisms. Having this in mind, the strategy for Specificator creation is that it supports the possibility of machine-to-machine interaction. This means it embodies a higher level of complexity compared to the requests of machine-to-machine complexity. It is structured in tabular format, providing clear and consistent structure. This allows easy

identification and processing of the data using automated scripts and algorithms. Further, it allows creation of database which would serve as a repository of the information.

3.3. Implementation of proposed methodology

Implementation of the proposed methodology is currently directed towards two core aspects:

Development of the **Requirements Specificator** and Testing **Verification methods**.

In close collaboration with the BIMMS company, a case study was conducted on an ongoing project. The primary goal at this stage was to create the Requirements Specificator. The focus during the creation was to put on the defining modelling requirements and model content. Various industry and company specific requirements were acknowledged. Following the methodology process, this framework was then used for creation of the requirements for the specific project. Simultaneously, the possible verification methods were tested out. Based on the rules outlined by the requirements, company developed a building model. Once the model was ready, it was exported to the IFC file format. Then the verification process was conducted. In agreement with the company, it was decided to test three possible approaches of validation: one method focused on the internal evaluation of the quality, that would be performed on the company's side, and two external verification methods, that would be done by the client. The aim of the verification process is to confirm the model's compliance to the predefined requirements (Figure 18).

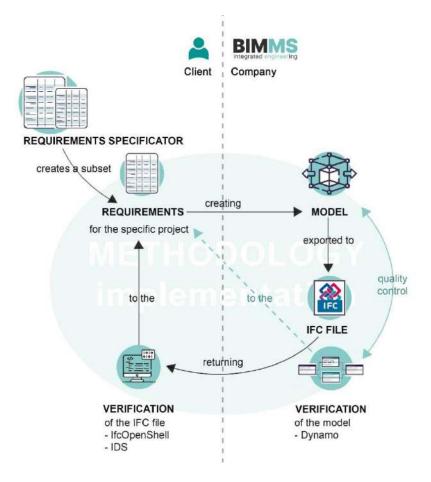


Figure 18 – Illustration of methodology implementation within the company

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4. REQUIREMENTS SPECIFICATOR

The developed Requirements Specificator demonstrates a versatile applicability and is used to assist several topics in the BIM process. <u>To provide the guidance to the client in specifying information requirements</u> – assuring the provision of relevant and appropriate level of information, needed to execute certain BIM Use. <u>Serving as a modelling guide to the team members</u> – providing precise and standardized instructions that enable consistent approach to modelling by all collaborators, not only assuring quality of the BIM model but enhancing overall efficiency. <u>Constituting rule sets</u> – enabling model evaluation and checking the compliance to the established requirements.

4.1. Methodology for creating the Requirements Specificator

Creating the Requirements Specificator was based on the process that included several steps in collecting and filtering the data (Figure 19).

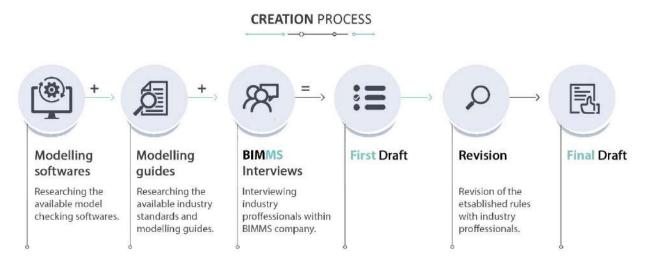


Figure 19 – Process of creating the Requirements Specificator

Ruleset creation involved methodological approach consisting of research and filtering viable information. Preliminary phase included evaluation and testing out various BIM model checking software applications and functionalities within them. Accompanying step included research through the available guides and standards covering the topic of BIM model quality and modelling overall (Table 6). Following this, next stage included the interviews with the industry professionals within the BIMMS company about the issues related to information requirements and quality of the BIM models. After collecting the data, it was formulated in the rulesets that were finally again revised and filtered with the professionals from the company.

Process of defining information content of the Level of Information Need followed the same methodology, with additional step of researching the IFC4 Schema, available MVDs and parsing through property sets for each of the elements. Finally, defining modelling rules and information content for specific BIM Uses relied a lot on the research of usual practice within industry and the company, as well as requirements of the software's used for conducting analysis.

Framework Tier	Analysed Guides and Manuals	Technical documentation and specification	Tested Tools	
I tier:	GSA BIM Guide (2016)	IFC 4 Schema	Revit Model	
General Project Requirements	BIM Essential Guide (2013)	ICC-001 Design to Code Compliance Checking (ICC 2006)	Checker	
II tier:	NATSPEC National BIM Guide (2022)		Solibri	
Alphanumerical Requirements	Singapore BIM Guide Version 2.0 (2013)		Navisworks usBIM.Checker	
Geometrical Requirements	COBIM Series 3: Architectural Desing (2012)		usbiivi.cnecker	
Design Specific Requirements Level of Information Need	COBIM Series 4: MEP Design (2012)			
Level of Information Need	COBIM Series 5: Structural Design (2012)			
	COBIM Series 6 Quality Assurance (2012)			
	COBIM Series 12: Use of models in facility management (2012)			
	COBIM Series 13: Use of models in construction (2012)			
	Statsbygg BIM Manual 1.2.1 (2013)			
	GSFIC BIM Guide Series 01 (2013)			
	The New Zealand BIM Handbook (2019)			
	CIC BIM Standards General (2021)			
	e - Submission Guideline			
	Mechanical, Electrical, Plumbing (2011)			
	Revit MEP 2011 User's Guide (2011)			
	DDC BIM Guidelines (2012)			
	BS EN 17412-1:2020 (2020)			
	Level of Development (LOD) Specification for Building Information Models (2021)			
III tier:				
Cost Estimation	COBIM Series 7 Quantity take-off (2012)	GSA-004 Architectural Design to Quantity Takeoff for	Bexel	
	BuildingSMART Quantity-Take-off IDM (2020)	Cost Estimating (2011)		
	RICS new rules of measurement			
	NRM 2: Detailed measurement for building works (2012)			
Energy Analysis	BIMSpeed	BuildingSMART "Technical Report for BIM-BEM	Green Building	
	Analysis of BIM-to-BEM critical parameters and	Workflows" (2022)	Studio	
	recommendations to solve the current bottlenecks (2019)	GSA-003 Architectural Design to Building Energy	Insight	
	BIM application D4.3	Analysis (2011) NOW-001 Nordic Energy Analysis (2011)	DesignBuilder Energy Plus	
	Development and advanced prefabrication of innovative, multifunctional building envelope elements for	HUT HVAC-001 Indoor climate simulation to HVAC	CYPETHERM E	
	MOdular REtrofitting and CONNECTions (MORE-CONNECT)	design(2010)	Plus	
	(2017)	HUT_HVAC-002 Space Requirements and Targets to		
	COBIM Series 10: Energy Analysis (2012)	Thermal Simulation (2008)		
	GSA BIM Guide 05 - Energy Performance (2015)			
	BIM + Building Performance Analysis			
	Using Revit 2014 and IES Virtual Environment (2014)			
	Implementation Guide:	1		
	Space Boundaries for Energy Analysis (2009)			
	Dynamic Energy Optimization with Revit® and Insight 360			
	(2017)	4		
	Comparison of Building Energy Modeling Programs: HVAC			
	Systems (2013)			

Table 6 - List of used guides and tools

4.2. Requirements Specificator Structure

Requirements Specificator was constituted following the principles of class hierarchy inheritance. In other words, child classes inherit rules and functionalities from their parents' class. The organization of classes is structured into three distinct tiers, each serving specific groups within the Requirements Specificator (Figure 20).

I tier:

• General Project Requirements;

II tier:

- Alphanumerical Requirements, Geometrical Requirements and Design Specific Requirements;
- Level of Information Need;

o Architecture;

o Structure;

o MEP;

III tier:

BIM Uses:

- Cost Estimation;
- Energy Analysis.

-							
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General requirements to be	applied to all models.				
Alphanumerical	Geometrical	Design Specific		LOIN	
Alphanumerical requirements)	Geometrical requirements.	• Design Specific requirements.	Level o	f Informatio	n Need.
			ARCH	STR	MER
	BIM	Uses			
 BIM Uses requirements and 	Level of Information Need.				

Figure 20 – Requirements Specificator Structure

First tier acts as a parent class in the hierarchy, so it captures fundamental rules and functionalities that are applicable across the entire Requirements Specificator. Moving to the second tier, classes are organized thematically, where each is focused on specific aspect within the BIM modelling. They inherit rules from the higher tier, further processing and expanding their functionalities to domain-specific requirements. Finally, third tier incorporates rules from both previous tiers, omitting and adapting the ones needed to assist provided uses.

Using hierarchical structure enhances conceptual understanding of the Requirements Specificator and enables easier navigation for the users. This contributes to better utilization and interpretation of the guidelines. Additionally, tiered design supports variety of applications and possible scenarios, allowing users to modify it according to their specific needs.

4.3. I tier: General Project Requirements

As its name suggests, first tier embodies general requirements that should be satisfied on a project level. It provides requirements for all stakeholders, assuring efficiency, consistency, and unification across all model disciplines. The primary purpose of this set is to facilitate interoperability and information exchange among different team members. In order to achieve this, requirements are constructed around

critical aspects of model exchange, addressing several key topics such as file naming convention, georeferencing, consistency of units and use of linked files.

This tier specifies following rules:

1. **Agreed Version** – *All models shall be modelled in the same version of the required tool.*

2. **BIM File Naming** – All files within the project shall follow uniform and consistent naming convention specified by the information requirements. * If not requested otherwise, the ISO 19650-2 naming convention may be followed.

3. **Classification System** – All elements shall be assigned classification code and follow the same classification system e.g., Uniclass 2015.

4. **Unique GUIDs** – All components shall have unique GUID values.

5. **Project Information** – *Project Information shall be defined: Project Name; Project Adress; Project Number ID, Client Name; Author.*

6. **Project Units** – *Relevant measurement units shall be defined at the Project level of each model. Metric system is used unless required otherwise.*

7. **Consistency of units** – *All discipline models shall follow the same measurement system.*

8. **Measuring accuracy** – *Measuring accuracy shall be defined on project level. If not requested otherwise, default project units should contain two decimal places.*

9. **Correct use of entities** – *All elements shall be modelled using correct tools and objects e.g., flat roof modelled with roof object, not slab.*

10. **Geographic location** – Geographic Location shall be obtained from Survey Point. *Getting Geographic Location from Survey Point is more reliable than using Project Adress.

11. **Survey Point** – Survey Point shall refer to the true coordinates / real world location of the project. The location of the Survey Point shall be the same for all discipline models.

12. **Project Base Point** – *Project Base Point shall define the origin* (0,0,0) *of the project coordinate system. The location of the Project Base Point shall be the same for all discipline models.*

13. **Orientation** – *Project North in all discipline models shall be the same. True North direction in all discipline models shall be the same. Angle between Project North and True North shall be the same in all discipline models.*

14. **Level structure** – *All models shall use the same level structure.*

15. **Grids** – Grids shall be consistent across all discipline models.

16. **Unused Elements** – *Models shall not contain unused elements*.

- 17. **Linked Revit files** *Linked Revit Files shall be pinned in place.*
- 18. Linked CAD files Linked CAD Files shall be pinned in place.
- 19. In-Place Families Using In-Place Families should be avoided.

Each of the listed requirements carries a rule specification defining what needs to be followed. All rules are constructed following schema:

- The word "**shall**" express a requirement that must be followed strictly;
- The words "**should**" and "may" express recommendation as a valuable guidance;
- The word "**can**" express possibility that can be explored.

One requirement can be constructed using combination of different expressing ways, where "shall" defines a requirement and "should" is used as accompanying recommendation, as shown in the example below (Figure 21).

8	Measuring accuracy
	Measuring accuracy shall be defined on project level.
	If not requested otherwise, default project units should contain two decimal places.

Figure 21 - Example of rule specification, I tier: General Project Requirements

Having in mind that majority of these aspects is typically defined by the client and tailored to the specific project requirements, rules are accompanied by annexes of recommendations that may be followed. These annexes are based on the ISO standards, or in case where there is no standard on the topic, company professionals' advice. In the example of File Naming rule provided below (Figure 22), rule states that: "All files within the project shall follow uniform and consistent naming convention specified by the information requirements". Annex to the rule is a BS EN ISO 19650-2 Naming Convention that may be followed or serve the client as a guide for specifying file naming standard.

2	BIM File Naming
	All files within the project shall follow uniform and consistent naming convention specified by the information requirements.
	* If not requested otherwise, the BS EN ISO 19650-2 naming convention may be followed.
	Project Code> <originator<>Functional Breakdown<>Spatial Breakdown<>Form<>Discipline<>Number</originator<>
	Project Code – individual code for the project e.g., SC1
	Originator – unique code for the organization creating information e.g., SFT
	Functional Breakdown – design purpose of the information e.g., fire protection information
	Spatial Breakdown – spatial location of information e.g., first floor building level 01
	Form – defining form of information
	D-drawing
	G-diagram
	I-image
	L-list
	M-model
	T-textual
	V-video/audio
	Discipline – technical activities
	A-Architecture
	B-Building surveying
	C-Civil engineering
	D-demolition/dismantling
	E – Electrical Engineering
	Number – used for differentiation by allocating a sequential number
	*General rules
	Avoid using special characters in fields and folders $\ : ? " <> [] \& $, . { } @$
	All fields shall be separated by a hyphen character.

Figure 22 - BIM File Naming, I tier: General Project Requirements

4.4. II tier:

As explained previously, this tier dives into details of modelling requirements identified by the industry standards and BIMMS company professionals. Main goal is twofold: first, to address repetitive quality issues and enhance overall model quality and secondly, to improve the exchange process between the parties. It addresses two key aspects which are:

1. Modelling requirements:

- Alphanumerical;
- Geometrical;
- Design specific;
- 2. Model content:
- Level of Information Need Architectural elements;
- Level of Information Need Structural elements;
- Level of Information Need MEP elements;

As shown above, the model requirements section is divided into three categories: alphanumerical, geometrical and design specific requirements, where each of them embodies a set of rules that address

certain aspects of the model quality. Alphanumerical requirements involve detailed instructions regarding the information contained within the BIM model and the way that information is structured. On the other hand, geometrical requirements delve into geometrical representations of objects and their relations. Design specific tier addresses very specific requirements that are related to the practice currently followed within the company.

The model content section can be seen as an addition to alphanumerical requirements. It is aimed at providing clear information about which data should be contained within which element.

4.4.1. Alphanumerical Requirements

Alphanumerical requirements ruleset delves into the topic of naming conventions and consistency within the model. It provides systematic way of the labelling and categorization of elements and other data, assuring efficient data management inside and in between the models.

The research conducted within the company showed that large portion of quality issues appear due to lack of standardization and consistency, particularly in the naming domain. Usually, naming is addressed only to a certain extent such as naming the levels and objects. This deficiency leads to a lack of uniformity within the elements essential for collaboration of different parties e.g., views and callout views.

Furthermore, the modelling process faces major drawbacks due to inconsistencies in property naming and values. While this does not manifest as an issue during the modelling process, it can pose a significant difficulty in providing specific BIM uses. Notably, process of QTO is considerably influenced by this topic since it relies on the use of parameters for extracting certain elements or their values. Meaning that inconsistencies and lack of unification in this field, slow down the process significantly. Having this in mind, created alphanumerical requirements address three critical aspects:

Naming - Standardization and consistency of naming as facilitator of interoperability.

Properties – Uniformity of property naming and values as paramount for optimizing processes and BIM functionalities.

Consistency of data – Maintaining data consistency for providing uniform and reliable information.

Requirements are specified as follows:

1. **Level Naming** – All levels shall follow a uniform and consistent naming convention specified by Information requirements. If not requested otherwise, ISO 19650-2:2018 may be followed: Using a two-digit sequential numbering system.

2. **View Naming** – View Naming shall be uniform and consistent following the Naming Convention requested by the Information Requirements. If not requested otherwise, View Naming may follow the schema: Level (Optional)<>Content

3. **Callout View Naming** – View Naming shall be uniform and consistent following the Naming Convention requested by the Information Requirements. If not requested otherwise, View Naming

schema may be applied. If the View refers to a fabrication detail, Classification code may be applied in the naming.

4. **Object Naming** – All objects shall follow the same naming convention specified by the Information requirements. If not requested otherwise, BS 8541-1:2012 may be followed.

5. **Material Naming** – All materials shall follow the same naming convention.

6. **Property Occurrence** – *Each BIM object shall have only one occurrence of the property.* **In case of duplication, hard-coded properties have precedence.*

7. **Property Units** – All property units shall be consistent and following metric system, if not specified otherwise.

8. **Unique Property Naming** – *Each unique information describing the object shall contain a unique property name.*

9. **Property Naming** – *Properties shall be named in consistent and human-readable way.*

10. **Property Value** – *Properties shall have defined values where known.*

11. **Unique Room Naming** – *There shall be no rooms containing the same naming code.*

12. **Space and Room Naming** – *Space and Room Naming shall be the same as the naming defined by the program.*

13. **Consistency of Levels** – *Naming of the levels shall be consistent in all discipline models.*

Each requirement specifies a rule that the model needs to adhere to. Rules are following the Shall/Should expression schema as explained in the previous paragraph, which means that each rule contains a specific requirement of what must be followed and is accompanied by recommendation that can help users in achieving it (Figure 23). Recommendations are either proposed by ISO standard, or the company's example of good practice.

1	Level Naming
	All levels shall follow a uniform and consistent naming convention specified by Information requirements.
	If not requested otherwise, ISO 19650-2:2018 may be followed:
	Using a two-digit sequential numbering system.
	ZZ - Multiple Levels
	XX - No Level Applicable
	GF - Ground Floor
	0 - Base level of building (where ground floor is not appropriate)
	1 - Floor 1
	2 - Floor 2
	M1 - Mezanine above level 01
	M2 - Mezanine above level 02
	B1 - Basement level 1
	B2 - Basement level 2
2	View Naming
	View Naming shall be uniform and consistent following the Naming Convention requested by the Information Requirements.
	If not requested otherwise, View Naming may follow the schema:
	Level (Optional) Content
	Level-description of the content and purpose of the view
	Content-further clarification of the information shown
	e.g., LEVEL 1-FLOOR PLAN
3	Callout View Naming
5	
3	View Naming shall be uniform and consistent following the Naming Convention requested by the Information Provisionants
3	View Naming shall be uniform and consistent following the Naming Convention requested by the Information Requirements.
3	View Naming shall be uniform and consistent following the Naming Convention requested by the Information Requirements. If not requested otherwise, View Naming schema may be applied. If the View refers to a fabrication detail, Classification code may be applied in the naming e.g.,

Figure 23 - Section of Naming rules, II tier: Alphanumerical requirements

4.4.2. Geometrical Requirements

Geometrical Requirements focus on defining guidelines related to geometry, positioning and modelling of the elements. Focal point is to establish rules that would enhance overall model quality and ensure that the BIM model accurately reflects real-world objects.

In the discussions with the company's professionals, it was concluded that majority of attention given to geometrical verifications is focused on the intersection of the elements i.e., Clash Detection. While there is no doubt in the importance of detecting elements intersection, this has led to some of the foundational aspects to be neglected. For example, duplication of the same elements does not present a visual problem, hence it is often overlooked during the modelling process. This results in issues appearing during the performance of Quantity Take-offs, where this duplication produces inaccurate quantities.

Recognizing the importance of these issues, this category is focused on defining rules that address geometrical aspects of modelling that do not just affect the visual appearance of the model, but the accuracy of data provided as well. This can be illustrated on the example of the following rule (Figure 24):

6	Elements Location - Doors/Windows
	Windows and doors shall be assigned to the same floor as the walls or roofs in which they are located.

Figure 24 - Elements location rule, II tier: Geometrical Requirements

This rule is pretty straightforward stating that the hosted elements of the walls should be allocated to the same level as those walls. This seems like a minor detail but is a very common issue in modelling practice. The issue appears when there is a mismatch between the levels of these interconnected elements. For example, window can be hosted in the wall and assigned to the building storey 1, whereas the wall itself is associated to the upper level. They are aligned because the window is actually elevated at the height equivalent to the upper storey. Visually, everything seems in order, however there is discrepancy in the information that causes further issues with phasing and construction planning.

Addressing these issues, a subset of rules is created as follows:

1. **Published Models** – *Published models shall not contain model objects of other disciplines, even if they were used as reference.*

2. **Lost Elements** – *Element placed on distance bigger than xx in x,y,z direction from the grid borderlines shall be considered a lost element.*

3. **Duplicated Elements** – *Model shall not contain identical instances in the same place.*

4. **Mirrored Elements** – *Model shall not contain mirrored instances of loadable components.*

5. **Elements Intersection** – *Model shall not contain elements that overlap / intersect.*

6. **Elements Location – Door/Windows** – *Windows and doors shall be assigned to the same floor as the walls or roofs in which they are located* (Figure 25).

7. **Elements Location – Door Host** – *Interior doors shall be placed in interior walls and exterior doors shall be placed in exterior walls.*

8. **Elements across multiple storeys** – *Elements should not be modelled continuously across multiple storeys.* **Exception: Elements that are constructed as continuous i.e. in situ poured shafts. Elements modelled across multiple storeys shall be referenced to the lowest story on which they appear.*

9. **Unallocated** / **Unplaced Space** – *Model shall not contain spaces that are not placed.*

10. **Redundant Space** – *There should be no spaces overlapping. Spaces shall not cross each other horizontally or vertically.*

11. **Space Modelling** – Spaces shall be directly adjacent to surrounding walls / other space components, floor below and ceiling finish / structural slab.

12. **Unallocated / Unplaced Rooms** – *Model shall not contain rooms that are not placed.*

13. **Redundant Rooms** – *There should be no rooms overlapping.* **If there is no element to be zone boundary, room separation lines should be used.*

14. **Room Area** – *Room Area shall be the same as the area required and defined by the room Schedule.*

15. **Space Area** – Space Area shall be the same as the area required and defined by the space program.

16. **Sloped Floors** – *Modelling sloped floors that exceed levels continuously should be avoided. *It is advised to create independent sloped floor in each level with the meeting points of the floors being at the upper and lower edges of the levels.*

17. **Structural Elements Connection** – *Structural connections should be modelled.*

18. **MEP Elements Connection** – *There shall be no unconnected MEP elements.*

19. **Elements not within rooms/spaces** – *Instances of furniture should be located inside the room/space.*

1	Published models
	Published models shall not contain model objects of other disciplines, even if they were used as reference.
2	Lost Elements
	Element placed on distance bigger then xx in x,y,z direction from the grid borderlines shall be considered a lost element.
3	Duplicated Elements
	Model shall not contain identical instances in the same place.
4	Mirrored Elements
	Model shall not contain mirrored instances of loadable components.
5	Elements Intersection
	Model shall not contain elements that overlap / intersect.
6	Elements Location - Doors/Windows
	Windows and doors shall be assigned to the same floor as the walls or roofs in which they are located.

Figure 25 - Segment of rules, II tier: Geometrical Requirements

4.4.3. Design specific requirements

This section introduces a set of specific design guidelines that address dimensioning the elements and overall design practice that should be followed. In many cases client's directives are missing or being ambiguous, causing interoperability difficulties and moreover, causing much larger issues when it comes to fabrication of elements and on-site construction, especially when the element requires strict conformance to predefined dimensions or dimensions being dependent on the country legislative. Dimensions proposed in the Requirements Specificator align with the current practice followed within the company and are changeable depending on the project specific requirements.

This section centres on three key components: Element Size, Clearances and Good modelling practice.

While element sizing is often specified through constraints when dealing with a very distinct type of object, it is beneficial to define the range of sizes for all elements. It enhances precision and uniformity

within the model. Moreover, it enables compliance of the dimensions to the regulations defined by country's legislative.

Concept of defining clearances mirrors the same idea. It avoids issues detected during construction and follows the legislative regarding prescribed values e.g., toilet clearance (Figure 26).

2	Clearance in front of Doors/Windows
	Interior Doors - Minimal clearance in front of the door shall not be less than 900mm.
	Exterior Doors - Minimal clearance in front of the door shall not be less than 1200mm.
	Emergency Exit Doors - Minimal clearance in front of the door shall not be less than 1200mm.
3	Clearance in front of the Water Closet
	Minimal distance between axis of the water closet and compartmentation wall shall not be less than 450mm.
	Minimal distance between the front edge of the water closet and other elements shall not be less than 533mm.
4	Entrance Landings
	Door maneuvering clearances shall not overlap with ramp landings.

Figure 26 – Clearance rule sets, II tier: Design specific Requirements

Good modelling practice rules, in this case specified for MEP elements, integrate company's established quality procedures into the Requirements Specificator. These requirements are designed based on the quality reports of the semiconductor's company sector. They are ensuring that the modelling process is aligned to the design and fabrication requirements and preventing the issues occurring in the later stages of the project.

Rules are constructed as follows:

1. **Element Size** – Wall height should not be less than 300mm. Window width should not be less than 100mm. Door width should not be less than 800mm. Door height should not be less than 2000mm. Staircase width should not be less than 900mm. Slab thickness should not be less than 100mm. Roof thickness should not be less than 100mm. Column profile diameter/width should not be less than 50mm. Beam profile width should not be less than 50mm.

2. **Clearances in front of Doors/Windows** – Interior Doors – Minimal clearance in front of the door shall not be less than 900mm. Exterior Doors – Minimal clearance in front of the door shall not be less than 1200mm. Emergency Exit Doors – Minimal clearance in front of the door shall not be less than 1200mm.

3. **Clearance in front of the Toilet** – *Minimal distance between axis of the water closet and compartmentation wall shall not be less than 450mm. Minimal distance between the front edge of the water closet and other elements shall not be less than 533mm.*

4. **Entrance Landings** – *Door maneuvering clearances shall not overlap with ramp landings.*

5. **Minimal room height** – *Minimal height measured from the top of the floor finish to the bottom of the ceiling finish shall not be less than 2.20m.*

6. **Minimal handrail height** – *Minimal handrail height for stairs and ramps shall not be less than* 900mm.

7. **Low Points** – *Low Points should be avoided.* **so that impurities would not collect in those points – ducts, drain lines, gas lines depending on type of gas.*

8. **Drainline Slope** – Drainlines shall have slope that allows self-drainage. *minimal slope 1-100

9. **Piping Insulation** – Insulation type and dimensions shall be in accordance to information requirements. *Minor clashes between insulation and other elements are tolerated.

10. **Equipment Vacuum Line** – Equipment Vacuum Line shall follow the fastest possible route to minimize the number of bends i.e., energy loss.

11. **Popout Sharing Criteria** – *Different tools should not share the same popout. Matrix for popout sharing* (Figure 27).

12. **Spool Pipe sizing** – Maximum pipe length shall be 6m. Maximum pipe length with two bends shall be 3m. Maximum pipe length with more than two bends shall be 1.5m.

13. Layers – All layers and colouring shall be consistent according to information requirements.

14. **Valve handles** – *All valve handles shall be designed to be accessible.*

15. **Routing** – All services shall run inside their designated area defined by space management rules.

16. **No crossing lines in fab** – *There should be no lines crossing in the technical area near the main equipment. *Main equipment surroundings should be as neat as possible.*

17. **Steel/Copper Piping Bending** – *Piping sizes ¹/₄*, *3/8 and ¹/₂ should use bending angles and not fittings.* **Bends to be made in 15 degrees increment. Preferably 45° and 90°.*

18. **Line Numbers** – *Line numbers shall be assigned to the corresponding lines.*

19. Line Numbers Naming – All line numbers shall follow the same naming convention.

20. **Piping Length Dimensions** – All piping lengths shall be rounded to whole numbers or with decimal component 0.5.

21. Field Connection – All prefab elements shall contain the marking of the location of the joints.

11 Popout Sharing	; Criteria				
Different tools s	should not share	e the same popo	out.		
Matrix for popo	out sharing				
	Dry Mechanical	Wet Services	Hot Duct	Heat Traced Lines	Electrical Services
Dry Mechanical	yes	yes	yes	yes	yes
WetServices	yes	yes	yes	yes	no
Hot Duct	yes	yes	yes	yes	no
Heat Traced Lines	yes	yes	yes	yes	no
Electrical Services	yes	no	no	no	yes

Figure 27 - Popout Sharing Criteria, II tier: Design specific Requirements

4.4.4. Level of Information Need

This section serves as a reference tool aimed at enhancing data content of the elements within the model. It represents a systematic way of providing the information requirements that enables user an easier identification of data needed to be contained within the model. It is important to note that it is a foundational Requirements Specificator and should be adapted to project specific scenarios. The main idea is to form a repository of objects containing essential data for each element, enhancing the overall model content quality.

It is categorized into three main disciplines: Architectural, Structural and MEP (Mechanical, Electrical and Plumbing). Each of the disciplines contains Level of Information Need for most frequently used elements. Furthermore, a finer division is implemented within each discipline, aligning with the three primary stages of construction projects: Design, Construction, and Operation (Figure 28).

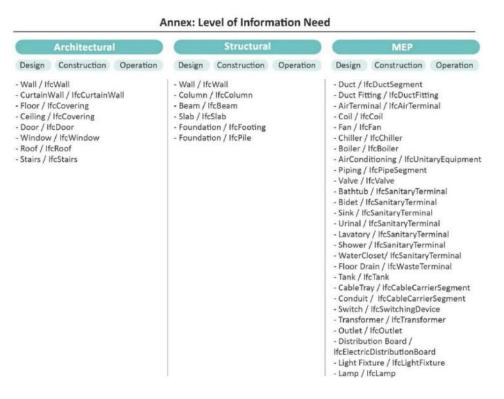


Figure 28 - Level of Information Need Structure

Method of specifying Level of Information Need aligns to the schema proposed by BS EN 17412-1:2020 (2020) standard, designing geometrical, alphanumerical and documentation requirements, as shown in an example of the Wall below (29). Full schema is provided in the Appendix 5.

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Figure 29 - Level of Information Need Schema – Example for Wall

Geometrical information defines the overall level of detail and the graphical representation of elements. It provides general guidelines on how the element should be modelled and is conditional on the delivery milestone, meaning the detail and accuracy of modelling grow exponentially with higher stages. Geometry requirements content was based on a recognized industry standard, specifically the Level of Development (LOD) Specification for Building Information Models (2021) and guides provided above.

On the section of geometrical requirements of the wall through all three phases (Figure 30) it can be compared how the level of detail changes through modelling phases. More detailed representation and higher accuracy is required in the construction and operation.

Information Delivery Milestone:	Design	Information Delivery Milestone:	Construction	Information Delivery Milestone:	Operation
Purpose:	Architecture	Purpose:	Architecture	Purpose:	Architecture
Actor:	/	Actor:	/	Actor:	/
Object:	"Wall" / IfcWall	Object:	"Wall" / IfcWall	Object:	"Wall" / IfcWall
Geometrical information	on:	Geometrical information	on:	Geometrical information	on:
Detail:	Simplified volume representation. Modelled accurately in terms of the overall geometry and thickness.	Detail:	Element modelled to accurate dimensions. Penetrations are modelled to nominal dimensions for major wall openings and large mechanical elements.	Detail:	Element modelled to accurate dimensions. All connections, ornate details and openings modelled to rough-opening dimensions.
Dimensionality:	3D	Dimensionality:	3D	Dimensionality:	3D
Location:	Absolute and relative to other building elements	Location:	Absolute and relative to other building elements	Location:	Absolute and relative to other building elements
Appearance:	Single color fill	Appearance:	Color fill to distinguish different materials	Appearance:	Color fill to distinguish different materials
Parametric behaviour:	Not requested	Parametric behaviour:	Not requested	Parametric behaviour:	Not requested

Figure 30 - Comparison of geometrical information for the IfcWall in Design, Construction and Operation, II tier: Level of Information Need-Architectural

Alphanumerical information outlines data content that should be assigned to the elements. It is structured in the tabular configuration, which, as explained previously, is devised to facilitate machine-to-machine interactions. Within this construct, each parameter is accompanied by contextual description, data type it embodies and the corresponding unit of measurement. Where feasible, properties adhere to the IFC schema (Figure 31), facilitating seamless data transition process into the IFC format.

	Qto_CoveringBaseQuant	ities		Dimensional Data		
			Thickness	Nominal thickness (or width) of the plate.	numeric	mm
Template	PropertyName	Value		Sum of all gross areas of the covering facing the	e numeric	m²
Single Value	GrossArea	lícQuantityArea	Gross Area	space. No opening that is included in the covering is subtracted.		
Single Value	NetArea	ifcQuantityArea		Sum of all net areas of the covering facing the		c m²
			Net Area	space. All openings that is included in the covering are subtracted.	numeric	
				Performance Data		l.
	Pset_CoveringCommo	n	Structural/ LoadBearing	Indicates whether the object is intended to carry loads (TRUE) or not (FALSE).	boolean	YESING
Template	PropertyName	Value	Fire Rating	Fire rating for this object. It is given according to the national fire safety classification.	numeric	1
Single Value	FireRating	IfcLabel		2		
Single Value	AcousticRating	Ifetabel		Acoustic rating for this object. It is provided according to the national building code. It		2
			Acoustic Rating	indicates the sound transmission resistance of this object by an index ratio (instead of providing full sound absorbtion values).	numeric	/
	Pset CoveringFlooring	1	Is Water Resistent	Indicates whether the object is water resistant (TRUE) or not (FALSE).	boolean	YESING
				Indication whether the surface finish is designed		
Template	PropertyName	Value	Has NonSkid Surface	to prevent slippery (TRUE) or not (FALSE).	boolean	YESINO
Single Value	HasNonSkidSurface -	ifcBoolean		Indication whether the surface finish is designed	boolean	YESINO
STANDED FOR STANDARD			Has AntiStatic	to prevent electrostatic charge (TRUE) or not		

Figure 31 - Compliance to the IFC Schema, Flooring / IfcCovering

Properties are methodically grouped into sets, providing systematic organization that enables easier identification and navigation. The sets are as following:

- 1. **Identity Data** providing naming and identification data of the element;
- 2. **Material Data** providing data regarding the material;
- 3. **Dimensional Data** providing dimensional data about the element;
- 4. **Performance Data** providing data about the elements performance;
- 5. **Cost** providing data about cost of the installation;
- 6. **Phasing** assigning the project phase;

As the alphanumerical content of the elements also grows exponentially with construction and operation phase, more sets are added:

- 7. **Installation data** providing data about the installation of the element;
- 8. **Warranty Data** providing data about the warranty.

It is important to note that the progression of the project does not only influence the quantity of information content, but the content changes as well, becoming more specific and accurate. For example, in the design phase structural columns contain estimated reinforcement quantity, which is given as a rough estimation based on previous experience. Logically, in the construction and operation phase this information translates into the actual reinforcement data. The example of the IfcDoor properties shown below illustrates the exponential growth of data in different phases (Figure 32).

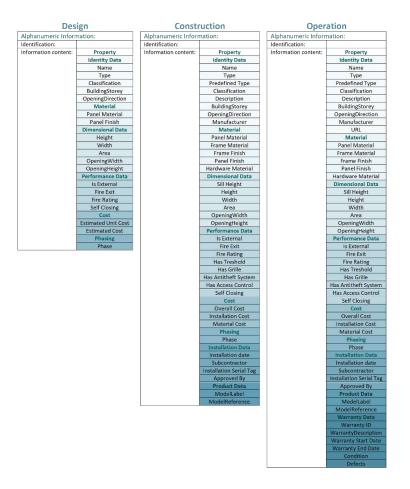


Figure 32 - Visual comparison of Information content for the IfcDoor in Design, Construction and Operation, Level of Information Need – Architectural

Created library contains 126 specifications of Level of Information Need divided by three phases for 42 elements. Each element is specified following previously explained schema for the Design, Construction and Operation phase. Elements are classified by discipline into three categories: architectural, structural and MEP. Each element accompanies a certain number of associated parameters that differs through phases (Table 7).

Parameters		4
ign	Construction	Operation
7	30	38
7	27	34
5	29	37
4	26	35
9	37	45
1	41	49
D	29	37
D	33	39
5	26	33
7	32	39
D	33	40
9	31	38
7	31	39
6	37	44
D	31	38
1	43	49
8	30	37
7	38	45
3	35	43
2	44	50
2	34	41
D	31	37
2	33	40
8	30	37
7	30	37
6	30	38
7	30	37
7	30	40
9	32	39
9	32	39
4	30	37
7	27	34
3	21	28
2	21	28
6	30	37
1	35	42
4	27	34
5	28	35
7	30	37
8	28	35
742	1252	154
142	1252	154 353
3	742	

Table 7 – Elements and Number of associated parameters, II tier: Level of Information Need

The diagram shown below illustrates graphically the relationships between entities, property sets and properties within elements (Figure 33).

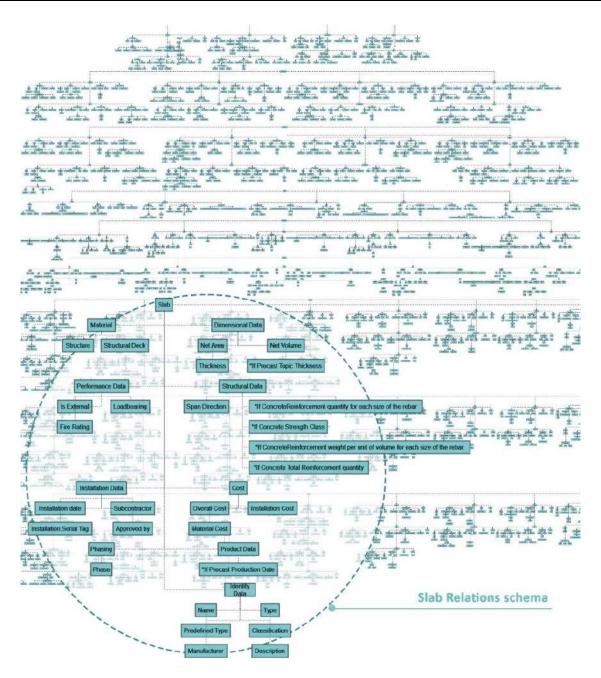


Figure 33 - Visualization of elements and parameters relations, II Tier: Level of Information Need

A key point to highlight is that each element contains data relevant to its specific type. In addition to the property sets outlined earlier, it embodies the information relevant to its discipline. For instance, structural elements contain Structural Data set (Figure 34), offering reinforcement information, while mechanical elements hold Mechanical Data set (Figure 35) where relevant mechanical content is displayed. This approach ensures that the data contained within each element is uniquely suited to its role and purpose.

Structural Data				
*If ConcreteReinforcement				
weight per unit of volume	Weight of reinforcement calculated per unit of volume.	numeric	kg/m3	
(for each size of the rebar)				
*If ConcreteReinforcement				
quantity (for each size of	Quantity of reinforcement of different size for the unit.	numeric	kg	
the rebar)				
*If ConcreteTotal	Total quantity of reinforcement needed for the unit.	numeric	kg	
Reinforcement quantity	Total quantity of remotement needed for the unit.	numenc	×Б	
*If ConcreteStrength Class	Classification of the concrete strength in accordance with	numeric	Mpa	
in concretes a chigan class	the concrete design code which is applied in the project.			
Loadbearing capacity	Maximum load that can be applied to the structure.	numeric	kg/m²	

Figure 34 - Section of Structural Data Set for the Slab in Construction phase, II tier: Level of Information Need – Structural

Mechanical Data				
Air Flow Rate Range	Air flowrate range within which the air terminal is designed to operate.	numeric	Liter/Minute	
Air Flow Rate	The actual airflow rate as designed.	numeric	Liter/Minute	
Temperature Range	Allowable minimum and maximum temperature.	numeric	°C	
Air Pressure	The pressure within a container due to the compression of atmospheric gases.	numeric	Pa	

Figure 35 - Section of Mechanical Data Set for the Duct in Construction phase, II tier: Level of Information Need – MEP

4.5. III tier: BIM Uses

Third tier focuses on providing rules and guidelines regarding the specific BIM Uses. It inherits the rules provided in the earlier tiers and further defines directives needed to perform accurately, in this case, Cost Estimation and Energy Analysis. Each use contains set of modelling rules that should be followed, as well as Level of Information Need that should be assigned to the elements. It is important to note that Requirements Specificator provides overall approach, and that information content can vary depending on the milestone, purpose and software being used.

4.5.1. Cost Estimation

When it comes to Cost Estimation, the rules and Level of Information Need vary significantly on the purpose of the quantity take-off e.g., QTO for tendering or QTO for fabrication. Chosen approach for the Requirements Specificator follows the BIMMS company workflow, hence it addresses frequent modelling issues that lead to inaccurate quantities and information content that is needed to perform the estimation using Bexel software. This tier is a result of research conducted on the company's standard QTO practice as well as content addressed by the company's professionals.

Majority of viable rules for QTO are already addressed by the previous alphanumerical and geometrical requirements, meaning the tier itself inherits previous and contains a few more rules that are significant for performing the use (Figure 36).

		COST ESTIN	ATION					
1	Structural Types							
Elem	ents that are from the constru	action perspective considered different struct	ural types shall be mo	delled as individual types				
* e.g.	e.g., wooden walls of different heights, that are constructed differently							
2	Resource Naming							
All re	sources shall follow the same	naming convention.						
* This	allows grouping the quantitie	es of each resource.						
3	Ceiling drops and coves	1						
Ceilin	g drops and coves shall be mo	delled as walls containing the same layers a	s ceiling.					
*Up t	o 300mm they are quantified	in metres.						
4	Compound elements			[
-			h					
Every	layer of compound element :	shall be modelled as to present the accurate	dimensions of the acc	urate construction.				
-	Data formal strengthere and	former and the second sector sector						
5	Reinforced structures and	formwork in concrete elements						
If not	modelled, reinforced structu	res and formwork quantities shall be obtaine	d from modelled geor	netry using ratios provide	d by structural designer.			
*	and a first of a second second second second	and the first have fear and all second states	lana and hands	(A A A A A A A A A A A A A A A A A A A				
*Amo	ount of reinforcement weight	per unit of volume for each element categor	y (proposed by Mauri	tio Morales, BIMNS)				
		Reinforcement weight per unit of volume						
	Element Category	0 1						
	Beams	(kg/m ³) 300						
	Columns	325	1					
	Ground Concrete Slab	65						
	Concrete Slab	110	1					
	Concrete Walls	120	1					
	Foundation Isolated Slab	85						
	Foundation Beam	280	1					
	Foundation Floating Slab	20	1					
	<u>_</u>		-					
6	6 Commercial size							
Speci	fying the size according to pro	vided list of commercial sizes: piping,cable t	ays and ducting.					
-			_					

Figure 36 - Cost Estimation ruleset, III tier: Cost Estimation

Concerning the Level of Information Need for the elements, the scope is to avoid insufficiency and excess of data within the model. Having this in mind information content is a subset of data provided in the overall section of Level of Information Need. It addresses content of all discipline elements, relevant for performing QTO. It is grouped under following sets:

- 1. **Identity Data** providing naming and identification data of the element;
- 2. **Material Data** providing data regarding the material;
- 3. **Dimensional Data** providing dimensional data needed for QTO;
- 4. **Cost Data** providing data about cost of the material, equipment and labour; and
- 5. **Phasing** assigning the project phase.

Data given in the overall section is expanded to fit the QTO use. Special attention is put to the content of Dimensional Data since it is one of the key aspects of proper extraction of quantities. Where needed, general dimensional data is expanded with data required for extraction of specific position e.g., Exposed height parameter (height of the element from the finish floor level of the bottom storey to the finish ceiling level) is added to the wall element, since it is used for calculating quantities of the wall finish. With structural elements category of Structural Data is filled with information addressing reinforcement quantities as well as formwork area needed for calculation and planning of formwork placement and removal (Figure 37).

Purpose:											
	Cost Estimation:										
Actor:											
Object:	"Column" / IfcColumn	"Column" / IfcColumn									
Geometrical information:											
Detail:	Element modelled to accurate dim	ensions and geometry. Penetrations and connections are mo	odelled to nominal dir	mensions.							
Dimensionality:	3D										
.ocation:	Absolute										
Appearance:	Not required										
Parametric behaviour:	Not required										
Alphanumeric Information:											
dentification:											
nformation content:	Property	Description	Data Type	Units							
		Identity Data									
	Name	Construction stage indicating when the element was created e.g., New Construction.	text	/							
	Туре	Construction stage indicating when the element was demolished.	text	/							
	Predefined Type	Holds the entity specific en umeration of predefined types to further classify the entity	text	/							
	Classification	Classification code according to chosen classification system.	text	/							
	Level	Defines the reference level.	text	/							
	Type Mark	text	/								
		Material									
	* Depending on the purpose of the insulation composed of rock fibers	e Cost Estimation, Material descriptions may vary in detail e.g 	g., stone wool or stone	e wool board							
	Structural Material	The primary material used to construct the structural layer.	text	/							
	*If Steel Finish	The type of finish for the steel column.	text	/							
		Dimensional Data									
	Length	Total le ngth of the column.	numeric	m							
	Section Dimensions/Diametar	Width and depth / diametar of the column section.	numeric	m							
	*If Steel Weight	The weight of the steel per unit length.	numeric	kg/l							
	*If Concrete/Precast Gross Volume	Volume of the column, not taking into account possible processing features (cut-out's, etc.) or openings and recesses.	numeric	m³							
	*If Concrete/Precast Net Volume	Volume of the column, taking into account possible processing features (cut-out's, etc.) or openings and recesses.	numeric	m³							
	*If Concrete Outer Surface Area	Total area of the extruded surfaces of the column (not taking into account the end cap areas), normally generated as perimeter * length.	numeric	m²							
		Structural Data									
	*If ConcreteReinforcement weight per unit of volume (for each size of the rebar)	Weight of reinforcement calculated per unit of volume.	numeric	kg/m3							
	*If ConcreteReinforcement quantity (for each size of the rebar)	Quantity of reinforcement of different size for the unit.	numeric	kg							
	*If ConcreteTotal Reinforcement quantity	Total quantity of reinforcement needed for the unit.	numeric	kg							
	Latteral Formwork	Area of Latteral Formwork Cost	numeric	m2							
	Labor Cost	Cost of workforce for installing one unit.	numeric	£							
	Equipment Cost	Cost of equipment for installing one unit.	numeric	•							
			numeric	e							
Material Cost Cost of material for installing one unit. numeric											
		Phasing									
Documentation:	Phase	Phasing Identifies the phase in which the object is created.	text	/							

Figure 37 - Level of Information Need of the Column for conducting QTO, III tier: Cost Estimation

Created QTO library, addresses Level of Information Need of most frequently used elements from all three disciplines (Table 8).

Elements	Data Sets									
	Identity	Material	Dimensional		Performance	Structural				
	Data	Data	Data	Cost Data	Data	Data	Phasing			
Wall / IfcWall	6	5	6	3	1		1			
Curtain Wall / IfcCurtainWall	6	5	5	3			1			
Flooring / IfcCovering	6	7	3	3			1			
Ceiling / IfcCovering	6	7	3	3			1			
Door / IfcDoor	6	5	5	3			1			
Window / IfcWindow	6	6	8	3			1			
Roof / IfcRoof	6	6	5	3			1			
Stairs / IfcStairs	6	6	7	3			1			
Structural Wall / IfcWall	6	1	6	3		5	1			
Column / IfcColumn (Figure 34)	6	2	6	3		5	1			
Beam / IfcBeam	6	2	9	3		6	1			
Slab / IfcSlab	6	2	5	3		6	1			
Foundation / IfcFooting / IfcPile	6	1	11	3		6	1			
Duct / IfcDuctSegment	6	2	4	3			1			
Duct Fitting / IfcDuct Fitting	10	2	4	3	3		1			
AirTerminal / IfcAirTerminal	10	2	3	3			1			
Coil / IfcCoil	10	1	3	3			1			
Chiller / IfcChiller	10	1	3	3			1			
Boiler / IfcBoiler	10	1	4	3			1			
AirConditioning / IfcUnitaryEquipment	10	1	3	3			1			
Piping / IfcPipeSegment	10	1	3	3	3		1			
Valve / IfcValve	10	2	1	3			1			
Bathtub / IfcSanitaryTerminal	10	2	3	3			1			
Bidet / IfcSanitaryTerminal	10	1	3	3			1			
Sink / IfcSanitaryTerminal	10	1	3	3			1			
Urinal / IfcSanitaryTerminal	10	1	3	3			1			
Lavatory / IfcSanitaryTerminal	10	1	3	3			1			
Shower / IfcSanitaryTerminal	10	3	3	3			1			
WaterCloset / IfcSanitaryTerminal	10	3	3	3			1			
FloorDrain / IfcSanitaryTerminal	10	1	1	3			1			
Tank / IfcTank	10	1	3	3			1			
CableTray / IfcCableCarrierSegment	6	1	3	3			1			
Conduit / IfcCableCarrierSegment	6	1	2	3			1			
Switch / IfcSwitchingDevice	6	1	3	3			1			
Transformer / IfcTransformer	8	1	3	3			1			
Outlet / IfcOutlet	6	1	2	3			1			
Distribution Board / IfcElectricDistributionBorad	6	1	2	3			1			
.ight Fixture / IfcLightFixture	6	1	2	3			1			
Lamp / IfcLamp	6	1	2	3			1			
							s			
	304	90	151	117	7	28				
							7			

Table 8 - Elements and Number	of associated	narameters.	III tier:	Cost Estimation
Table 0 - Elements and Number	or associated	parameters,	III UCI.	Cost Estimation

4.5.2. Energy Analysis

This tier covers modelling guidelines and necessary content for executing Energy Analysis. Due to the software-driven nature of this analysis, Requirements Specificator aims to establish general rules for proper alignment during the analysis process. The basis for this tier comes from thorough research into the Energy Analysis subject. It is based on the studying available guides, manuals and testing out various software platforms. Given the variations and possible conflicts between the requirements of different providers, this approach concentrates on the universally accepted methods. The aim is to provide base of requirements needed for proper execution of Energy Analysis, while overcoming the complexities associated with diverse software environments.

The initial segment of this section revolves around modelling rules and guidelines. In the topic of Energy analysis, few aspects are vital: Location and Position; Building envelope and Room and Space Boundaries.

In other words, it is important to accurately specify location, weather station and to address surrounding objects if existing. Then to ensure that the modelling process is aligned to proper translation of building envelope to analysis software, and thirdly to address rooms and spaces modelling rules that are vital for creation of thermal zones. Addressing these topics, rules were specified. For illustration purposes, section of rules is provided below, whereas the whole schema is provided in the Appendix 7:

1. **Location** – Model shall have specified Location/Project Address.

2. **Weather Station** – *Model shall have weather station defined.*

3. **Surrounding building** – All external shadowing buildings shall be modelled as mass blocks. They shall not contain mass floors.

4. **Materials** – *Every element shall have defined material layers.*

5. **Compound Elements** – Building elements should be modelled as single integral element that contains layers. *It is not advisable to model each layer separately.

6. **Sandwiched Elements** – *In the case of two Wall layers being placed next to each other, only one shall be RoomBounding.*

7. **Wall Centerline** – *In case of aligning walls that have different thickness, centerline shall be aligned, not the exterior edge.*

8. **External Elements** – All External Elements shall be marked as Is External.

9. **Walls of different materials** – Walls that are continuous, but made of different materials, shall be modelled separately. *Material Thermal Data is different.

10. **Shading Devices** – *Shading devices should be created using walls, roof or mullion families.*

11. **Redundant Space** – All interior areas shall have room placed e.g., shaft and unoccupied space as well. *Rooms are used for differing interior and exterior space. If there is no Room adjacent to another space, then the vertical wall is considered as an Exterior wall.

12. **Rooms inside Rooms** – *Placing rooms inside other Rooms shall be avoided.*

13. **Room Separation Line** – *Room Separation Line shall be used only if there is no other element e.g., wall separating two spaces. Room Separation Line shall not be placed next to the wall. *This can result in bounding issues.*

14. **Space** – Spaces shall be modelled from finished floor to finished ceiling. In case the space contains suspended ceiling, spaces shall be made both for the room space and the plenum area.

Rules that require clearer understanding of the specification are accompanied by explanatory details as shown below (Figure 38).

25	Columns
Depend	ing on their size and impact on reducing the usable floor area, modelling columns for energy analysis should be avoided.
If includ	led, they should be set as non-room bounding.
*Exclud	ing columns for energy model does not have large impact on space volume, but avoids issues in analysis softwares.

Figure 38 - Requirement for modelling column, III tier: Energy Analysis

The second section of this tier addresses Level of Information Need for the elements included in the Energy Analysis. It includes two sections: repository of architectural elements needed for the energy analysis of the building and a library of MEP elements that are relevant for the HVAC energy performance analysis.

In the topic of the energy assessment of buildings, specific details about architectural elements need to be addressed. This involves their dimensions, material, thermal and analytical data related to that material. To manage this, properties were organized into following sets:

- 1. **Identity Data** providing naming and identification data of the element;
- 2. **Material Data** providing data regarding the material;
- 3. **Material Thermal Data** providing data regarding the thermal characteristics of the material (Figure 39);
- 4. **Analytical Data** providing data regarding the heat transfer, thermal resistance and mass;
- 5. **Performance Data** providing data about the elements performance;
- 6. **Dimensional Data** providing dimensional data about the element;
- 7. **Performance Data** providing data about the elements performance;
- 8. **Phasing** assigning the project phase.

Within doors and windows elements sets addressing glazing and shading information were added.

9. ***If shading / *If Glazing** – providing data about glazing/shading elements.

	Material Thermal Data						
*Depending on the type of material, Thermal Data information can very.							
Thermal Conductivity	numeric	W/m-K					
*If on the ground Soil Thermal Conductivity	Specifies the abilitty of material to conduct heat.	numeric	W/m·K				
Specific Heat	Heat energy per unit mass (typically 1 kg) required to raise the temperature of a substance by one degree Celsius. The higher the specific heat capacity of a substance, the more energy is required to raise its temperature.	numeric	J/kg°C				
Density	numeric	kg/l					
Emissivity	The emissivity of the surface of a material is its effectiveness in emitting energy as the rmal radiation and varies betwe en 0.0 and 1.0.	numeric	/				
	Analytical Data						
Heat Transfer Coefficient(U)	Coefficient for calculating heat transfer, typically by convection or phase change between a fluid and a solid.	numeric	W/(m ² *K)				
Thermal Resistance®	The temperature difference by which an object or material resists a heat flow.	numeric	(m²*K)/W				
Thermal Mass	Specifies the abbility of an element to store heat, the product of each material layer mass, and specific heat capacity.	numeric	kgft²/(s²K)				

Figure 39 - Material Thermal Data and Analytical Data of the Flooring, III tier: Energy Analysis

When it comes to specifying data content for the analysis of HVAC systems, functionalities of Energy Plus software were researched. It was decided to use this tool as a reference since it is considered one of the most detailed software's for this type of analysis. Information was grouped as following:

- 1. **Identity Data** providing data regarding the thermal characteristics of the material;
- 2. **Analytical Data** providing data regarding the capacities and rates of the element(Figure 40);
- 3. **Phasing** assigning the project phase.

	Analytical Data		
Cooling Capacity	The design capacity of the cooling coil.	numeric	W
Heating Capacity	The design capacity of the heating coil.	numeric	W
Inlet/Outlet Node Names	The names of the nodes where the fluid medium enters and exits the heating coil.	text	/
Heat Exchanger	The coil is operable in two configurations: CounterFlow or	text	/
Configuration	CrossFlow.	ic.nc	/
*If Steam Maximum Steam Flow Rate	The maximum possible steam volumetric flow rate in m3/s through the steam heating coil.	numeric	m3/sec
*If Water Maximum Water Flow Rate	The maximum possible water volume flow rate (m3/sec) through the coil.	numeric	m3/sec
Maximum Air Flow Rate	The maximum possible air volume flow rate (m3/sec) through the coil.	numeric	m3/sec
Inlet Water Temperature	The inlet water temperature for the design flow.	numeric	°C
Outlet Water Temperature	The outlet water temperature corresponding to the rated heating capacity.	numeric	°C
Inlet Air Temperature	The inlet air temperature for the design flow.	numeric	°C
Outlet Air Temperature	The outlet air condition desired for design flow.	numeric	°C
Inlet Air Humidity Ratio	The highest value of humidity ratio possible for the Design inlet air stream.	numeric	kgWater/kgDryAir
Outlet Air Humidity Ratio	The value of humidity ratio for the Design outlet air stream.	numeric	kgWater/kgDryAir
Availability Schedule	Schedule that defines when the coil is available. The name of the schedule (ref: Schedule) that denotes whether the coil can run during a given time period. A schedule value greater than 0 (usually 1 is used) indicates that the unit can be on during a given time period. A value less than or e qual to 0 (usually 0 is used) denotes that the unit is off. If this field is blank, the schedule has a value of 1 for all time periods.	numeric	/

Figure 40 - Analytical Data of the Coil, III tier: Energy Analysis

The created library addresses Level of Information Need of the following elements (Table 9).

Elements				Data Sets										
	Identity	Material	Dimensional	Thermal	Analytical	Performance	Electrical	Glazing	Shading	Disastas				
	Data	Data	Data	Data	Data	Data	Data	Data	Data	Phasing				
Space / IfcSpace	6	3	3	6	19					1				
Zone / IfcZone	5	3	3	3	15	1				1				
Wall / IfcWall	4	5	3	4	3	2				1				
Flooring / IfcCovering	4	5	3	5	3	2				1				
Ceiling / IfcCovering	4	7	3	4	3					1				
Door / IfcDoor	2	5	3	4	3	1		7		1				
Window / IfcWindow	3	7	6	4	8	6			6	1				
Roof / IfcRoof	3	6	4	4	3	2				1				
Duct / IfcDuctSegment	9	2	5		2					1				
AirTerminal / IfcAirTerminal	12	2	5		10	1				1				
Coil / IfcCoil	6	1			14					1				
Fan / IfcFan	7				10					1				
Chiller / IfcChiller	6	1	3		15		2			1				
Boiler / IfcBoiler	6	1			13					1				
AirConditioning /	10	1			4		2			1				
IfcUnitaryEquipment	10	T			4		2			L				
Piping / IfcPipeSegment	10	1	2		4					1				
Transformer / IfcTransformer	5		3		10		2			1				
	102	50	10	24	120	10	C	7	6	17				
	102	50	46	34	139	15	6	1	6	422				
										422				

Table 9 - Elements and Number of associated parameters, III tier: Energy Analysis

4.6. Quantitative Overview of Created Requirements

The created Specificator includes 75 requirements with accompanying guidelines and 182 specifications for the Level of Information Need, all classified according to purpose and project milestones (Figure 41). It encompasses more than 15 different property sets and an extensive range of parameter occurences: 3535 parameters for three different project phases, 736 parameters for Cost Estimation and 422 parameters for Energy Analysis. This provides an extensive base to be used in defining requirements and results in 4693 rules that can be imployed during the verification of the model.



Figure 41 – Visual representation of requirements and parameters quantification

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5. VERIFICATION / CASE STUDY

The proposed methodology was subjected to validation through a case study. In collaboration with BIMMS, the Requirements Specificator was implemented in the project that is currently being developed within the company. The implementation process included realization of the model within Autodesk Revit platform, followed by the exporting to the IFC format.

5.1. Verification rules and requirements

In order to investigate possible verification approaches, a subset of the rules was extracted from the Requirements Specificator:

<u>Unique Room Naming</u> – There shall be no rooms containing the same room number.

<u>Unallocated / Unplaced Rooms</u> – Model shall not contain rooms that are not placed.

Room Area – Room Area shall be the same as area required and defined by the Room Schedule.

<u>Elements intersection</u> – Model shall not contain elements that overlap/intersect.

Minimal handrail height – Minimal handrail height for stairs and ramps shall not be less than 900mm.

<u>Elements Location – Doors/Windows</u> – Windows and doors shall be assigned to the same floor as the walls or roof in which they are located.

<u>Level of Information Need</u> – Elements shall contain the information content defined by the Level of Information Need.

5.2. Verification Methodology

In agreement with the company, it was decided to investigate two possible approaches of checking the rules defined in the subset: Checking if the Revit file complies to the modelling rules and Checking the compliance of the IFC file to the proposed rules and information requirements.

First approach is intended for the use during modelling process, by the team members creating the model. It represents quality assurance measurement that is being performed while the model is being developed, enabling users to identify and rectify mistakes before exporting to the IFC format. Consequently, leading to reduction in both time and effort when compared to the conventional process of exporting the model and conducting validation using external software tools like Solibri or Navisworks.

Second approach is designed to accommodate both the internal verifications of the quality and the external assessment undertaken by the client. It aims to address the compliance of the IFC file that is being delivered to the client, to the information requirements defined by the EIR.

Based on this, three methodologies of verifications were conducted. Using Visual Programming Language within Dynamo platform to test the Revit model, using Python programming language with the IfcOpenShell and IDS for the checking of the IFC file (Figure 42).

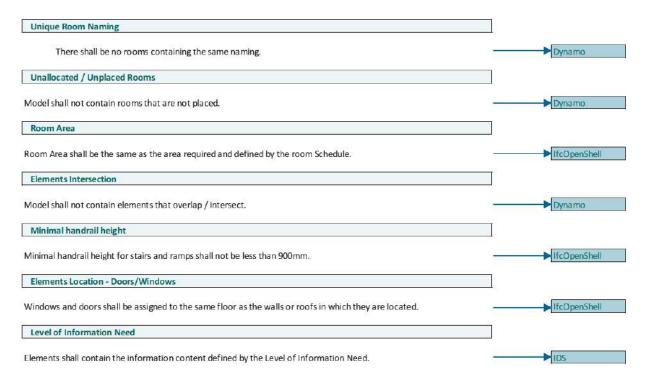


Figure 42 – Assigning Verification methods to chosen rules

5.3. Dynamo

As explained previously, first verification methodology uses Visual Programming language within Dynamo environment. The aim is to perform three different checks on the Revit model developed by company. First two verifications address and validate the architectural model, whereas third checking employs both architectural model and MEP model that is linked.

5.3.1. Unique Room Naming

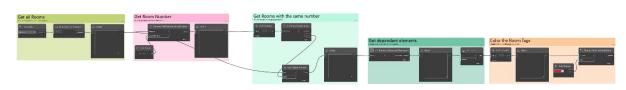


Figure 43 - Dynamo script for checking unique room naming

This verification includes a script designed for verifying unique room naming (Figure 43). It assures that the model does not contain duplicated room names. It is based on the condition, if the rooms contain the same room number, they are duplicated and shall be marked as such. Process includes several steps as shown below (Figure 44).

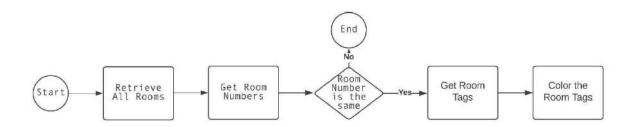


Figure 44 - Checking unique room naming – process flow

First, all the elements of the room category are collected along with the values of the property Number. In order to parse the ones containing the same number value two possible approaches are identified, first, using sequence of nodes to identify and extract duplicated numbers and second, using a Python script (Figure 45). Since the node approach would mean that data is growing exponentially with checking of each number, duplicating the information for each occurrence, a Python script is chosen as a more efficient approach.

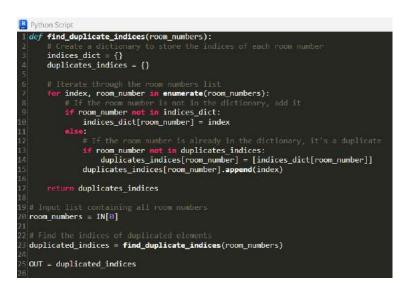


Figure 45 - Searching for duplicated indices – Python script

Script takes a list of room numbers as input and defines a function for finding duplicated indices. Within the function two dictionaries are initialized, one to keep track of the first occurrence of each room number and another to identify duplicate occurrences. In other words, it checks if the room number has been seen before, without storing unnecessary duplicate information. Output of the script provides a dictionary that associates key (room number) with values (indices).

After retrieving the rooms that are duplicated, second step is to present them within the model graphically. Simply overriding the room elements with different colour can be one approach, but it presents an issue if the view template and visibility overrides do not include colour fill. Taking this into consideration, instead of colouring the rooms itself, the room tags connected to them should be coloured. In order to get the room tags of the duplicated rooms first, a list of all dependant elements is identified. Then a python script was used to extract only room tags from the list (Figure 46).

Python Script		×
<pre>1 import clr 2 clr.AddReference('RevitAPI') 3 from Autodesk.Revit.DB import * 4 clr.AddReference('RevitServices') 5 from RevitServices.Persistence import DocumentManager 6 7 # Access the current Revit document 8 doc = DocumentManager.Instance.CurrentDBDocument 9 10 # Function to filter RoomTag elements from a list of elem 11 def filter_room_tags_from_elements(elements): 12 room_tags = []</pre>	ents	
<pre>I3 for element in elements: I4</pre>		
18;# Input: elements_list (list of Revit elements) 19;elements_list = UnwrapElement(IN[0]) 20		
21 # Call the function to Filter RoomTags from the input liss 22 room_tags_list = filter_room_tags_from_elements(elements_		
23 24 # Output the list of RoomTags 25 OUT = room_tags_list		

Figure 46 - Searching for related room tags – Python script

The provided verification of the Revit file showed that there are three rooms containing the same room number, displayed as in the Figure 47.

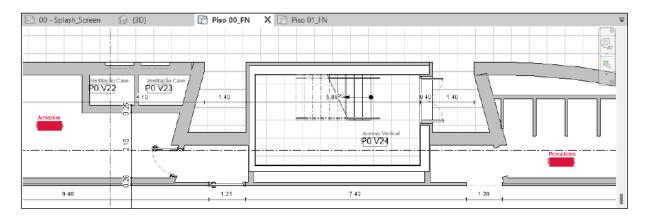
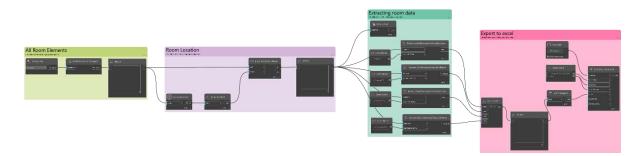


Figure 47 – Visualization of results of duplicated numbers check within Revit

5.3.2. Unallocated / Unplaced Rooms

This verification checks if the Revit file contains unplaced rooms and exports a report with elements data to Excel sheet (Figure 48). Process defined in the script, retrieves all the elements of category room contained in the model and checks their location (Figures 49).





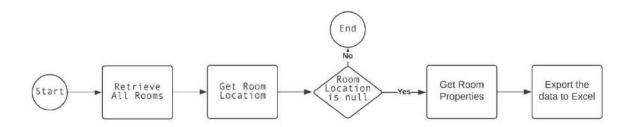


Figure 49 - Checking for unplaced rooms – process flow

The list of all room elements is created followed by the extraction of rooms location values. Created list is then filtered with null values, so it outputs the list of rooms that are unplaced. In other words, functionalities of Object.IsNull node are used to filter the elements which location value equals zero. Then the parameter values associated with those room elements are collected. Script extracts information relevant to rooms identification: Name, Number, Level and GUID. After creating the list of parameter values associated to each room, it exports the data to Excel sheet creating a report.

Performed verification showed that four rooms contained within Revit file are unplaced. The results were then confirmed with creation of the room schedule which listed the same instances (Figure 50).

Ref.		Designação	Piso	Perimetro	Área	INFO Sito	INFO Edificio	INFO Piani	INFO Vano
P0.V15		Armazém	Not Placed	Not Placed	Not Placed	PC7	E1	P0	V016
P0.V20		ISS	Not Placed	Not Placed	Not Placed	lariate land and an	E1	P0	V028
1.V33		Sala de Reuniões	Not Placed	Not Placed	Not Placed	PCZ	E1	P1	V072
2.V19		Gabinete	Not Placed	Not Placed	Not Placed	PCZ	E1	P2	V084
P2.V27		Gabinete	Not Placed	Not Placed	Not Placed	PCZ	E1	P2	V099
	П				0.00 m²				
_	П								
	Ш		P0.V20	IS S		Pisc	00	2_H5pBNZ1	C6eaZQt2mS2sI
	۱L		P0.V15	Armazém		Pisc	00	2_H5pBNZ1	C6eaZQt2mS2o
			P1.V33	Sala de Reuniõe	es	Pisc	01	2_H5pBNZ1	C6eaZQt2mS3Kv
			P2.V19	Gabinete		Pisc	02	2_H5pBNZ1	C6eaZQt2mS31
L							200 million 100	and the second se	

Figure 50 - Results of the unplaced rooms check

5.3.3. Intersection of Elements

Third verification is the most complex since it addresses not one but two models. It checks the intersection of the elements within the Architectural model with the elements contained in the linked MEP model (Figure 51). The script verifies if there is intersection between the wall and the pipe instances (Figure 52).

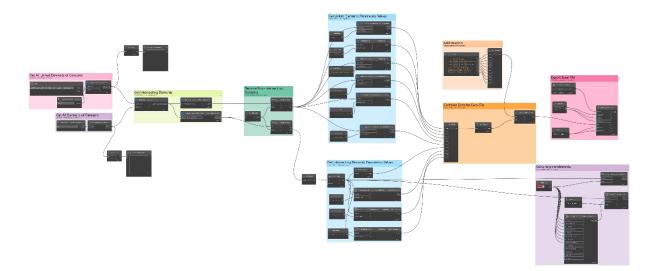


Figure 51 - Dynamo script for checking intersecting elements

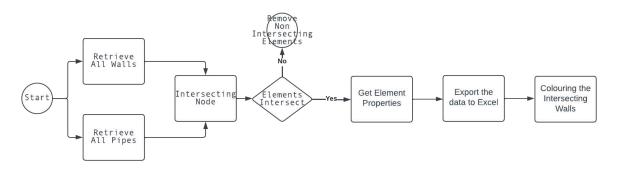


Figure 52 - Checking for element intersection – process flow

The first step of the process is retrieving all elements of these two categories within the models. In this specific case, piping is not directly represented within working model, but contained in the linked model, so it uses different retrieving approach comparing to the walls. Instead of using standard nodes integrated in Dynamo, it requires using the functionalities within the nodes specifically intended to deal with linked elements, provided by BimorphNodes package. This package allows interaction with linked elements and functions for addressing their intersection. Element.IntersectsElements functionality is employed to detect intersections, which is then followed by result nodes displaying elements of both categories. The way BimorphNodes operates, results in displaying two distinct lists. One of the lists contains all piping instances that were evaluated, while the other displays all wall instances, where empty values are provided for the walls that do not intersect. In order to extract only the elements that have intersection, next step involves filtering process. By utilizing List.IsEmpty node on the walls result, a list of indices is created which is then used as a mask for filtering both lists (Figure 53).

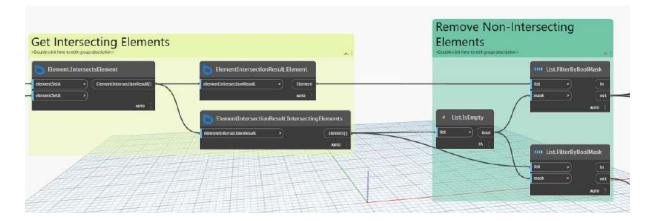


Figure 53 - Filtering the intersected elements

After getting the list of intersected elements, script retrieves the parameter values needed for the identification of the elements. For the piping elements it provides values regarding: Size, IfcGUID, System Classification, System Type, System Abbreviation and System Name. For the wall elements: Name, IfcGUID, Type Mark and Level. This data is then combined and exported into Excel sheet (Figure 54).

Linked Element Size	Element	-,	Linked Element System Type	Element System	Linked Element System Name		Intersecting Element IfcGUID	Intersecting Element Type Mark	Intersecting Element Level
16ø	1Xs7DnCjrASeLL	Domestic Hot Water	LinkElement(Eler	DWH	AA.AQ1	.wi.CER.PLA.PLS.BLC.ES	1\$xnqZn398Qx7g95ffw599	PI.217	Level(Name=Piso 02, Elevation
20ø	OffbvTt5v0zxpGg	Domestic Hot Water	LinkElement(Eler	DWH	AA.AQ 1	.wi.CER.PLA.PLS.BLC.E	1\$xnqZn398Qx7g95ffw599	PI.217	Level(Name=Piso 02, Elevation
16ø	2bi6y70tD7gOv8	Domestic Hot Water	LinkElement(Eler	DWH	AA.AQ1	.wi.CER.PLA.PLS.BLC.E	3lpNFH7f15iwaQCeAuDL0A	PI.242	Level(Name=Piso 02, Elevation:
160ø	3Twp1tu\$95Hwi	Sanitary	LinkElement(Eler	RWD	AP 37	.wi.CER.PLA.PLS.BLC.E	1\$xnqZn398Qx7g95ffw599	PI.217	Level(Name=Piso 02, Elevation
25ø	0HxYdja2n4hhz3	Domestic Cold Water	LinkElement(Eler	DCW	AA.AF 4	.wi.CER.PLA.PLS.BLC.E	3lpNFH7f15iwaQCeAuDL0A	PI.242	Level(Name=Piso 02, Elevation-
90ø	3jUsf1nBP1IREco	Sanitary	LinkElement(Eler	RWD	AP 7	.wi.BLC.EST 170mm	2HJqoNBk5APQG2OTaGOL	PI.208	Level(Name=Piso 01, Elevation:
16ø	2fxqODkEv2duK	Domestic Cold Water	LinkElement(Eler	DCW	AA.AF 4	.wi.BLC.EST 170mm	OgB9NRHxP61evBSYry8Url	PI.208	Level(Name=Piso 02, Elevations
16ø	2fxqODkEv2duK	Domestic Cold Water	LinkElement(Eler	DCW	AA.AF 4	.wi.BLC.EST 170mm	OgB9NRHxP61evBSYry8Url	PI.208	Level(Name=Piso 02, Elevation-
16ø	2fxqODkEv2duK	Domestic Cold Water	LinkElement(Eler	DCW	AA.AF 4	.wi.BLC.EST 170mm	OgB9NRHxP61evBSYry8Url	PI.208	Level(Name=Piso 02, Elevations
16ø	2fxqODkEv2duK	Domestic Cold Water	LinkElement(Eler	DCW	AA.AF 4	.wi.BLC.EST 170mm	OgB9NRHxP61evBSYry8Url	PI.208	Level(Name=Piso 02, Elevation
16ø	OrP1EPJIj0_OZa9	Domestic Cold Water	LinkElement(Eler	DCW	AA.AF 4	.wi.CER.PLA.PLS.BLC.E	1\$xnqZn398Qx7g95ffw2GH	PI.217	Level(Name=Piso 01, Elevations
16ø	OrP1EPJIj0_OZa9	Domestic Cold Water	LinkElement(Eler	DCW	AA.AF 4	.wi.BLC.EST 170mm	2HJqoNBk5APQG2OTaGOK	PI.208	Level (Name=Piso 01, Elevation
16ø	OrP1EPJIj0_OZa9	Domestic Cold Water	LinkElement(Eler	DCW	AA.AF 4	.wi.BLC.EST 170mm	2HJqoNBk5APQG2OTaGOK	PI.208	Level(Name=Piso 01, Elevation
16ø	2hC9DMkZXBrPr	Domestic Cold Water	LinkElement(Eler	DCW	AA.AF 4	.wi.BLC.EST 170mm	1\$xnqZn398Qx7g95ffw591	PI.208	Level(Name=Piso 02, Elevation

Figure 54 - Report of performed check within Excel

For easier identification of the intersected elements within the model, graphic display of the results is also incorporated into the script. This step includes implementing colour-coding approach to highlight the walls that intersect with piping instances. In order for the colour to be displayed in all views, regardless of the view template, the overriding graphic settings functionality is revoked. As shown in the results below, this enables detection of the elements in different views (Figure 55).

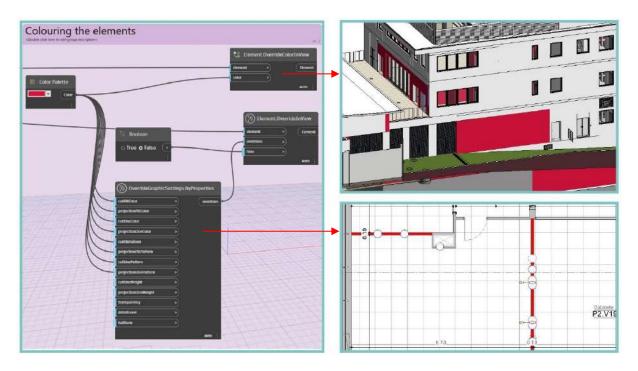


Figure 55 - Visual representation of results within Revit

5.4. IfcOpenShell

Second type of verification uses Python and IfcOpenShell to process IFC file and checks if it complies to certain requirement. For the purpose of research, three different aspects of verification are addressed through created scripts:

Alphanumerical – relying on the method of direct extraction of property and its value;

Geometrical – extracting geometric information of elements;

Checking of relations - navigating elements relationships.

5.4.1. Minimal handrail height

First verification procedure includes checking if the handrail height is less than 900 mm. This is relatively straightforward method as it checks the data contained directly within the IFC. As it can be seen in the property sets of the IfcRailing, Height property is stored in the Pset_RailingCommon meaning that is the container within which data should be processed.

Methodology of processing data, as described in Figure 56, is to retrieve all railing objects contained in the IFC file and then loop through each of them to find required property.

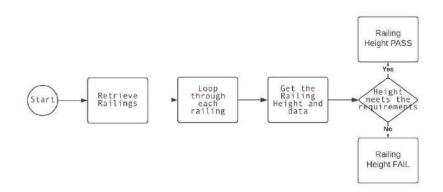


Figure 56 - Checking the railing height – process flow

Algorithm iterates through the property sets associated with the IFC object using IfcRel DefinesByProperties relationship. This relationship as defined by the IFC schema, enables the code to access property sets of the object and to identify the one called Pset_RailingCommon. Lastly, a function is called to retrieve the height property value and compare it to the required one. The railing that does not meet the requirements, is printed in results, along with the data that enable the element identification.

Performed verification of the IFC file showed that out of total number of 66 railing objects, 23 does not meet the height requirement (Figure 57). Upon further inspection of the displayed results, it is concluded that it is one type of the railing that has 23 instances in the file.

```
Railing Name: Railing:.arv.railing.metal.spl.wall 1000mm:4149939 | Railing GUID: 200$z0_lXCBges0V8dDWLP
| Height does not meet requirement (0.88m)
Total Railings: 66
Railings Not Meeting Requirement: 23
PS C:\Users\adjuk\Desktop\Case Studies\IfcOpenShell.RailingHeight>
```

Figure 57 - Results of performed check

5.4.2. Room Area

Second validation script checks if the areas of the rooms contained within the IFC file complies to the Room Schedule defined by the client. Unlike the first script which assess handrail height extracting property stored in the property set, this check employs geometrical calculations to generate the area of the rooms. It does not rely on the preexisting data that can be manipulated within the IFC schema, so it provides higher accuracy of calculations.

For execution of this verification first an Excel spreadsheet was formed based on the Room schedule requested by the client. The table created listed 143 rooms and data associated with them: Room Number, Room Name and Room Area (Figure 58).

			Room	Long Name	Room Area	P1.V15	Camarina	8.13	#2.V22	Gabinete	38.82
			Number	1	2 XXXXXXXXXX	#1.V16	Regie	6.77	P2.V23	Gabinete	19.87
			PD MRI	Acesso Vertical	15.65	P1.V17	Coursette	0.65	P2.V24	Gabinete	18.74
	-		P0.V02	Circulação	11.58	P1.V18	Arrumos	4.74	P2.V25	Gabinete	29.59
	The second secon		P0.V03	Area Tecnica	3,57	P1.V21	Circulação	12.55	P2.V26	Sala de Reuniões	25.61
10000000	CC Salimunation	And a state of the	PD.V04	Elevadores	4.45	P1.V22	Countie	0.58	P2.V27	Sabinete	39.48
		TTTT HIM	P0, V05	Агея Тёспіка	12.55	P1.V23	IS H + ADA	14.8	P2.V28	Gabinete	27,4
		in the second	PD VD6	Área Técnica	2.49	P1.V24	Acesso Vertical	16.65	P2.V20	Courette	0.60
	A PARTY OF THE PAR		PD.V07	Area Técnica	4.45	#1.V25	Anumos	24.29	P2.V30	15.5 + ADA	19.6.
- III - III			P0.V12	Area Comercial	623,96	P1.V26	Arrumos	13.75	P2.V31	Sala de Reuniões	9.15
The OTHER DESIGNATION OF THE OTHER DESIGNATION		TITLE BERLINS	PO.VIX	Área de Espasição	5.77	P1.V27	Courette	0.61	12.932	Sala de Atruniões	8.79
		Control Inc. Inc.	P0.V14	Area de Exposição	5.81	P1.V28 P1.V29	IS S + ADA Circulação	19.62	P2.V33	Circulação Sala de Reuniñes	29.0
			P0.V15	Armazim	28.81	P1.V29	Gabinete	21.29	P2.V84 P2.V35		8.81
	CHILL L		P0.V16 P0.V17	Provadores Vestilado 15	22.35	P1.V31	Gabineta	29.57	P2.V35 P2.V36	Sala de Reuniões Sala de Reuniões	8.5
			P0.V18	15 H	8.2	P1.V31	Salo de Reyniñes	45.03	P2.V30	Sala de Reuniões	8.70
			P0.V19	15 404	4,47	P1.V33	Sala de Rouniões	9.81	P2.V38	Espaço de Trabelho - Opens	59.61
		-	PD. V20	155	9.14	P3.V34	Sala de Reuniões	9.40	P2.V39	Gabinete	11.9
			P0.V21	Courette	1	P1.V35	Espaço de Trabalho - Opens	53.63	P2.V40	Varanda	34.68
			P0.V22	Ventilação Cave	1.53	P1.V36	Acesso Vertical	9.49	P2.V41	Courette	5.02
			P0.V23	Ventilação Cave	1.64	P1.V37	Variandia	61.72	P3.V01	Acesso Vertical	16.65
			PD.V34	Acesso Vertical	16.65	P1.V38	Varanda	113.23	P3.V02	Aperso Vertical	1.13
			PD.V24 PD.V25	Area Técnica - PT	20.52	P1.V38 P1.V44	Gabinete	113.23 28.99	P3.V02 P3.V03	Acesso Vartical Circulação	1.13 8.9
			P0.V25	Área Técnica - PT	20.52	P1.V44	Gabinete	28.99	P3.V03	Circulação	8.9
Room Number	Long Name	Room Area	P0.V25 P0.V26	Área Técnica - PT Área Técnica - Gerador	20.52 9.71 8.27 3.96	P1.V44 P1.V45	Gabinete Arrumos	28.99 3.54 2.89 20.22	P3.V03 P3.V05 P3.V07 P3.V09	Circulação Elevadores	8.9 12.47 0.78 10.95
Room Number	Long Name		P0.V25 P0.V26 P0.V27 P0.V28 P0.V28 P0.V38	Área Técnica - PT Área Técnica - Gerador Área Técnica - QE Antecamara Courette	20.52 9.71 8.27 3.96 4.46	P1.V44 P1.V45 P1.V46 P1.V47 P3.V01	Gabinete Arrumos Circulação Varanda Acesso Vertical	28.99 3.54 2.89 20.22 10.1	P3.V03 P3.V05 P3.V07 P3.V09 P3.V10	Circulação Dievadores Área Técnica Circulação IS	8.9 12.47 0.78 10.95 2.53
Room Number P0.V01	Long Name Acesso Vertical	Room Area 15.65	P0.V25 P0.V26 P0.V27 P0.V28 P0.V38 P0.V34	Area Técnica - PT Area Técnica - Gerador Área Técnica - QE Antecamara Couretta Armadém	20.52 9.71 8.27 3.96 4.46 92.41	P1.V44 P1.V45 P1.V45 P1.V47 P3.V01 P2.V02	Gabinete Arrumos Circulição Varanda Acesso Ventical Acesso Ventical	28.93 3.54 2.85 20.22 16.1 1.44	P3.V03 P3.V05 P3.V07 P3.V09 P3.V10 P3.V10 P3.V11	Circulação Elevadores Área Técnica Circulação IS IS	8.9 12.47 0.78 10.95 2.51 3.32
P0.V01	Acesso Vertical	15.65	P0.V25 P0.V26 P0.V27 P0.V28 P0.V38 P0.V34 P0.V38	Area Tecnica - PT Area Tecnica - Geration Ana Tecnica - Gel Antecamana Courrette Armadem Acesso Ventical	20.52 9.71 8.27 3.96 4.46 12.41 18.51	P1.V44 P1.V45 P1.V46 P1.V47 P3.V01 P2.V02 P2.V03	Gabinete Arrumos Circulação Varanda Acesso Venical Acesso Venical Circulação	28.99 3.54 2.89 20.22 16.1 1.44 11.04	P3.V03 P3.V05 P3.V07 P3.V09 P3.V10 P3.V11 P3.V12	Circulação Elevadores Área Tecnica Circulação Es IS IS Sala de Reuniães	8.9 12.47 0.78 10.95 2.53 3.32 86.94
P0.V01 P0.V02	Acesso Vertical Circulação	15.65 11.58	P0.V25 P0.V26 P0.V27 P0.V28 P0.V38 P0.V38 P0.V38 P0.V38	Area Técnica - PT Area Técnica - Gerador Aves Técnica - QE Antecamera Courente Armadem Acesso Vertical Varanda	20.52 9.71 8.27 3.96 4.46 92.41 18.31 104.51	P1.V44 P1.V45 P1.V46 P1.V47 P3.V01 P2.V02 P2.V03 P2.V04	Gabinete Arrumos Circulação Varandu Acesso Vertical Acesso Vertical Circulação Area Fécilica	28.99 3.54 2.89 20.23 16.1 1.44 11.04 3.73	P3.V03 P3.V05 P3.V07 P3.V09 P3.V10 P3.V11 P3.V12 P3.V13	Circulação Elevadores Áres Técnica Circulação IS IS Sala de Reuniões Copa	8.5 12.47 0.78 10.95 2.53 3.32 86.94 7.42
P0.V01 P0.V02 P0.V03	Acesso Vertical Circulação Área Técnica	15.65 11.58 3.57	P0.V25 P0.V26 P0.V27 P0.V28 P0.V38 P0.V38 P0.V38 P0.V38 P0.V38 P0.V40	Area Técnica - PT Area Técnica - Gerador Area Técnica - Gerador Area Técnica - QE Artecamera Couverte Armadem Acesso Vertical Varanda Area Técnica	20.52 9.71 8.27 3.96 4.46 92.41 18.31 104.51 31.06	P1.V44 P1.V45 P1.V46 P1.V47 P3.V01 P2.V02 P2.V03 P2.V03 P2.V04 P2.V07	Gabinete Arrumos Circulação Varanda Acesso Ventical Acesso Ventical Circulação Area Técnica Area Técnica	28.99 3.54 2.85 20.27 16.1 1.44 11.04 3.73 1.08	P3.V03 P3.V05 P3.V07 P3.V09 P3.V10 P3.V10 P3.V11 P3.V12 P3.V13 P3.V14	Circulação Elevadores Aves Thenica Circulação IS IS Sala de Reuniões Copia Ternaço	8.3 (2.47) (0.78) 10.95 2.51 3.32 86.94 7.43 79.4
P0.V01 P0.V02	Acesso Vertical Circulação	15.65 11.58	P0.V25 P0.V26 P0.V27 P0.V28 P0.V38 P0.V38 P0.V38 P0.V38 P0.V38 P0.V41	Arga Técnica – PT Area Técnica – Gerador Area Técnica – Gerador Armatérica – GE Antecamara Courette Armatére Armatére Nesso Vertical Varandia Area Técnica Armatére	20.52 9.71 8.27 3.96 4.46 92.41 18.51 104.51 11.06 46.17	P1.V44 P1.V45 P1.V46 P1.V47 P3.V01 P2.V02 P2.V03 P2.V04 P2.V07 P2.V08	Gabinete Arrumos Circulação Varande Aceso Vertical Aceso Vertical Crecia ção Area Técnica Area Técnica Area Técnica	28.99 3.54 2.89 20.22 16.1 1.44 11.04 3.73 1.08 13.01	P3.V03 P3.V07 P3.V09 P3.V09 P3.V10 P3.V11 P3.V12 P3.V13 P3.V14 P3.V15	Circulação Elevaldories Área Telorácia Circulação 15 Sala de Reuniães Copa Terraço Area Técnica - Cobertura	8.3 (2.47 0.79 10.95 2.51 3.32 85.94 7.43 79.4 179.87
P0.V01 P0.V02 P0.V03	Acesso Vertical Circulação Área Técnica	15.65 11.58 3.57 4.46	P0.V25 P0.V26 P0.V27 P0.V28 P0.V38 P0.V38 P0.V38 P0.V38 P0.V38 P0.V38 P0.V48 P0.V42	Aces Técnica - PT Area Técnica - Gerador Anso Técnica - Gel Antocamana Courette Armadem Acesso Vertical Verande Area Técnica Area de Esposição	20.52 9.71 8.27 3.96 4.46 92.41 18.31 104.51 11.06 46.12 5.58	P1.V44 P1.V45 P1.V45 P3.V01 P2.V02 P2.V03 P2.V04 P2.V07 P2.V08 P2.V08 P2.V09	Gabinete Arrumos Cinculação Vanada Acesso Ventical Acesso Ventical Acesso Ventical Area Técnica Area Técnica Area Técnica (obby	28.99 3.54 2.89 20.22 16.1 1.44 11.04 3.73 1.08 13.01 99.82	P3.V03 P3.V05 P3.V07 P3.V09 P3.V10 P3.V11 P3.V12 P3.V12 P3.V14 P3.V15 P3.V16	Circulação Elevalação Arva Técnica Circulação IS Sala de Reuniães Copa Terraço Arva Técnica - Colaertura Area Técnica - Colaertura Area Técnica - Colaertura	8.3 (2.47 0.78 10.95 2.51 3.32 86.94 7.42 79.4 179.89 33.95
P0.V01 P0.V02 P0.V03 P0.V04 P0.V05	Acesso Vertical Circulação Área Técnica Elevadores Área Técnica	15.65 11.58 3.57 4.46 12.55	P0.V25 P0.V26 P0.V27 P0.V28 P0.V38 P0.V38 P0.V38 P0.V38 P0.V38 P0.V48 P0.V48 P0.V42 P1.V01	Area Técnica - PT Area Tecnica - Gerador Antocamera - Gel Antocamera Courette Antocamera Acesso Vertical Varanda Area Técnica Area de Capoloto Acesso Vertical	20.52 9.71 8.27 3.96 4.66 02.41 18.51 104.51 11.06 86.12 5.58 17.69	P1.V44 P1.V45 P1.V46 P1.V47 P3.V01 P2.V02 P2.V03 P2.V03 P2.V03 P2.V09 P2.V09 P2.V09 P2.V09 P2.V10	Gabinete Arrumos Cinculação Varanda Acesso Vertical Acesso Vertical Consação Área Técnica Area Técnica Area Técnica Area Técnica Area Técnica Area Técnica Area Técnica Area Técnica Area Técnica	28.99 3.54 2.89 20.22 16.1 1.44 11.04 3.73 1.08 13.01 99.82 10.85	P3.V03 P3.V05 P3.V07 P3.V09 P3.V10 P3.V11 P3.V12 P3.V12 P3.V14 P3.V15 P3.V16 8F.V01	Circulação Elevandores Area Técrica Circulação 15 55 56 56 56 56 56 56 56 56 56 56 56 56	8.3 12.47 0.79 10.95 2.53 3.32 85.94 7.43 79.44 179.87 13.96 164.45
P0.V01 P0.V02 P0.V03 P0.V04 P0.V05 P0.V06	Acesso Vertical Circulação Área Técnica Elevadores Área Técnica Área Técnica	15.65 11.58 3.57 4.46 12.55 2.49	P0.V25 P0.V26 P0.V27 P0.V28 P0.V38 P0	Area Tekrika - PT Area Tekrika - Gerador Area Tekrika - GB Antacamana Canuerte Armazona Area Overical Varanda Area Tecrika Armazona Area de Caposição Acesso Vertical Circulação Overical	20.52 9.71 8.27 3.96 4.66 02.43 18.31 104.51 31.06 46.17 5.58 17.69 11	P1.V44 P1.V45 P1.V47 P3.V01 P2.V02 P2.V03 P2.V03 P2.V04 P2.V07 P2.V09 P2.V09 P2.V09 P2.V10 P2.V11	Gabinets Arrumos Cinculegão Azesso Ventical Azesso Ventical Censora (80 Area Técnica Area Técnica Area Técnica Area Técnica Area Técnica Sa Técnica Sa Sa S	28.99 3.54 2.89 20.27 16.1 1.44 11.04 3.73 1.08 13.01 99.82 10.85 14.8	P3.V03 P3.V07 P3.V07 P3.V10 P3.V10 P3.V11 P3.V12 P3.V13 P3.V14 P3.V15 P3.V26 RF.V01 S1.V01	Circulação Elevandorei Arva Técnica Circulação IS Sala de Reuniães Copa Copa Ternaço Area Técnica - Cobertura Area Técnica - Cobertura Aceso Vertical	8.3 12.47 0.79 10.95 2.53 3.32 85.94 7.43 79.4 179.87 133.96 164.45 16.64
P0.V01 P0.V02 P0.V03 P0.V04 P0.V05 P0.V05 P0.V06 P0.V07	Acesso Vertical Circulação Área Técnica Elevadores Área Técnica Área Técnica Área Técnica	15.65 11.58 3.57 4.46 12.55 2.49 4.46	P0.V25 P0.V26 P0.V27 P0.V28 P0.V38 P0.V38 P0.V38 P0.V38 P0.V38 P0.V38 P0.V42 P0.V42 P1.V03 P1.V03 P1.V04	Area Tecnica - Gerador Area Tecnica - Gerador Ana Tecnica - Gerador Antecamara Caurette Armaden Armaden Areas Verital Variande Area Tecnica Armanim Area de uponicito Accesso Verital Circulação Area Tecnica	20.52 9.71 8.27 3.96 4.46 92.42 18.31 104.51 11.06 46.17 5.58 17.69 11 4.58	P1.V44 P1.V45 P1.V46 P1.V47 P3.V01 P2.V02 P2.V03 P2.V03 P2.V04 P2.V07 P2.V08 P2.V09 P2.V10 P2.V10 P2.V11 P2.V12	Gablinete Arrumos Cinculação Varande Acesso Vertical Cinculação Area Técnica Area Técnica Area Técnica Area Técnica Area Técnica Area Técnica Area Técnica Area Técnica Construição IS H - ADA Courette	28.99 3.54 2.89 20.22 16.1 3.44 11.04 3.73 1.08 13.01 99.82 10.85 14.8 0.58	P3.V03 P3.V05 P3.V07 P3.V09 P3.V10 P3.V12 P3.V12 P3.V12 P3.V12 P3.V15 P3.V15 P3.V15 P3.V15 P3.V15 P3.V15	Circulação Etensidores Alvan Tecelos Coranção IS IS IS IS Sanda Reuniões Cook Tensoo Alvan Tecelos - Cobertura Alvan Tecelos - Cobertura Alvan Circulas - Cobertura Alvan Circulas - Cobertura Alvan Stecida - Cobertura	8.3 12.47 0.79 10.95 2.53 3.32 85.94 7.43 79.44 179.87 13.96 164.45
P0.V01 P0.V02 P0.V03 P0.V04 P0.V05 P0.V06	Acesso Vertical Circulação Área Técnica Elevadores Área Técnica Área Técnica	15.65 11.58 3.57 4.46 12.55 2.49	P0.V25 P0.V26 P0.V27 P0.V28 P0.V38 P0	Anos Teknika - PT Anos Teknika - Gerador Ante-camara Couriette Armadem Accesso Verrical Varande Area Gerica Area Gerica Area Gerica Area Gerica Area Gerica Circulação Anos Ternica Literadores	20.52 9.21 8.27 3.96 4.46 92.41 18.31 104.51 11.06 46.17 5.58 17.69 11 4.58 12.98	P1.V44 P1.V45 P1.V45 P2.V45 P2.V47 P2.V02 P2.V02 P2.V03 P2.V04 P2.V07 P2.V08 P2.V09 P2.V09 P2.V09 P2.V10 P2.V11 P2.V12 P2.V12 P2.V13	Galente Anunos Chostigão Visande Aceso Vential Aceso Vential Aceso Vential Aceso Ventia Area Tecica Area Tecica Area Tecica (otily Arunos S H + ADA Coorte	28.99 3.54 2.89 20.22 16.1 1.44 11.04 3.73 1.08 13.01 99.82 10.85 14.8 0.58 16.65	P3.V03 P3.V05 P3.V07 P3.V07 P3.V10 P3.V10 P3.V12 P3.V12 P3.V13 P3.V14 P3.V15 P3.V16 RF.V01 S3.V02 S3.V03	Circuigão Elevadores Area Teknica Coroacida S S S S S S S S S S S S S S S S S S S	8.3 12.47 0.79 10.95 2.51 3.32 7.42 7.95.4 179.83 33.96 164.45 166.45 166.45 2.67 9.76 4
P0.V01 P0.V02 P0.V03 P0.V04 P0.V05 P0.V05 P0.V06 P0.V07	Acesso Vertical Circulação Area Técnica Elevadores Área Técnica Area Técnica Area Técnica Area Técnica	15.65 11.58 3.57 4.46 12.55 2.49 4.46	P0. V25 P0. V26 P0. V27 P0. V28 P0. V28 P0. V28 P0. V38 P0. V38 P0. V38 P0. V38 P0. V38 P0. V38 P0. V38 P0. V41 P0. V42 P1. V03 P1. V05	Area Tecnica - Gerador Area Tecnica - Gerador Ana Tecnica - Gerador Antecamara Caurette Armaden Armaden Areas Verital Variande Area Tecnica Armanim Area de uponicito Accesso Verital Circulação Area Tecnica	20.52 9.71 8.27 3.96 4.46 92.42 18.31 104.51 11.06 46.17 5.58 17.69 11 4.58	P1.V44 P1.V45 P1.V46 P1.V47 P3.V01 P2.V02 P2.V03 P2.V03 P2.V04 P2.V07 P2.V08 P2.V09 P2.V10 P2.V10 P2.V11 P2.V12	Gablinete Arrumos Cinculação Varande Acesso Vertical Cinculação Area Técnica Area Técnica Area Técnica Area Técnica Area Técnica Area Técnica Area Técnica Area Técnica Construição IS H - ADA Courette	28.99 3.54 2.89 20.22 16.1 3.44 11.04 3.73 1.08 13.01 99.82 10.85 14.8 0.58	P3.V03 P3.V05 P3.V07 P3.V09 P3.V10 P3.V12 P3.V12 P3.V12 P3.V12 P3.V15 P3.V15 P3.V15 P3.V15 P3.V15 P3.V15	Circulação Etensidores Alvan Techcia Circulação IS IS IS IS IS IS IS IS IS IS IS IS IS	8.3 12.47 0.79 10.95 2.53 3.32 85.94 7.43 79.4 179.87 13.96 133.96 164.45 16.64
P0.V01 P0.V02 P0.V03 P0.V04 P0.V05 P0.V05 P0.V06 P0.V07 P0.V12 P0.V13	Acesso Vertical Circulação Area Técnica Elevadores Area Técnica Área Técnica Area Técnica Area Técnica Area Comercial Área de Exposição	15.65 11.58 3.57 4.46 12.55 2.49 4.46 623.96 623.96 5.77	P0. V25 P0. V27 P0. V27 P0. V27 P0. V28 P0. V38 P0. V38 P0. V38 P0. V38 P0. V38 P0. V38 P0. V38 P0. V48 P0. V48 P1. V03 P1. V03 P1. V03 P1. V05	Anos Tecnica - Geradori Anea Tecnica - Geradori Anas Tecnica - Gal Antecamana Converte Armazén	20.52 9.21 8.27 3.96 4.46 02.41 18.31 104.51 11.06 46.12 5.58 17.69 11 4.58 12.58 17.69 11.1	P1.V44 P1.V45 P1.V45 P1.V45 P1.V45 P1.V02 P2.V02 P2.V03 P2.V02 P2.V03 P2.V04 P2.V03 P2.V09 P2.V10 P2.V10 P2.V11 P2.V11 P2.V13 P2.V14	Gabierte Anuncos Cincicição Viranda Acceso Vertical Acceso Vertical Cincica do Avea Técnica Avea Técnica Avea Técnica Avea Técnica Unitivo Santo Vertical Concette Acceso Vertical Concette Acceso Vertical	28.99 3.54 2.89 20.27 10.1 1.1 1.44 11.04 3.73 10.4 13.01 99.82 10.85 14.8 0.585 15.68	P3.V03 P3.V05 P3.V07 P3.V07 P3.V09 P3.V11 P3.V12 P3.V12 P3.V12 P3.V12 P3.V13 P3.V15 P3.V16 8F.V01 S1.V01 S1.V01 S1.V03 S1.V03	Crosspin Developes Area Teorica Circulação October Si Sala de Reunibes Coop Terreço Area Teorica - Cobertura Area Teorica - Cobertura Area Teorica - Cobertura Comenta - Comenta - Comenta - Comenta - Comenta - Area Servica Area Servica	8.3 12.47 0.79 10.95 2.55 3.32 75.4 179.87 133.96 164.45 16.64 9.74 4 2.57
P0.V01 P0.V02 P0.V03 P0.V04 P0.V05 P0.V05 P0.V06 P0.V06 P0.V07 P0.V12	Acesso Vertical Circulação Area Técnica Elevadores Área Técnica Area Técnica Area Técnica Area Técnica	15.65 11.58 3.57 4.46 12.55 2.49 4.46 623.96	90. V25 P0. V26 P0. V28 P0. V28 P0. V28 P0. V38 P0. V38 P0. V38 P0. V38 P0. V48 P0. V48 P0. V48 P0. V48 P0. V48 P0. V48 P0. V28 P0. V38 P0. V38 P1. V40 P1.	Aroa Techcia - M Aroa Techcia - Galanti Aroa Techcia - Galanti Armadom Armadom Armadom Varanda Armadom	20,52 9,21 8,27 3,96 4,46 92,41 18,51 11,06 5,58 11,06 5,58 17,60 111 4,58 12,98 1,11 80,1	P1.V44 P1.V45 P1.V45 P1.V47 P2.V02 P2.V02 P2.V02 P2.V02 P2.V03 P2.V09 P2.V09 P2.V09 P2.V10 P2.V10 P2.V11 P2.V11 P2.V12 P2.V13 P2.V14	Galeinte Anuncos Anuncos Anuncos Anuncos Visande Anuncos Visande Anun Contas Anun Contas Anun Techica Anun Techica Anun Techica Anuncos (Sill + ADA Constite Contas	28.99 3.54 2.80 20.22 16.1 1.44 11.04 1.04 13.01 99.82 10.85 14.8 0.58 16.65 25.68 20.58 20.99	P3.V03 P3.V05 P3.V07 P3.V07 P3.V17 P3.V12 P3.V12 P3.V12 P3.V12 P3.V12 P3.V12 P3.V12 P3.V12 P3.V12 P3.V12 P3.V12 S3.V01 S3.V01 S3.V02 S3.V03 S3.V09 S3.V03	Circuigão Elevadores Area Tehnica Circuiqão di di S Sain de Reuniães Cosia Cosia Circuitos Cosia Circuitos Cosia Circuitos Cosia Circuitos Cosia Circuitos C	8.3 12.47 0.75 10.05 2.55 3.32 86.96 179.87 139.95 164.45 16.54 9.77 4 2.55 11.05 15.55 15.

Figure 58 - Room schedule spreadsheet in Excel

Second step in the verification process is creating the script that would check the provided IFC file. Overall methodology of processing data is described below (Figure 59).

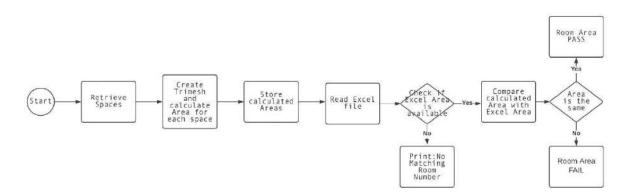
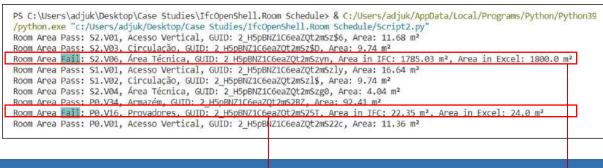


Figure 59 - Checking of room area - process flow

Algorithm collects all IfcSpace objects from the provided IFC and then processes geometry for each of them. It uses IfcOpenShell functionalities to extract faces and verts of the shape geometry, and then groups them into sets of three. Grouping function is necessary step as it forms triangles that are building the mesh that is generated using Trimesh functions. In order to get the area for each of the spaces, created meshes are cut with the horizontal planar surface through their centroid, giving section areas that represent the areas of the spaces. Section areas are rounded to two decimal places so they correspond to the ones provided by Excel sheet. Since the information requirements specify that Room Numbers is unique identifier of each of the rooms, it is used to connect the rooms extracted from the IFC file with the ones defined in the sheet. After collecting the data, the code is being used to compare the calculated areas with the ones given by the client, providing PASS/FAIL results.

After conducting the verification, results are printed, showing all spaces contained in the IFC file, their number, name, GUID, area and the PASS/FAIL result. Performed checking showed that 141/143 rooms

comply with the client's requirements. Provided information and GUID they allowed further identification of the ones that failed within the IFC viewer (Figure 60).



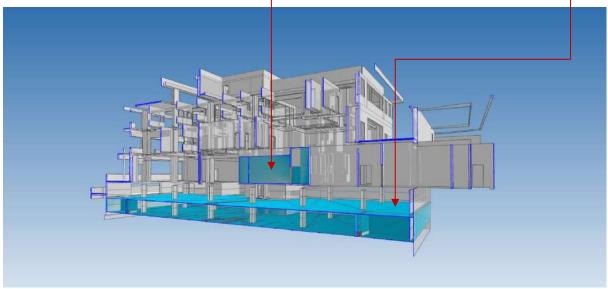
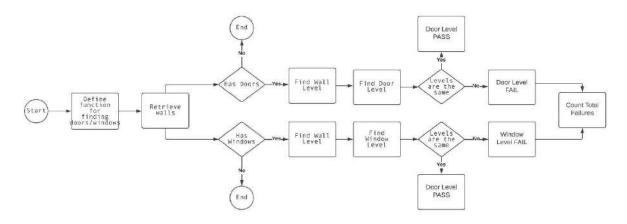
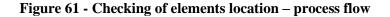


Figure 60 – Results of performed check

5.4.3. Elements Location – Doors/Windows

The third verification procedure checks if the doors and windows are located on the same level as the walls that are hosting them. Execution of this checking required writing a script that would run the IFC file and detect mismatches between the levels (Figure 61).





In order to compare levels of the walls and hosted elements it is necessary first to define a function for finding doors and windows placed in the walls. Since there is no direct functionality to collect the hosted elements, process of finding doors and windows within the wall is based on the relations given in the IFC door and window containment schema provided below (Figure 62).

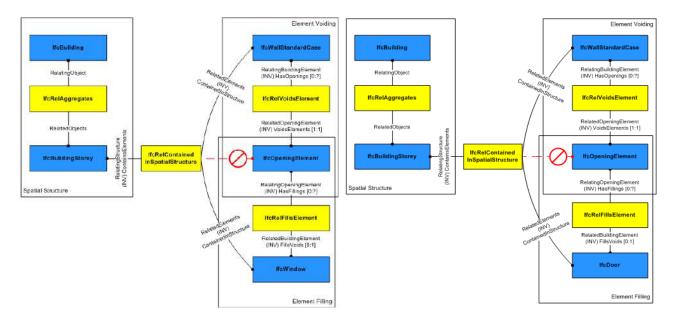


Figure 62 - IfcWindow and IfcDoor containment schema

Algorithm goes through IfcRelVoidsElements associated to the walls and iterates through these relationships to identify the opening elements connected to them. For each opening script evaluates if it is the IfcOpeningElement, ensuring that only valid openings are considered for further analysis. Once the openings are defined, it searches for the IfcRelFillsElement connected to them, linking the openings to the filling elements that are doors or windows (Figure 63).

13	# Find IfcRelVoidsElement relationships
14	<pre>void_relations = ifc_file.by_type("IfcRelVoidsElement")</pre>
15	for rel in void_relations:
16	if rel.RelatingBuildingElement == wall:
17	<pre>opening = rel.RelatedOpeningElement</pre>
18	<pre>if opening.is_a("IfcOpeningElement"):</pre>
19	# Find IfcRelFillsElement relationships for the opening
20	<pre>fill relations = ifc file.by type("IfcRelFillsElement")</pre>
21	for fill rel in fill relations:
22	if fill_rel.RelatingOpeningElement == opening:
23	<pre>filling = fill_rel.RelatedBuildingElement</pre>
24	if filling.is a("IfcDoor"):
25	doors.append(filling)
26	<pre>elif filling.is_a("IfcWindow"):</pre>
27	windows.append(filling)

Figure 63 – Section of the script - searching for hosted elements

After returning the list of doors and windows connected to the wall, spatial containment of the elements is processed in order to find building storeys they are located on. Verification provides PASS/FAIL results, printing the relevant data of the walls and hosted elements if their levels mismatch.

Performed checking of the IFC file showed that out of 211 door and window elements 2 door elements are not on the same level as the walls they are placed in (Figure 64). Printed data revealed that walls are placed on the Piso 01, whereas doors level is Piso 00.

 PS C:\Users\adjuk\Desktop\Case Studies\IfcOpenShell.Levels> & C:/Users/adjuk/AppData/Local/Programs/Python/Python39 /python.exe "c:/Users/adjuk/Desktop/Case Studies/IfcOpenShell.Levels/Script1.py" Fail: Door level does not match wall level. Wall Name: Basic Wall:.wi.EST.BLC.EST 190mm:1062253 Wall GUID: 2dqOqUXN1ElvYk5vidj840 -Wall Level: Piso 01
Door Name: Portaro 1F PLANA:2000 x 800:4663095 Door Level: Piso 00 Door GUID: 1cw\$vJ9VD68hrSJgzPid8y
Fail: Door level does not match wall level. Wall Name: Basic Wall:.wi.EST.BLC.EST 190mm:1064790 Wall GUID: 1\$xnqZn398Qx7g95ffw2K3 Wall Level: Piso 01
Door Name: Portaro 1F PLANA:2000 x 800:4663096 Door Level: Piso 00 Door GUID: 1cw\$vJ9VD68hrSJgzPid8p
Total Doors: 105 Total Windows: 106 Total Failures: 2 O PS C:\Users\adjuk\Desktop\Case Studies\IfcOpenShell.Levels> []

Figure 64 - Results of performed check

Results were then verified in the BIMCollab software to confirm the correctness of performed test. Smart view was created containing the GUID of the listed elements and then their data was assessed. Verification showed that they are on the same elevation, but with different containment relations to building storeys (Figure 65).

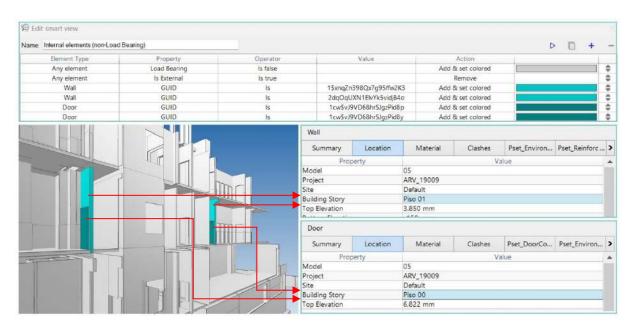


Figure 65 - Verification of results in IfcViewer

5.5. IDS

The third type of verification uses IDS format to check compliance of the IFC file to the Level of Information Need defined by the EIR. Two methods of using IDS were evaluated as the first one uses open approach, and the second uses tools developed by ACCA Software:

- 1. IDS Converter and IfcTester (BlenderBIM)
- 2. usBIM.IDS editor and usBIM.IDS validator.

For the purpose of this case study wall elements were chosen for the verification, so initially Revit file was populated with data and then exported to the IFC used for validation process.

5.6. Populating Revit file

The initial phase of verification process involved population of the wall elements within the Revit file with attributes defined by the Level of Information Need. Depending on the type of information, they were either created as type or instance parameters (Figure 66). Data connected to Cost, Installation and Warranty was set up as instance parameters since it can differ for each wall instance depending on the position and installation date. On the other hand, information concerning performance, description and manufacturer remains the same for the whole family type, so it was populated as type parameter. Properties that are identified as hard coded so already within the Revit file, were directly used, avoiding duplication of data entry. Additionally, populating the file with dimensional data was intentionally omitted from this step, as it is generated automatically during the IFC export process. This approach prevented unnecessary redundancy.

	B 1.4		11.12
Property	Description Identity Data	Data Type	Units
Name	Primary i dentifier of an object.	text	/
Туре	Defines the object type, specific information about object.	text	/
Predefined Type	Holds the entity specific enumeration of predefined types	text	,
Classification	to further classify the entity Classification code according to chosen classification	text	,
	system. An alphanumeric value		
Description	providing a concise description The organization that manufactured and / or assembled	text	/
Manufacturer	the item.	text	/
URL	Avalid URL hyperlink to the manufacturer's website.	text	/
	Material		
Structure	The primary material used to construct the structural layer.	text	/
Substrate	The primary material used as a substrate.	text	/
Thermal/Air Layer	The primary material used as a thermal layer.	text	/
Membrane Layer	The primary material used as a membrane layer.	text	/
Finish	The type of finish for the wall.	text	/
	Dimensional Data Total nominal length of the wall along the wall center line		
Length	(even if different to the wall path).	numeric	mm
Width	Total nominal width (or thickness) of the wall measured perpendicular to the wall path.	numeric	mm
Height	Total nominal height of the wall.	numeric	mm
	Area of the wall as viewed by an elevation view of the		
Gross Side Area	middle plane of the wall. It does not take into account any wall modifications (such as openings).	numeric	m²
Net Side Area	Area of the wall as viewed by an elevation view of the middle plane. It does take into account all wall	numeric	m²
Net Side Area	modifications (such as openings).	numeric	m-
Gross Volume	Volume of the wall, without taking into account the openings and the connection geometry.	numeric	m²
Net Volume	Volume of the wall, after subtracting the openings and	numeric	m²
Her volume	after considering the connection geometry. Performance Data		
	Indication whether the element is designed for use in the		
is External	indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). If (TRUE) it is an external	boolean	YES/NO
	element and faces the outside of the building.		
Lo ad Bearing	Indicates whether the object is intended to carry loads (TRUE) or not (FALSE).	boolean	YES/NO
ls Water Resistent	Indicates whether the object is water resistant (TRUE) or	boolean	YES/NO
	not (FALSE). Acoustic rating for this object. It is provided according to		
A	the national building code. It indicates the sound		,
Acoustic Rating	the national building code. It indicates the sound transmission resistance of this object by an index ratio	numeric	/
	the national building code. It indicates the sound transmission resistance of this object by an index ratio (instead of providing full sound absorbtion values).		-
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Figure 66 – Mapping parameters

Because of the limitation given by Revit when it comes to grouping properties and naming property sets, parameters were organized as follows: Cost and Installation Data grouped in the set named General; Warranty Data grouped in the set named Other; Is External and Fire Rating within the IFC Parameters and Is Water Resistant to property set Data.

Although the IFC export will change the distribution of parameters and locate them in sets according to the IFC schema, their organization within Revit file was important step in facilitating the overall process and ensuring easier navigation and input of the provided values for the users.

Since the file contains over 70 wall family types and over 1000 wall instances, Dynamo script and schedules were used to enhance the speed of populating parameters with the data. In the figure below section of populated data is shown (Figure 67).

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Figure 67 - Section of data populated within the Revit

5.7. Exporting to IFC

After populating the walls with required data, the model was exported to the IFC-SPF format. Assuring the data being properly exported involved several steps (Figure 68). Firstly, to check that all the walls are exported to IFC as IfcWall, and coverings made with wall object as IfcCovering. Secondly, exporting from the selected 3D view and selecting the option to only export elements visible in the view. Next step included adjusting the export of property sets where exporting of IFC common property sets and exporting of base quantities was selected. Along with these sets, user defined property sets were added to assure all the parameters being exported to the IFC. Chosen version was IFC4 Reference View and chosen classification system was Uniclass 2015.

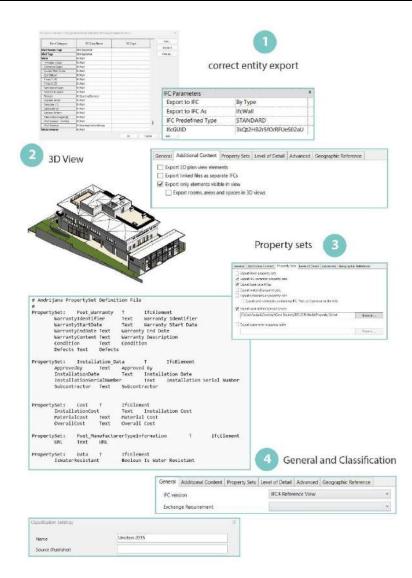


Figure 68 - Process of IFC export

Prior to checking the compliance of the file to IDS, IFC was evaluated in the BIMCollab viewer (Figure 69). Exploration of the file showed that all the parameters were effectively mapped and exported. Along with the alphanumeric information, quantities were also examined and compared to the ones displayed in the proprietary file, which showed no discrepancies.

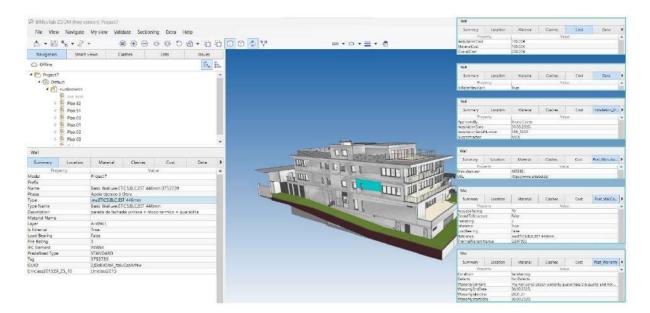


Figure 69 - Evaluation of IFC file within IfcViewer

5.7.1. IDS Converter and Blender BIM

Methodology chosen for this type of verification adopts an open approach, combining IDS converter with the functionalities provided by Blender BIM. IDS converter is an app developed by Carlos Dias (Dias, 2023) that is used to generate an IDS format as defined by BuildingSMART. Within Blender there is a BIM add on that contains functionality IFC Tester that is used to check the compliance of the IFC file to the IDS format. Process consists of three key steps, which are:

• Populating the Excel sheet with defined requirements – filling the template provided by the converter app;

• Using the IDS converter for generating IDS using the IDS converter app to transform Excel data into an IDS format and

• IFC compliance check with IfcTester - inside Blender BIM using the IfcTester feature to compare provided IFC file with the IDS.

Excel template is structured with columns each defining distinct aspect of the requirement. Being structured this way it provides easy navigation and user-friendly environment. Setup follows a structure as shown in the figure below (Figure 70).

specification name	name of the specification (necessary)
specification description	description (optional)
entity	IFC type (necessary)
predefined type	predefined type of the element (optional)
property name	property name
property type	data type of the requested property (necessary)
property set	name of the property set (necessary)
property value	value requested in the property (optional)
have restriction	if True-property needs to be matched by property value
restriction base	data type of property value (optional)
optionality	optionality of the property (necessary)

Figure 70 - Excel template structure

This structure enables the user to not only establish the properties that need to be retained within the model but to define and verify their corresponding values as well. This functionality proves particularly convenient when addressing specific property values such as fire rating. For instance, in this case it was requested to all solid walls have Fire Rating that is 3 and each wall to be approved by BIMMS.

These specifications were defined in the following way (Figure 71).

specification name	specification description	entity	predefined type	property name	property type	property set	property value	have restriction	restriction base	optionality
My_spec_12	Wall needs this properties	IFCWALL	SOLIDWALL	FireRating	IfcLabel	Pset_WallCommon	3	TRUE	integer	required
My_spec_17	Wall needs this properties	IFCWALL		ApprovedBy	lfcText	Installation_Data	Bruno Caires	TRUE	string	required

Figure 71 - Specifying the restrictions of the parameters values

Following the Template data structure, an Excel sheet is populated with the requirements (Figure 72) and then using the IDS converter, exported to IDS format.

specification name	specification description	entity	predefined type	property name	property type	property set	property value	have restriction	restriction base	optionality
Wall_Length	Wall needs this properties	IFCWALL	8	Length	IfcLengthMeasure	Qto_WallBaseQuantities		FALSE	-	require d
Wall_Width	Wall needs this properties	IFCWALL	6	Width	IfcLengthMeasure	Qto_WallBaseQuantities	9	FALSE		required
Wall_Height	Wall needs this properties	IFCWALL		Height	IfcLengthMeasure	Qto_WallBaseQuantities		FALSE		required
Wall Gross Side Area	Wall needs this properties	IFCWALL		GrossSideArea	IfcArea Measure	Qto WallBaseQuantities		FALSE	1	required
Wall_Net_Side_Area	Wall needs this properties	IFCWALL		NetSideArea	IfcArea Measure	Qto_WallBaseQuantities	1	FALSE		required
Wall_Gross_Volume	Wall needs this properties	IFCWALL		GrossVolume	IfcVolumeMeasure	Qto_WallBaseQuantities		FALSE		required
Wall_Net_Volume	Wall needs this properties	IFCWALL		NetVolume	IfcVolumeMeasure	Qto_WallBaseQuantities		FALSE		required
is External	Wall needs this properties	IFCWALL		IsExternal	IfcBoolean	Pset_WallCommon		FALSE	2 1	required
ls_Water_Resistant	Wall needs this properties	IFCWALL		IsWaterResista	If cBoolean	Data		FALSE		required
Is_Loadbearing	Wall needs this properties	IFCWALL		LoadBearing	IfcBoolean	Pset_WallCommon		FALSE		required
Wall_Acoustic_Rating	Wall needs this properties	IFCWALL		AcousticRating	IfcLabel	Pset_WallCommon		FALSE		required
Solid Wall Fire Rating	Wall needs this properties	IFCWALL	SOLIDWALL	FireRating	If cLabel	Pset WallCommon	З	TRUE	integer	required
Wall_Fire_Rating	Wall needs this properties	IFCWALL		FireRating	IfcLabel	Pset_WallCommon	[0-9]	TRUE	string	required
Wall_Installation_Date	Wall needs this properties	IFCWALL	E.	InstallationDa	IfcText	Installation_Data	1	FALSE	2	required
Wall_Installation_Serial_Nu	Wall needs this properties	IFCWALL		InstallationSer	lfcText	Installation_Data		FALSE		required
Wall_Subcontractor	Wall needs this properties	IFCWALL		Subcontractor	ifcText .	Installation_Data		FALSE		required
Wall ApprovedBy	Wall needs this properties	IFCWALL		ApprovedBy	IfcText	Installation_Data	Bruno Caires	TRUE	string	required
Wall_Warranty_Identifier	Wall needs this properties	IFCWALL	1	Warrantyident	IfcText	Pset_Warranty		FALSE		required
Wall_Warranty_Content	Wall needs this properties	IFCWALL		WarrantyCont	IfcText	Pset_Warranty		FALSE		required
Wall_Warranty_Start_Date	Wall needs this properties	IFCWALL	2	WarrantyStart	IfcText	Pset_Warranty		FALSE		required
Wall_Warranty_End_Date	Wall needs this properties	IFCWALL	8	WarrantyEndE	IfcText	Pset_Warranty	9	FALSE		required
Wall_Condition	Wall needs this properties	IFCWALL		Condition	IfcText	Pset_Warranty		FALSE		required
Wall_Defects	Wall needs this properties	IFCWALL		Defects	lfcText	Pset_Warranty		FALSE		required
Wall_Installation_Cost	Wall needs this properties	IFCWALL	1	InstallationCo	IfcText	Cost	1	FALSE		required
Wall_Material_Cost	Wall needs this properties	IFCWALL		MaterialCost	lfcText	Cost		FALSE		required
Wall Overall Cost	Wall needs this properties	IFCWALL	8	OverallCost	IfcText	Cost	A	FALSE		required

Figure 72 - Specifications defined in the Excel template

One of the issues encountered following this approach to create IDS is that the Excel template only addresses parameters that are stored as properties within property sets. This means that all the information such as classification, materials, description and GUID cannot be added directly to the table. Which raises the question can parameters that are stored as attributes and in higher-level entities also be submitted to evaluation? To answer this question, it was needed to delve into the documentation of both IDS format, IDS converter and IfcTester. First IDS format's Github repository was evaluated. Documentation provided there which includes both Property-facet, Attribute-facet and Material-facet proved that IDS format itself is designed to handle both attributes and properties, as well as materials. This finding led to conclusion that limitations encountered have to be either by converter or the tester. Going further, IDS converter's repository was evaluated. The investigated documentation revealed that the limitation is deriving from the converter's functionality, which posed another question: is there a way to go around this limitation? The proposed methodology would be to follow the steps of populating Excel sheet, then using the converter to export the IDS, and then manually add to the code, requirements that cannot be directly exported with the template. This approach was tested with adding classification requirement manually (Figure 73), which proved to be working.

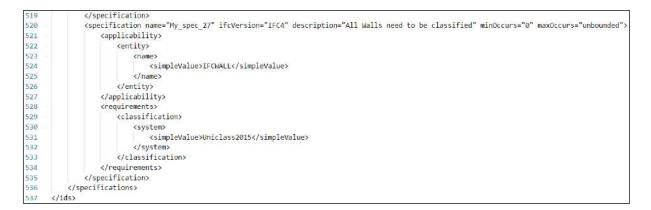


Figure 73 - Adding classification specification to the code

After creating the IDS, IfcTester was used to conduct the assessment of the IFC file to the established IDS. The outcome of the verification is elaborated upon below (Figure 74).

Passed: 1163 / 1163 (100%) LoadReining data shall be provided in the dataset Pact_NallConnor Water_Resistant Passed: 1163 / 1163 (100%) Takterfestivant data shall be provided in the dataset loca id_Wall_Fire_Rating Passed: 10 / 10 (100%)	Passod: 1163 / 1163 (100%) installation_Date Passod: 1163 / 1163 (100%) Toctallation_Serial_Number Pass Passod: 1163 / 1163 (100%) Installation_Serial_Number Pass Passod: 1163 / 1163 (100%) InstallationSerialMonter mate shall be provided in the dataset Installation_Data Wall_Length
Loadbearing Passod: 1163 / 1163 (100%) Usadbearing:data shall be provided in the dataset Pact_HallCommon Water_Resistant Passod: 1163 / 1163 (100%) Islustertesistant data shall be provided in the dataset Nate Nid_Wall_Fire_Rating Passod: 10 / 10 (100%) Firefleting data shall be ('pattern's '31') and in the dataset Pact_HallCommon	Wall_Installation_Date Person Pessed: 1163 / 1163 (100%) Textallationbase data shall be provided in the dataset Textallation_Data Wall_Installation_Serial_Number Pessed: 1163 / 1163 (100%) TextallationSerialModer state shall be provided in the dataset Textallation_Data
UsedNaming data shall be provided in the detaset Part MullConson Water_Resistant Passed: 1163 / 1163 (100%) Indeterfeaintant data shall be provided in the detaset Data Did_Wall_Fire_Rating Passed: 10 / 10 (100%)	Passed: 1163 / 1163 (100%) 1. InctallationSerial the provided in the datest Trutalisting Data. Wall_Installation_Serial_Number Passed: 1163 / 1163 (100%) 1. InstallationSerialMonter data shall be provided in the dateset Installation_Data.
Water_Resistant Passed: 1163 / 1163 (100%) Interfeasitient detershall be provided in the deteset Bete Udd_Wall_Fire_Rating Passed: 10 / 10 (100%)	Wall_Installation_Serial_Number Pass Passed: 1163 / 1163 (100%) 1. InstallationSerialMumber state shall be provided in the dataset Installation_Nata
Passed: 1163 / 1163 (100%) Iblighterbesäntant deta shall be provided in the detaset Data Ilid_Wall_Fire_Rating 13 Passod: 10 / 10 (100%)	Pass Passed: 1163 / 1163 (100%) 1. InstallationSerialMonder state shall be provided in the dataset installation_Data
Passed: 1163 / 1163 (100%) Iblighterbesäntant deta shall be provided in the detaset Data Ilid_Wall_Fire_Rating 13 Passod: 10 / 10 (100%)	Pass Passed: 1163 / 1163 (100%) 1. InstallationSerialMonder state shall be provided in the dataset installation_Data
lid_Wall_Fire_Rating Passed: 10 / 10 (100%)	
Passed: 10 / 10 (100%)	Wall Length
Passed: 10 / 10 (100%)	
. Firstoling data shall be ('pattern': $\left 3\right\rangle$ and in the dataset Post_HallKormon	Pass Passed: 1163 / 1163 (100%)
	1. Length data shall be provided in the detenet Qto wellBaseQuestities
all_Acoustic_Rating	Wall_Net_Volume
Passed: 1163 / 1163 (100%)	Passed: 1163 / 1163 (100%)
AccurticRating data shall be provided in the dataset Peet Mulliamen	1. NetWalane data shall be provided in the dataset Qts_MallBaseQuestifies
all_ApprovedBy	Wall_Overall_Cost
Passed: 1163 / 1163 (100%)	Passed: 1163 / 1163 (100%)
ApprovedBy data shall be ('pattern': 'Bruno Caires') and in the dataset Installation_Buta	1. OverallCost data shall be provided in the dataset Cost
all_Condition	Wall_Subcontractor
- Rassed: 1163 / 1163 (100%)	Passad: 1163 / 1163 (100%)
Condition dats shall be provided in the dataset Pset_Merranty	1. Subcontractor data shall be provided in the dataset Installation_Data
all_Defects	Wall_Warranty_Content
Passed: 1163 / 1163 (100%)	Passed: 1163 / 1163 (100%)
Defects data shall be provided in the dataset Poet_Marranty	1. MarrantyContext data shall be provided in the dataset $\operatorname{Piet_Marranty}$
all_Fire_Rating	Wall_Warranty_End_Date
Bassed: 1163 / 1163 (100%)	Passed: 1163 / 1163 (100%)
Firefating data shall be ('pattern') '[0:31'] and in the dataset firet_Millionson	1/ HarrantyEnablets data shall be provided in the dataset Piet_Harranty
all_Gross_Side_Area	Wall_Warranty_Identifier
Passed: 1130 / 1163 (97%)	Passed: 1163 / 1163 (100%)
GreenvSideAres data shall be provided in the dataset Qto_WallBuseQuantities	1. Harrantyliontifier data shall be provided in the dataset Post_Marranty
all_Gross_Volume	Wall_Warranty_Start_Date
Passed: 1130 / 1163 (97%)	Passed: 1163 / 1163 (100%)
. GressWalame data shall be provided in the dataset Qte_smill#sceQuentilles	1. MarrantyStariDate data shall be provided in the dataset Past_Marranty
all_Height	Wall_Width
Passed: 1130 / 1163 (97%)	Passed: 1163 / 1163 (100%)
Height data shall be provided in the dataset Qtu MallBaseQuantities	1. Width data shall be provided in the dataset Qts shillses@cametiries
all_Net_Side_Area	Wall_Material_Cost
Passed: 1130 / 1163 (97%)	Pass Passed: 1163 / 1163 (100%)
NetSidedrea data shall be provided in the dataset Qto MallBaseQuantities	1. NaterialCost data shall be provided in the dataset (cot
II Classification	

Figure 74 - Results of performed check

The results obtained from the verification process demonstrate high level of compliance. As it can be seen on the provided results, majority of verifications provided 100% accuracy, meaning that all 1163 IfcWall entities comply to the specified IDS requirements. However, certain difficulties emerged particularly in relation to the quantity properties. 97% of the evaluated walls were marked as passing the prescribed requirement. A closer examination of the results revealed that 33 walls did not contain required properties: Height, Gross Volume and Gross and Side Net Area. To address this issue, further

inspection of IFC model in the BIMCollab platform was conducted. Based on the GUID of the walls provided in the results, Smart view was created to isolate only the walls showing discrepancies (Figure 75).

-	THE RAY BRANC		2012/201		
Element Type Wall	Property GUID	Operator Contains	Value 151BLOM2n5T9szikMrH4bX	Action Add & set colored	
Wall	GUID	Contains	0bHkVPy696ExFgGz37ceSF	Add & set colored	
Wall	GUID	Contains		Add & set colored	
Wall	GUID	Contains	0bHkVPy696ExFgGz37cews 0bHkVPy696ExFgGz37ceqP	Add & set colored	
Wall	GUID	Contains		Add & set colored	
Wall	GUID	Contains	0bHkVPy696ExFgGz37cet_ 0bHkVPy696ExFgGz37ceob	Add & set colored	
Wall	GUID	Contains	1dnHUTU259NAcWuYSmaPi4	Add & set colored	
Wall	GUID	Contains	1dnHUTUz59NAcWuY5maPgc	Add & set colored	
Wall	GUID	Contains	1dnHUTU259NAcWuY5maPeL	Add & set colored	
Wall	GUID	Contains	0g89NRHxP61ev8SYry8Pc7	Add & set colored	
Wall	GUID	Contains	0gB9NRHxP61evBSYry8PYL	Add & set colored	
Wall	GUID	Contains	0gB9NRHxP61evBSYry8Pz0	Add & set colored	
Wall	GUID	Contains	0gB9NRHxP61evBSYry8PSJ	Add & set colored	
Waii	GUID	Contains	0gB9NRHxP61evBSYry8Pwj	Add & set colored	
Wall	GUID	Contains	OgB9NRHxP61evB5Yry8Obk	Add & set colored	
Wall	GUID	Contains	0g89NRHxP61ev8SYry8UPk	Add & set colored	
Wall	GUID	Contains	OgB9N RHxP61ev8SYry8Obk	Add & set colored	
Wall	GUID	Contains	0gB9NRHxP61evBSYry8UKc	Add & set colored	
Wall	GUID	Contains	3nG5WSqNv84Am440V4HTCN	Add & set colored	
Wall	GUID	Contains	3nG5W5qNvB4Am440V4HTsa	Add & set colored	
		02000700C	3nG5W5qNv84Am440V4HTdR	Add & set colored	
Wall	GUID	Contains			
	GUID	Contains	- 25		
	GUID	Contains	<u> </u>		
	GUID	Contains	- <u> </u>		
	GUID	Contains	- <u> </u>		
	GUD		- <		
	GUID	Contains	<u> </u>		
	GUID		<u> </u>	. —	
N1 577	GUD	Contains	<u> </u>		
N1 577	GUD		<u> </u>		
N1 577	GUD		- <u>- </u>		
N1 577	GUD				
	GUD		<u> </u>	. —	
				. —	

Figure 75 - Visualization of results within IfcViewer

Based on the evaluation of the selected walls, it can be concluded that possible reason for an issue during the export of the base quantity set could be due to their geometry. Further investigation on the possible issues during IFC export provided no answer on why this happens, only that the possible problem could be related to the conversion of units. Having this in mind, it is recommended to adopt slightly different approach in cases where geometric complexity of the walls could pose the challenge during the export of the data. In such case, it is advised to consider data mapping as opposed to relying on the automated generation through the base quantities export.

5.7.2. ACCA IDS Editor and IDS Validator

Second approach to using IDS format for checking IFC file compliance to the requirements, relies on the tools developed by ACCA software. Methodology is based on the use of two tools:

usBIM.IDS editor - a tool used to specify information requirements and convert them into a standard IDS file, which will be used for validation. It is an open online application that can be used by everyone.

usBIM.IDS validator - this tool checks the IFC file against the IDS format created previously. Finally, it verifies if the provided IFC file meets the requirements outlined in the IDS.

Both tools are integrated into the usBIM cloud system.

As explained in the previous chapter, this verification methodology will use wall instances as a subject of study, so the initial step is to create an IDS format that specifies all information that should be contained within the wall. Advantage of ACCA's editor compared to the previous inspected methodology is that it allows creation of requirements for not only properties, but classification, material and attributes as well. The tool has built in functionality to recognize IFC relationships and entity inheritance, so specifying attributes only requires defining their name, without further knowledge of their position in the IFC schema. Based on the way how IFC stores required information, parameters were organized under four groups: Classification; Attributes; Materials and Properties.

Furthermore, following this division they were specified in the editor as shown in the examples below (Figure 76).

			Classification	
		_	Classification	
Requirement for classificat	ion			
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Figure 76 - Specification of requirements in editor

One of the functionalities of editor is that it allows defining range of values or the exact value within the property. Which, in this case, was used to specify that all fire rating values should be in the range of 0 to 9. Additionally, a specific requirement was set by which all wall elements need to be approved by BIMMS.

During the process of creating IDS, couple of issues were noticed, which was confirmed by the later inspection of the IFC schema. It turned out that attribute Phase has no direct relation to the IfcWall. Meaning that, it can be assessed only as the attribute within IfcProject which is the entity where this data is stored. Furthermore, an issue was noticed in specifying the exact name of the material. While this is straightforward when an element comprises a single material, it leads to a question when dealing with compound elements that consist of multiple layers. To answer this question, research of both editor's and validator's documentation was undertaken. It was discovered that it is possible to specify the naming of each material layer and should be in a format as exemplified in the Figure 77. Naming process follows a specific schema: <wall name>, <structural layer name>, <Materials>, <material layers>, excluding the membrane layer since it has no thickness. However, this approach is very time consuming especially when dealing with elements containing a substantial number of layers. So, it is advised to be applied only when elements comprise a single layer or limited number of material layers.

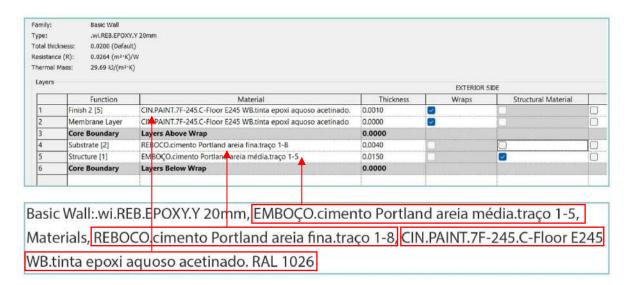


Figure 77 - Schema for specifying naming of material

After preparing the IDS format, validator was used to conduct verification. Results of the checking showed that all 1163 wall instances satisfy classification requirement, as well as majority of the information requirements. The issue was detected with the base quantities, where the results match the results provided by the previous verification method. 33 wall instances are missing Height, Gross Side Area, Net Side Area and Gross Volume (Figure 78).

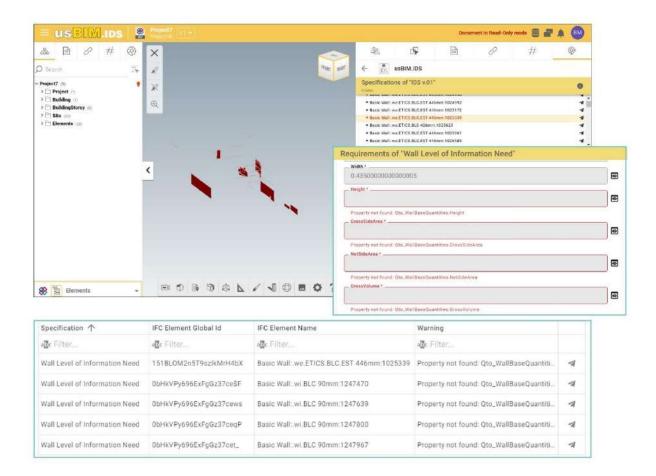


Figure 78 - Results of performed check within validator

5.8. Comparison of the methods for verification

When evaluating optimal verification methodology for specific use case, it is crucial to understand their distinctive advantages and limitations. In this context, Dynamo serves as a tool specifically intended for direct checking of the Revit model. This allows uninterrupted workflow, eliminating the need for additional steps of exporting required by majority of model checkers. Additional step in integrating Dynamo in a quality assuring process would be automation of the issue correction, which would significantly reduce time and resources lost in these processes. In scenarios where discrepancies are identified within model checker, identified issues are manually or semi-automatic transferred from the checker to the Revit environment, and subsequently handled. Integration of Dynamo would allow automation of error detection and correction within the authoring platform. Advantages of using this tool is its user-friendliness, and its applicability on different models. Opposed to this, IFC-related verifications are highly dependent on the version of the IFC, and the way data is structured within IFC schema, which sometimes limits the use. When evaluating the IfcOpenShell and IDS verification methodologies, several factors are observed. Primary limitation of the use of IfcOpenShell is that it requires prior programming experience, but also deep knowledge of the IFC schema. Nevertheless, it allows much faster processing of bigger amount of data and enables performing geometry checking that with IDS can only be performed to certain extent, through defining property values. In contrast, biggest advantage of the IDS format in both tested approaches is that is accessible and fairly easy to apply. Comparison of two tested methodologies using IDS undoubtedly shows an advantage in the use of converter and BlenderBIM since it is a completely open approach. Although the converter displays certain limitations in its ability to specify requirements, this constraint can be overcome with relatively straightforward code modifications. ACCA's editor is far more advanced in formulating IDS, but differences between IfcTester within BlenderBIM and IDS validator are minor. Key advantage of validator is that it enables visual identification of the elements and facilitates export of the BCF file that can be used to address the issue further. In summary, all verification methods offer unique benefits and challenges, meaning multiple factors should be considered when deciding which one to use.

6. CONCLUSIONS

Quality Management is a fundamental principle for addressing quality of products or services. Its evolution can be traced back starting from the ancient civilizations to the 4th industrial revolution, otherwise known as Industry 4. Digital transformation brought by Industry 4.0 facilitated the need for Quality 4.0 which is a new approach in managing quality, that relies on the use of digital technologies, particularly automation, to enhance quality control. This research identified various benefits on the use of Quality 4.0 tools in the Quality Management processes, which underlines the significance of embracing this approach for staying competitive in currently evolving digitalization.

When it comes to construction industry, process of managing quality presents a unique challenge. This complexity arises from the involvement of large number of various stakeholders and the nature of the construction projects, which is unpredictable and always changing. Quality Management addresses not only the final product, but the processes as well. With the implementation of BIM, Quality Management in the AEC sector has experienced drastic transformation, shifting from the traditional on-site procedures to the managing quality in digital environment. With the digital model becoming key factor of project development and collaboration between stakeholders, the focus of quality managing methodology was redirected to it. This facilitated two processes that address quality of the model: Quality Assurance and Quality control. For proper Quality Management within BIM environment, it is of crucial importance to understand how these processes function and what their core differences are. Numerous guidelines and manuals are available on the topic of model quality, providing an insight into the status of QA/QC practices on the market. It was evaluated the extent and detail to which they address these topics, confirming that majority of provided documents lack clear and detailed guidelines to achieve model quality.

The key component of QA/QC processes within BIM represents model checking. Despite the obvious benefits, there are still a lot of challenges in the efficiency of its application. It is usually very complex process and users are often reluctant to trust the results. To perform model checking three components must be addressed, the predefined rules, the information content and the tool used for checking. To provide better understanding of the model checking processes and to evaluate solutions available on the market, several software solutions and their functionalities were analysed.

Putting in BIM context the overall definition of quality as conformance to requirements, leads to the conclusion that model quality can be measured in its ability to fulfil intended purpose. Meaning that QA/QC processes should be focused on the compliance of the model to the predefined requirements. Requirements given by the appointing party are the ones defining main objectives and purpose of the model. If the model fails to achieve its purpose, it is a faulty product. One of the main challenges found in proper defining of the requirements is that client lack the proper knowledge on how to specify the requirements comprehensively. This facilitates poor inputs that result in poor model quality. Interviews conducted within the company confirmed that lack of clarity and detail represent main issues with client's specification of the requirements.

This research has recognized that improving quality of BIM model requirements can answer the question on how the model quality can be enhanced. It is proposed a solution that suggest an implementation of the methodology that would address the way how clients specify requirements and how the BIM model is verified according to those requirements. This methodology is based on the understanding that the accuracy, precision, and comprehensiveness of the model requirements are critical to the development of a BIM model. It was developed a Specificator that would assist the appointing party in the process of defining Project specific requirements. This would prevent the issues deriving from inadequate information. Project specific requirements are then delivered to the appointed party and used for the creation of the model. For assuring model quality, verification methods are included, validating the model's compliance to the predefined requirements. This reduces potential issues and improves the interoperability process.

To construct the Requirements Specificator, extensive research was conducted. The research phase began with data collecting approach using a variety of methods and sources. In order to ensure that the Specificator's content is based on the wide range of industry guidelines, standards and best practices, the initial phase was parsing through large number of different resources. This resulted in the collection of data that captures collective knowledge on this subject. Furthermore, study project involved collecting valuable information and expertise shared in the interviews with company's professionals. This resulted in not only gaining professional insights, but also aligning methodology with company's operating methods. The research journey further extended into a revision process, once again involving company's professionals. This revision phase was crucial step in fine-tuning the initial draft of the Specificator. It provided validation of the content. Finally, the first version of the Requirements Specificator was created.

In addition to the creation of Specificator, this research also addressed possible methods of verification of the model compliance to the rules defined by the requirements. The verification approach was aligned with the tendencies of using advanced technologies outlined previously. Possible methods were tested on the case study provided by the company. The verification approach tested three methods using visual programming language, IfcOpenshell and IDS format. Performed verifications showed that each tool has its benefits and drawbacks in terms of checking the BIM Model. However, in the wider scale application of these methodologies, choosing appropriate one depends on a set of variables that should be considered: resources, programming expertise, financial aspects and so on.

The concept of integrated QA/QC methodology proposed in the research holds great potential in addressing quality and assuring that the BIM model answers to the client's needs. It has the capacity of transforming the process of collaboration and the way deliveries are handled. However, the implementation of this approach to its full potential would require extensive financial and human resources for development. Firstly, in completing the knowledge base with more BIM uses so it can respond various scenarios. Related to this, Specificator would require continuous refinement aligning it with current standards and incorporating lessons learned from each project. Secondly, in creating the tool that would accommodate all verifications of the requirements from the Specificator.

The conducted research led to the development of a proposed methodology aimed at enhancing the quality of the model. Anyway, it is important to note that there are opportunities for further development and expansion of this methodology aimed at enhancing the range of its functionalities and overall efficiency. Further developments of the study could enhance proposed Specificator in several ways:

• Enlarging the Requirements Specificator by adding more parameters and requirements to the existing tiers. Specificator may meet a bigger variety of project-specific requirements by including wider range of criteria. Third tier may also be expanded to cover new BIM uses, assuring its applicability in wider range of project scenarios.

• Creating a Preparator that would allow automatic generation of the project specific requirements. Instead of manually creating a subset from the Specificator, this transition would work using machine to machine interaction, where the subset of all requirements would be extracted based on the user inputs in the Preparator. For example, in the Preparator client could select the type of building, project milestone, requested uses and other relevant details. The Preparator would then extract the necessary parameters and requirements from the Specificator's repository, creating a customized set of requirements for the specific project. Automation of this process would allow seamless transition of information from the preparator to the requirements specification, reducing the possibilities of errors or omissions.

• Verification methodology can be enhanced by developing a comprehensive verification process that encompasses all the specified requirements. The verification process would include both internal quality checks, as well as validation on the client's side. Final objective would be automation of verification process, using advanced algorithms and tools.

• Development of Web-Based Platform could facilitate the entire methodology, integrating all the components. This platform would involve the Preparator where project specific requirements would be generated, and a Tester where the digital model would be verified against these requirements. The platform would streamline the workflow by providing centralized environment for managing the quality assurance and checking processes. Results and reports would be automatically generated, allowing both appointing parties and appointed parties to access the results and communicate the issues.

The ultimate goal for further development would be to utilise Specificator machine to machine structure and allow automation of the creation and verification process, minimizing manual work and allowing seamless process.

The findings of this research underline the importance for the industry to prioritize Quality of the BIM Models. Although there is the large number of guidelines and tools available on the market, the depth with which they deal on the topic of Quality is not sufficient. They provide either very ambiguous guidelines or the ones not applicable in real world market, discouraging users in adopting them. With this in consideration, it becomes imperative to shift the focus towards methodologies that are straightforward, and applicable in practice. Moreover, the fragmentation of Quality procedures needs to be prevailed by integration, as it is the only possible way in striving for seamless processes.

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LIST OF ACRONYMS AND ABBREVIATIONS

AEC	Architecture, Engineering and Construction
AIR	Asset Information Requirements
BEP	BIM Execution Plan
BERA	Building Environment Rule and Analysis Language
BIM	Building Information Modelling
EIR	Exchange Information Requirements
GUID	Global Unique Identifier
IDS	Information Delivery Specification
IFC	Industry Foundation Class
LOD	Level of development
LoD	Level of detail
LOIN	Level of Information Need
MEP	Mechanical, Electrical and Plumbing
MVD	Model View Definition
OIR	Organizational Information Requirements
OWL	Web Ontology Language
QA	Quality Assurance
QC	Quality Control
QTO	Quantity take-off
RASE	Requirement, Applicability, Selection and Exception
RDF	Resource Description Framework
SASE	Standards, Analysis, Synthesis and Evaluation

APPENDICES

APPENDIX 1: I TIER: GENERAL PROJECT REQUIREMENTS

REQUIREMENTSSpecificator - General Project Requirements

	GENERAL PROJECT REQUIREMENTS
1	Agreed Version
	All models shall be modelled in the same version of the required tool.
2	BIM File Naming
	All files within the project shall follow uniform and consistent naming convention specified by the information requirements.
	* If not requested otherwise, the ISO 19650-2 naming convention may be followed.
	Project Code> <originator<>Functional Breakdown<>Spatial Breakdown<>Form<>Discipline<>Number</originator<>
	Project Code – individual code for the project e.g., SC1
	Originator – unique code for the organization creating information e.g., SFT
	Functional Breakdown – design purpose of the information e.g., fire protection information
	Spatial Breakdown – spatial location of information e.g., first floor building level 01
	Form – defining form of information
	D-drawing
	G-diagram
	l-image
	L-list
	M-model
	T-textual V-video/audio
	Discipline – technical activities
	A-Architecture
	B-Building surveying
	C-Civil engineering
	D-demolition/dismantling
	E – Electrical Engineering
	Number – used for differentiation by allocating a sequential number
	*General rules
	Avoid using special characters in fields and folders \ / : * ? " < > [] & \$, . { } @ All fields shall be separated by a hyphen character.
3	Classification System
	All elements shall be assigned classification code and follow the same classification system e.g., Uniclass 2015.
4	Unique GUIDs
	All components shall have unique GUID values.
5	Project Information
	Project Information shall be defined:
	Project Name;
	Project Adress;
	Project Number / ID;
	Client Name and
	Author. /
6	Project Units
v	Traffere writer
	Relevant measurement units shall be defined at the Project level of each model.
	Metric system is used unless required otherwise.
7	Consistency of Units

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REQUIREMENTSSpecificator - General Project Requirements

12	Project BasePoint	
	Project Base Point shall define the origin (0,0,0) of the project coordinate system.	
	Location of the Project Base Point shall be the same for all discipline models.	
13	Orientation	
	Project North in all discipline models shall be the same.	
	True North direction in all discipline models shall be the same.	
	Angle between Project North and True North shall be the same in all discipline models.	
14	Level Structure	
	All models shall use the same level structure.	
15	Grids	
	Grids shall be consistent across all discipline models.	
16	Unused Elements	
	Models shall not contain unused elements.	
17	Linked Revit Files	
	Linked Revit Files shall be pinned in place.	
18	Linked CAD Files	
	Linked CAD Files shall be pinned in place.	
19	In-Place Families	
	Using In-Place Families should be avoided.	

APPENDIX 2: Π **TIER: ALPHANUMERICAL** REQUIREMENTS

REQUIREMENTSSpecificator - Alphanumerical Requirements

	Level Naming						
	All levels shall follow a uniform and consistent naming convention specified by Information requirements.						
	If not requested otherwise, ISO 19650-2:2018 may be followed:						
	Using a two-digit sequential numbering system.						
	ZZ - Multiple Levels						
	XX - No Level Applicable						
	GF - Ground Floor						
	0 - Base level of building (where ground floor is not appropriate)						
	1-Floor 1						
	2 - Floor 2						
	M1 - Mezanine above level 01						
	M2 - Mezanine above level 02						
	B1 - Basement level 1						
	B2 - Basement level 2						
2	View Naming						
2	View Naming						
	View Naming shall be uniform and consistent following the Naming Convention requested by the Information Requirements.						
	If not requested otherwise, View Naming may follow the schema:						
	Level (Optional)<>Content						
	Level-description of the content and purpose of the view						
	Content-further clarification of the information shown						
	e.g., LEVEL 1-FLOOR PLAN						
3	Callout View Naming						
	applied in the naming e.g., Pr_20_65_60_17 : Cross-laminated timber (CLT) paneled module						
4	Object Naming						
	Object Naming						
	All objects shall follow the same naming convention specified by the Information requirements.						
	If not requested otherwise, BS 8541-1:2012 may be followed:						
	If not requested otherwise, BS 8541-1:2012 may be followed: For objects that already carry classification information as data in its attributes:						
	For objects that already carry classification information as data in its attributes: Source>_ <type>_<sybtype code<br="" product="">Source - library author or manufacturer;</sybtype></type>						
	For objects that already carry classification information as data in its attributes: Source>_ <type>_<sybtype code<="" product="" td=""></sybtype></type>						
	For objects that already carry classification information as data in its attributes: Source>_ <type>_<sybtype code<br="" product="">Source - library author or manufacturer; Type - type of object; Material – material type;</sybtype></type>						
	For objects that already carry classification information as data in its attributes: Source>_ <type>_<sybtype -="" author="" code="" library="" manufacturer;="" object;<="" of="" or="" product="" source="" td="" type=""></sybtype></type>						
	For objects that already carry classification information as data in its attributes: Source>_ <type>_<sybtype code<br="" product="">Source - library author or manufacturer; Type - type of object; Material – material type;</sybtype></type>						
	For objects that already carry classification information as data in its attributes: Source>_ <type>_<sybtype code<br="" product="">Source - library author or manufacturer; Type - type of object; Material – material type; Subtype/Product code – conveys additional information;</sybtype></type>						
	For objects that already carry classification information as data in its attributes: Source>_ <type>_<sybtype code<br="" product="">Source - library author or manufacturer; Type - type of object; Material – material type; Subtype/Product code – conveys additional information; For objects that do not carry classification information: Role>_<classification>_<presentation>_<source/>_<type_<sybtype code<="" product="" td=""></type_<sybtype></presentation></classification></sybtype></type>						
	For objects that already carry classification information as data in its attributes: Source>_ <type>_<sybtype code<br="" product="">Source - library author or manufacturer; Type - type of object; Material – material type; Subtype/Product code – conveys additional information; For objects that do not carry classification information: Role>_<classification>_<presentation>_<source/>_<type_<sybtype code<br="" product="">Role - role of the object owner;</type_<sybtype></presentation></classification></sybtype></type>						
	For objects that already carry classification information as data in its attributes: Source>_ <type>_<sybtype code<br="" product="">Source - library author or manufacturer; Type - type of object; Material – material type; Subtype/Product code – conveys additional information; For objects that do not carry classification information: Role>_<classification>_<presentation>_<source/>_<type_<sybtype code<br="" product="">Role - role of the object owner; Classification - Either a functional or product classification code;</type_<sybtype></presentation></classification></sybtype></type>						
	For objects that already carry classification information as data in its attributes: Source>_ <type>_<sybtype code<br="" product="">Source - library author or manufacturer; Type - type of object; Material – material type; Subtype/Product code – conveys additional information; For objects that do not carry classification information: Role>_<classification>_<presentation>_<source/>_<type_<sybtype code<br="" product="">Role - role of the object owner; Classification - Either a functional or product classification code; Presentation - role of the object owner;</type_<sybtype></presentation></classification></sybtype></type>						
	For objects that already carry classification information as data in its attributes: Source>_ <type>_<sybtype code<br="" product="">Source - library author or manufacturer; Type - type of object; Material – material type; Subtype/Product code – conveys additional information; For objects that do not carry classification information: Role>_<classification>_<presentation>_<source/>_<type_<sybtype code<br="" product="">Role - role of the object owner; Classification - Either a functional or product classification code; Presentation - role of the object owner; Source - library author or manufacturer;</type_<sybtype></presentation></classification></sybtype></type>						
	For objects that already carry classification information as data in its attributes: Source>_ <type>_<sybtype code<br="" product="">Source - library author or manufacturer; Type - type of object; Material – material type; Subtype/Product code – conveys additional information; For objects that do not carry classification information: Role>_<classification>_<presentation>_<source/>_<type_<sybtype code<br="" product="">Role - role of the object owner; Classification - Either a functional or product classification code; Presentation - role of the object owner; Source - library author or manufacturer; Type - type of object;</type_<sybtype></presentation></classification></sybtype></type>						
	For objects that already carry classification information as data in its attributes: Source>_ <type>_<sybtype code<br="" product="">Source - library author or manufacturer; Type - type of object; Material – material type; Subtype/Product code – conveys additional information; For objects that do not carry classification information: Role>_<classification>_<presentation>_<source/>_<type_<sybtype code<br="" product="">Role - role of the object owner; Classification - Either a functional or product classification code; Presentation - role of the object owner; Source - library author or manufacturer;</type_<sybtype></presentation></classification></sybtype></type>						

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REQUIREMENTSSpecificator - Alphanumerical Requirements

	Originator>_ <source/> _ <type>_<sybtype code="" product="">_<diferentiator< th=""><th></th></diferentiator<></sybtype></type>	
	Originator - conveys object provider by a 3–6-character code;	
	Source - library author or manufacturer;	
	Type - type of object;	
	Material – material type;	
	Subtype/Product code – conveys additional information;	
	Differentiator – conveys additional information.	
	Differentiator – conveys additional information.	
-		
5	Material Naming	
	All materials shall follow the same naming convention.	
6	Property Occurrence	
	Each BIM object shall have only one occurrence of the property.	
	*In case of duplication, hard-coded properties have precedence.	
7	Property Units	
	All property units shall be consistent and following metric system, if not specified otherwise.	
8	Unique Property Naming	
	· · · · · · · · · · · · · · · · · · ·	
	Each unique information describing the object shall contain a unique property name.	
	Lath unique information deschoing the object shall contain a unique property name.	_
9	Property Naming	
2	Property Natiling	-
	Properties shall be named in consistent and human-readable way.	-
	Propercies shall be named in consistent and numan-readable way.	-
	*Destance around the thet service Vec/Ne answer shall be as used to structure the Vec/Ne answer as 1-Determined	
	*Boolean properties that require Yes/No answer shall be named to clearly indicate the Yes/No answer e.g., IsExternal.	_
	*Properties shall not contain units, unless required.	
	*Property values shall not finish with a stop.	
	*If property contains a range value, it shall be separated using a hyphen e.g., 300-350.	
10	Property Value	
	Properties shall have defined values where known.	
	*Values can be defined as:	
	fixed - only one value available;	
	range - lower and upper boundary provided;	
	enumerated - number of values provided and	
	formula - value relying on another property value.	
		_
11	Unique Room Naming	
	There shall be no rooms containing the same naming.	
12	Space and Room Naming	
24		
	Space and Room Naming shall be the same as the naming defined by the program.	
	space and noom naming share be the same as the naming denied by the program.	
10	Constant and the later of the l	
13	Consistency of Levels	_
	Naming of the levels shall be consistent in all discipline models.	

APPENDIX 3: II TIER: GEOMETRICAL REQUIREMENTS

REQUIREMENTSSpecificator - Geometrical Requirements

3	Published models Published models shall not contain model objects of other disciplines, even if they were used as reference. Lost Elements Element placed on distance bigger then xx in x,y,z direction from the grid borderlines shall be considered a lost element. Duplicated Elements Model shall not contain identical instances in the same place. Mirrored Elements
3	Lost Elements Element placed on distance bigger then xx in x,y,z direction from the grid borderlines shall be considered a lost element. Duplicated Elements Model shall not contain identical instances in the same place.
3	Element placed on distance bigger then xx in x,y,z direction from the grid borderlines shall be considered a lost element. Duplicated Elements Model shall not contain identical instances in the same place.
3	Duplicated Elements Model shall not contain identical instances in the same place.
4	Model shall not contain identical instances in the same place.
4	
	Mirrored Elements
_	
_	Model shall not contain mirrored instances of loadable components.
5	Elements Intersection
	Model shall not contain elements that overlap / intersect.
6	Elements Location - Doors/Windows
	Windows and doors shall be assigned to the same floor as the walls or roofs in which they are located.
7	Elements Location - Doors Host
	Interior doors shall be placed in interior walls and exterior doors shall be placed in exterior walls.
8	Elements across multiple storeys
	Elements should not be modelled continuously across multiple storeys.
	*Exception: Elements that are constructed as continuous i.e. in situ poured shafts
	Elements modelled across multiple storeys shall be referenced to the lowest story on which they appear.
9	Unallocated / Unplaced Space
	Model shall not contain spaces that are not placed.
10	Redundant Space
	There should be no spaces overlapping.
	Spaces shall not cross each other horizontally or vertically.
11	Space Modelling
	Spaces shall be directly adjacent to surrounding walls / other space components, floor below and ceiling finish / structural slab.
12	Unallocated / Unplaced Rooms
12	

REQUIREMENTSSpecificator - Geometrical Requirements

13	Redundant Rooms
	There should be no rooms overlapping.
	*If there is no element to be zone boundary, room separation lines should be used.
14	Room Area
	Room Area shall be the same as the area required and defined by the room Schedule.
15	Space Area
	Space Area shall be the same as the area required and defined by the space program.
16	Sloped Floor
	Modelling sloped floors that exceed levels continously should be avoided.
	*It is advised to create independent sloped floor in each level with the meeting points of the floors being at the upper and lower edges of the levels.
17	Structural Elements Connection
	Structural connections should be modelled.
18	MEP Elements Connection
	There shall be no unconnected MEP elements.
19	Elements not within rooms/space
	Instances of furniture should be located inside the room/space.

APPENDIX 4: II TIER: DESIGN SPECIFIC REQUIREMENTS

REQUIREMENTSSpecificator - Design Specific Requirements

_	DESIGN SPECIFIC REQUIREMENTS	
1	Element size	
	Wall height should not be less than 300mm.	
	Window width should not be less than 100mm.	
	Door width should not be less than 800mm.	
	Door height should not be less than 2000mm.	
	Staircase width should not be less than 900mm.	
	Slab thickness should not be less than 100mm.	
	Roof thickness should not be less than 100mm.	
	Column profile diameter/width should not be less than 50mm.	
	Beam profile width should not be less than 50mm.	
2	Clearance in front of Doors/Windows	
	Interior Doors - Minimal clearance in front of the door shall not be less than 900mm.	
	Exterior Doors - Minimal clearance in front of the door shall not be less than 1200mm.	
	Emergency Exit Doors - Minimal clearance in front of the door shall not be less than 1200mm.	
3	Clearance in front of the Toilet	
	Minimal distance between axis of the water closet and compartmentation wall shall not be less than 450mm.	
	Minimal distance between the front edge of the water closet and other elements shall not be less than 533mm.	
4	Entrance Landings	
	Door maneuvering clearances shall not overlap with ramp landings.	
5	Minimal Room height	
5	Minimal height measured from the top of the floor finish to the bottom of the ceiling finish shall not be less than 2.20m.	
6		
6	Minimal handrail height	
	Minimal handrail height for stairs and ramps shall not be less than 900mm.	
7	Low Points	
	Low Points should be avoided.	
	*so that impurities would not collect in those points - ducts,drainlines,gasslines depending on type of gass	
8	Drainline Slope	
	Drainlines shall have slope that allows self-drainage.	
	*minimal slope 1-100	

REQUIREMENTSSpecificator - Design Specific Requirements

		Piping Insulation							
	Insulation type and dimensions shall be in accordance to information requirements.								
	*Minor clashes between insulation and other elements are tolerated.								
10	Equipment	Vacum Line							
	Equipment Vacum Line shall follow the fastest possible route to minimize the number of bends i.e., energy loss.								
	Equipment va	icum Line sha	ii tollow the la	astest possio	ne route to min	imize the number	or benus i.e., ener	gy loss.	
11	Popout Sharing Criteria								
	Different tool	Different tools should not share the same popout.							
	* Matrix for popout sharing								
		Dry Mechanical	Wet Services	Hot Duct	Heat Traced Lines	Electrical Services			
	Dry Mechanical	yes	yes	yes	yes	yes			
	Wet Services Hot Duct	yes yes	yes yes	yes yes	yes yes	no			
	Heat Traced Lines Electrical Services	yes yes	yes no	yes no	yes no	no yes			
12	Spool Pipe	sizing							
	Maximum pip	e length shall	be 6m.						
	Maximum pip	o longth with	two bonds sh	all bo 2m					
	maximum pip	e length with	two benus si	an be sin.					
	Maximum pip	e length with	more than tw	vo bends sha	ll be 1.5m.				
13	Layers								
	All 1	a a la contra a alca			4 - 1 - F				
	All layers and	colouring sha	ili de consistei	nt according	to information	requirements.			
14	Valve hand	lles							
	Valve handles	s shall be desi	gned to be acc	cessible.					
15	Douting								
15	Routing								
	All services sh	hall run inside	their designat	ted area defi	ned by space n	nanagement rules			
16	No crossing	g lines in fab							
				1 4 1					
	inere snould	be no lines cr	ossing in the t	ecnnical are	a near the mai	n equipment.			
	*Main equipr	nent surround	lings should b	e as neat as	possible.				
17	Steel / Cop	per Piping							
	Distant.	14 3/0 1-1	a						
	Piping sizes 1,	/4, 3/8 and 1/	z should use t	pending angl	es and not fitti	ngs.			
	*Bends to be	made in 15 d	egrees increm	ent. Preferal	bly 45° and 90°				
18	Line Numb	ers							
	Line numbers	shall be assig	ned to the co	rresponding	iines.				
19	Line Numb	ers Naming							
	All line numb	ers shall follo	w the same na	iming conver	ntion				
20	Piping leng	th dimension	5						_
	All piping leng	gths shall be r	ounded to wh	ole numbers	or with decim	al component 0.5			
21	Field Conn	ection							
	inera contri								

APPENDIX 5: II TIER: LEVEL OF INFORMATION NEED

REQUIREMENTSSpecificator - Architectural

Information Delivery Milestone:	Design			
Purpose:	Architecture			
Actor:				
Object:	"Wall" / IfcWall			
Geometrical information:				
Detail:	Simplified volume representation	n. Modelied accurately in terms of the overall geometry and thickne	55.	
Dimensionality:	30			
ocation:	Absolute and relative to other bu	uilding elements		
Appearance:	Single color fill			
Parametric behaviour:	Not requested			
Alphanumeric Information:				
dentification:				
nformation content:	Property	Description	Data Type	Units
	6	Identity Data		
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Classification	Classification code according to chosen classification system.	text	1
		Material		
	Structure	The primary material used to construct the structural layer.	text	1
	Thermal/Air Layer	The primary material used as a thermal layer.	text	1
	Finish	The type of finish for the wall.	text	1
		Dimensional Data		
	Length	Total nominal length of the wall along the wall center line (even if different to the wall path).	numeric	mm
	Width	Total nominal width (or thickness) of the wall measured perpendicular to the wall path.	numeric	mm
	Height	Total nominal height of the wall.	пителіс	mm
	Gross Side Area	Area of the wall as viewed by an elevation view of the middle plane of the wall. It does not take into account any wall modifications (such as openings).	numeric	m²
	Grass Volume	Volume of the wall, without taking into account the openings and the connection geometry.	numeric	m²
	1	Performance Data		
	is External	Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). If (TRUE) it is an external element and faces the outside of the building.	boolean	YES/NO
	Structural/LoadBearing	Indicates whether the object is intended to carry loads (TRUE) or not (FALSE).	boolean	YES/NO
	Fire Rating	Fire rating given according to the national fire safety classification.	numeric	1
		Cost		
	Estimated Unit Cost	Estimated cost of element per m ² / m ³ . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/ m³
	Estimated Cost	Estimated total cost needed for installing, based on estimated unit cost.	numeric	¢
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1
Documentation:	an a		1000 C	

formation Delivery Milestone:	Construction							
urpose:	Architecture							
tor:								
bject:	"Wall" / IfcWall							
cometrical information:								
tail:	Element modelled to accurate dime elements.	nsions. Penetrations are modelled to nominal dimensions for major	wall openings and I	arge mechanical				
mensional ty:	ciements.							
rensionality:	Absolute and relative to other build	ing elements						
pearance:	Color fill to distinguish different ma							
rametric behaviour:	Not requested							
phanumeric Information:								
ntification:								
ormation content:	Property	Description	Data Type	Units				
		Identity Data		1				
	Name	Primary identifier of an object.	text	1				
				-				
	Type	Defines the object type, specific information about object.	text	1				
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1				
	Classification	Classification code according to chosen classification system.	text	1				
	Description	An alphanumeric value providing a concise description of the element.	text	1				
	Manufacturer	The organization that manufactured and / or assembled the	text	1				
	-	item. Material						
	2			1 3				
	Structure	The primary material used to construct the structural layer.	text	1				
	Substrate	The primary material used as a substrate.	text	1				
	Thermal/Air Layer	The primary material used as a thermal layer,	text	1				
	Membrane Layer	The primary material used as a membrane layer.	text	t.				
	Finish	The type of finish for the wall.	text	1				
		Dimensional Data						
	Length	Total nominal length of the wall along the wall center line	numeric	mm				
		(even if different to the wall path). Total nominal width (or thickness) of the wall measured	18.30.46.00	100000				
	Width	perpendicular to the wall path.	numeric	mm				
	Height	Total nominal height of the wall.	numeric	mim				
	Gross Side Area	Area of the wall as viewed by an elevation view of the middle plane of the wall. It does not take into account any wall	numeric	m².				
	oross side Area	plane of the wall. It does not take into account any wall modifications (such as openings).	numeric	m				
	Net Side Area	Area of the wall as viewed by an elevation view of the middle plane. It does take into account all wall modifications (such as	numeric	m²				
		openings). Volume of the wall, without taking into account the openings		220				
	Gross Volume	and the connection geometry.	numeric	m3				
	Net Volume	Volume of the wall, after subtracting the openings and after	numarie	m ³				
	NEL YORUTTE	considering the connection geometry.	numeric	m.				
		Performance Data		-				
	Is External	Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). If (TRUE) it is an external element and faces the outside of the building.	boolean	YES/NO				
	Structural/LoadBearing	indicates whether the object is intended to carry loads (TRUE) or not (FALSE).	hoolean	YES/NO				
	Is Water Resistent	Indicates whether the object is water resistant (TRUE) or not (FALSE).	boolean	YES/NO				
	Fire Rating	Fire rating given according to the national fire safety	numeric	1				
		classification. Installation Data		L				
	Installation date	The date on which the installation was carried out.	date time	date				
	Subcontractor	A firm or person that carries out installation work.	text	/				
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1				
		A person responsible for assuring the quality and meeting the						
	Approved By	requirements of the installed element.	text	l.				
	Quartel Cost		numeri-					
	Overall Cost	Sum of all costs needed for installing the element. Cost of installing per m ² / m ⁴ , including workforce and	numeric	¢				
	Installation Cost	cost or installing per m' / m' , including workforce and equipment.	numeric	€/m², €/ m³				
	Material Cost	Cost of material per m ¹ /m ³ .	numeric	€/m², €/ m²				
		Phasing						
	2							

Purpose:	ne: Operation Architecture						
Actor:	Arcintecture						
ACTOR:							
Object:	"Wall" / IfcWall						
Seometrical information:	wen / newan						
etail:	Element modelled to accurate dim	ensions. All connections, ornate details and openings modelled to re	ough-opening dimen	sions.			
Xmensionality:	30						
ocation:	Absolute and relative to other build	fing elements					
Appearance:	Color fill to distinguish different ma	terials					
Parametric behaviour:	Not requested						
Nphanumeric Information:							
lentification:		1					
formation content:	Property	Description	Data Type	Units			
		Identity Data	1114475				
	Name	Primary identifier of an object.	test	1			
	Type	Defines the object type, specific information about object.	text	1			
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	2			
	Prebenned Type	further classify the entity	test	/			
	Classification	Classification code according to chosen classification system.	text.	1			
		An alphanumeric value	000050				
	Description	providing a concise description	text	1			
		of the element.					
	Manufacturer	The organization that manufactured and / or assembled the item	text	1			
	Contraction of the second s	item. A valid URL hyperlink to the	34682	-			
	URL	manufacturer's website.	text	1			
		Material					
	Structure	The primary material used to construct the structural layer.	text	7			
	Substrate	The primary material used as a substrate.	text	,			
	Substrate Thermal/Air Layer	The primary material used as a substrate. The primary material used as a thermal layer.	text				
	Membrane Layer	The primary material used as a thermal layer. The primary material used as a membrane layer.	text	1			
	Finish	The type of finish for the wall.	text	1			
		Dimensional Data					
	Lanath	Total nominal length of the wall along the wall center line	DUBSCHIP				
	Length	(even if different to the wall path).	numeric	mm			
	Width	Total nominal width (or thickness) of the wall measured perpendicular to the wall path.	numeric	mm			
	Height	Total nominal height of the wall.	numeric	mm			
		Area of the wall as viewed by an elevation view of the middle	- Mainscrite				
	Gross Side Area	plane of the wall. It does not take into account any wall	numeric	m²			
	C Contra to Marco (200)	modifications (such as openings).	100400-9454	2 100.85			
	Net Side Area	Area of the wall as viewed by an elevation view of the middle plane. It does take into account all wall modifications (such as	numeric	m²			
	The and Press	openings).	numeric	1.90			
	Gross Volume	Volume of the wall, without taking into account the openings	numeric	m ^s			
	Gross volume	and the connection geometry.	nomenc				
	Net Volume	Volume of the wall, after subtracting the openings and after considering the connection geometry.	numeric	m*			
		Performance Data		A196			
		Indication whether the element is designed for use in the					
	Is External	exterior (TRUE) or not (FALSE). If (TRUE) it is an external	boolean	VES/NO			
		element and faces the outside of the building.					
	Structural/LoadBearing	Indicates whether the object is intended to carry loads (TRUE) or not (FALSE).	boolean	VES/NO			
	Is Water Resistent	Indicates whether the object is water resistant (TRUE) or not	boolean	VES/NO			
	is water Resistent	(FALSE).	Boolean	AF2\MO			
	5.7 STORE 100	Acoustic rating for this object. It is provided according to the		-			
	Acoustic Rating	national building code. It indicates the sound transmission resistance of this object by an index ratio (instead of	numeric	1			
		providing full sound absorbtion values).					
	Fire Rating	Fire rating given according to the national fire safety	numeric	1			
		classification.		6			
	for the second second		date time	0.404/01			
	Installation date Subcontractor	The date on which the installation was carried out. A firm or person that carries out installation work.	date time text	date /			
	Subcontractor Installation Serial Number/Tag	A firm or person that carries out installation work. The Identifier assigned to installation.	numeric	1			
		The Identifier assigned to installation. A person responsible for assuring the quality and meeting the					
	Approved By		test	1			
	Approximately by	requirements of the installed element.					
	- Shite over a bit	requirements of the installed element. Warranty Data					
	Warranty ID	Warranty Data The identifier assigned to a warranty.	text	1			
		Warranty Data The identifier assigned to a warranty. An alphanumeric value	text	1			
		Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description	text	I I			
	Warranty ID	Warranty Data The identifier assigned to a warranty. An alphanumeric value		~			
	Warranty ID	Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty context and					
	Warranty ID WarrantyDescription	Warranty Data Warranty Data An alphanumeric value providing a concise description of the warranty content and avy exclusions. The date on which the warranty commences. The date on which the warranty expires.	text	7			
	Warranty ID WarrantyDescription WarrantyStart Date	Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty content and any exclusions. The date on which the warranty commences. The date on which the warranty expires. The physical status of the element at the time of the	text date time	/ dote			
	Warranty ID WarrantyDescription WarrantyStart Date	Warranty Data Warranty Data An alphanumeric value providing a concise description of the warranty content and avy exclusions. The date on which the warranty commences. The date on which the warranty expires.	text date time	/ dote			
	Warranty ID Warranty Description Warranty Start Date Warranty End Date	Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty content and any exclusions. The date on which the warranty commences. The faste on which the warranty expires. The physical status of the element at the time of the investory or audit, based on the best judgment of those persons families with the physical characteristics and condition. Basic imperfection that implies any deformity in component of a building that is owing to blemiched plan, inadequate or flaved workmanubip or deficient material and once in a while	text date time date time	/ date date			
	Werranty ID WarrantyDescription Warranty Start Date Warranty End Date Condition Defects	Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty content and any exclusions. The date on which the warranty expires. The date on which the warranty expires. The date on which the warranty expires. The date on which the improvement at the time of the inventory or auxit, based on the best judgment of those persons familiar with the physical characteristics and condition. Basic imperfection that implies any deformity in component flawed workmanship or deficient material and once in a while any blond of these. Cost	text date time date time text text	/ dote dote /			
	Warranty ID WarrantyDescription WarrantyDescription Warranty End Date Condition	Warranty Data The identifier assigned to a warranty. An alphanumerk value providing a concise description of the warranty content and any exclusions. The date on which the warranty contenences. The date on which the warranty expires. The provide the warranty of the set of the warranty of the se	text date time date time text	/ dote date /			
	Werranty ID WarrantyDescription Warranty Start Date Warranty End Date Condition Defects	Warranty Data Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty commences. The date on which the warranty commences. The date on which the warranty expires. The date on which the warranty expires as a set of the one of the investory of warranty is nonponent of a building that is owing to bienched plan, indecleapter or flaved workmanship or deficient material and once in a while any blend of these. Cost of installing per n ² / n ² , including workflorce and	text date time date time text text	/ dote date / /			
	Warranty ID Warranty Discription Warranty Start Date Warranty End Date Condition Defects	Warranty Data Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty commences. The date on which the warranty expires. The date on which the warranty expires. The provide theprovide the provide the provide theprovide thep	text date time date time text text	/ dots dote / / /			
	Warranty ID Warranty Start Date Warranty End Date Condition Defects Overall Cost Installation Cost	Warranty Data Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty commences. The date on which the warranty commences. The date on which the warranty expires. The date on which the warranty expires and the set of the investory of warranty is component of a building that is owing to bienched plan, indecised plan and once in a while any blend of these. Cest Sum of all costs needed for installing we firster and	text date time date time text text text numeric numeric	/ dote dote /			

Information Delivery Milestone:	Design						
Purpose:	Architecture						
Actor:							
Object:	"CurtainWall" / IfcCurta	inWall					
Geometrical information:	-						
Detail:	Simplified volume representatio and spacing of the multions.	plified volume representation. Modelled accurately in terms of the overall geometry and thickness. Nominal thickness of glazing and size i spacing of the multions.					
Dimensionality:	30						
location:	Absolute and relative to other b	lute and relative to other building elements					
Appearance:	Single color fill						
Parametric behaviour:	Not requested						
Alphanumeric Information:							
dentification:							
nformation content:	Property	Description	Data Type	Units			
		Identity Data					
	Name	Primary identifier of an object.	text	1			
	Туре	Defines the object type, specific information about object.	text	1			
	Classification	Classification code according to chosen classification system.	text	1			
	Material						
	Structure	The primary material used to construct the structural layer.	text	1			
	Thermal/Air Layer	The primary material used as a thermal layer.	text	1			
	Finish	The type of finish for the well.	text	1			
	Dimensional Data						
	Length	Total nominal length of the wall along the wall center line (even if different to the wall path).	numeric	mm			
	Width	Total nominal width (or thickness) of the wall measured perpendicular to the wall path.	numeric	mm			
	Height	Total nominal height of the wall.	numeric	mm			
	Gross Side Area	Area of the wall as viewed by an elevation view of the middle plane of the wall. It does not take into account any wall modifications (such as openings).	numeric	m²			
		Performance Data					
	is External	Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE), if (TRUE) it is an external element and faces the outside of the building.	boolean	YES/ND			
	Fire Rating	Fire rating given according to the national fire safety classification.	numeric	1			
		Cost		-			
	Estimated Unit Cost	Estimated cost of element per m ² / m ² . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/ m²			
	Estimated Cost	Estimated total cost needed for installing, based on estimated unit cost.	numeric	c			
		Phasing	5	dir.			
	Phase	Identifies the phase in which the object is created.	text	1			
Documentation:							

Information Delivery Milestone: Purpose:	Architecture					
Actor:						
ACTOF						
	large a second second second	A.A. M.				
bject:	"CurtainWall" / IfcCurtain	Wall				
eometrical information:						
etail:		ensions. Multion shapes and geometry defined.				
mensionality:	3D					
ocation:	Absolute and relative to other build					
ppearance:	Color fill to distinguish different ma	aterials				
arametric behaviour;	Not requested					
Uphanumeric Information:						
lentification:						
formation content:	Property	Description	Data Type	Units		
		Identity Data		· ·		
	Name	Primary identifier of an object,	text	1		
	Туре	Defines the object type, specific information about object.	text	1		
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1		
	Classification	Classification code according to chosen classification system.	text	1		
	Description	An alphanumeric value providing a concise description of the element.	text	/		
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1		
		Material		×.		
	Structure	The primary material used to construct the structural layer.	text	X		
	Substrate	The primary material used as a substrate.	text	1		
	Thermal/Air Layer	The primary material used as a substitute.	text	1		
	Membrane (aver	The primary material used as a membrane layer.	test	1		
	Finish	The type of finish for the wall.	text	1		
	rouar	Dimensional Data	1585	1		
	Total completel broath of the coeff almost the well senter line					
	Longth	(even if different to the wall path).	numeric	mm		
	Width	Total nominal width (or thickness) of the wall measured perpendicular to the wall path.	numeric	mm		
	Height	Total nominal height of the wall.	numeric	mm		
	Gross Side Area	Area of the wall as viewed by an elevation view of the middle plane of the wall. It does not take into account any wall modifications (such as openings).	numeric	m²		
	Net Side Area	Area of the wall as viewed by an elevation view of the middle plane. It does take into account all wall modifications (such as openings).	numeric	m²		
		Performance Data				
	ls External	Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). If (TRUE) it is an external element and faces the outside of the building.	boolean	YES/NO		
	Acoustic Rating	Acoustic rating for this object. It is provided according to the national building code. It indicates the sound transmission resistance of this object by an index ratio (instead of providing full sound absorbtion values).	numeric	1		
	Fire Rating	Fire rating given according to the national fire safety classification.	numeric	/		
		Installation Data				
	Installation date	The date on which the installation was carried out.	date time	date		
	Subcontractor	A firm or person that carries out installation work.	text	1		
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1		
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1		
		Cost				
	Overall Cost	Sum of all costs needed for installing the element. Cost of installing per m ² / m ³ , including workforce and	numeric	٤		
	Installation Cost	equipment.	numeric.	€/m², €/ m		
	Material Cost	Cost of material per m ² / m ³ Phasing	numeric	€/m², €/ m		
	Phase	identifies the phase in which the object is created.	text	1		

Information Delivery Milestone	e: Operation Architecture			
Purpose:	Architecture			
Actor:				
Dbject:	"CurtainWall" / IfcCurtain	oWall		
seometrical information:				
etail	Element modelled to accurate dima	ensions. All interface details modelied.		
imensionality:	30			
ocation:	Absolute and relative to other build	ting elements		
	Color fill to distinguish different ma			
ppearance:		aprias		
arametric behavlour:	Not requested			
Iphanumeric Information:	-			
entification:				
formation content:	Property	Description	Data Type	Units
		identity Data		÷
	Name	Primary identifier of an object.	text	1
				19
	Type	Defines the object type, specific information about object.	text	1
	Production of Trans	Holds the entity specific enumeration of predefined types to	text	1
	Predefined Type	further classify the entity	text	
	Classification	Classification code according to chosen classification system.	text	1
			1.000 C	
	0.236737.017	An alphanumeric value	023042	e gri
	Description	providing a concise description	text	1
		of the element.		
	Manufacturer	The organization that manufactured and / or assembled the	text	1
		item.		
	URL	A valid URL hyperlink to the manufacturer's website.	text	1
		Material		
		Material		
	Structure	The primary material used to construct the structural layer.	text	1
				7
	Substrate	The primary material used as a substrate.	text	-
	Thermal/Air Layer	The primary material used as a thermal layer.	text	1
	Membrane Layer	The primary material used as a membrane layer.	text	1
	Finish	The type of finish for the wall.	text	1
		Dimensional Data		
	100000000	Total nominal length of the wall along the wall center line	952002452	02/2
	Length	(even if different to the wall path).	numeric	mm
		Total nominal width (or thickness) of the wall measured	A DECEMBER OF	1.5.55
	Width	perpendicular to the wall path.	numeric	mm
	Height	Total nominal height of the wall.	numeric	mm
		Area of the wall as viewed by an elevation view of the middle		
	Gross Side Area	plane of the wall. It does not take into account any wall	numeric	m²
		modifications (such as openings).		
		Area of the wall as viewed by an elevation view of the middle		
	Net Side Area	plane. It does take into account all wall modifications (such as	numeric	m ²
		openings),	19-00035-02	
	S -	Performance Data		
		Indication whether the element is designed for use in the		
	is External	exterior (TRUE) or not (FALSE). If (TRUE) it is an external	boolean	YES/NO
		element and faces the outside of the building.	anoportanetta.	
		Acoustic rating for this object. It is provided according to the		
	Acoustic Rating	national building code. It indicates the sound transmission	numeric	1
	Prevensue nating	resistance of this object by an index ratio (instead of	traineric	× .
		providing full sound absorbtion values).		
	Fire Rating	Fire rating given according to the national fire safety	numeric	1
	and moting	classification.	- CONCERC	<u> </u>
		Installation Data	2	
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1
	and an exception of the	A person responsible for assuring the quality and meeting the		
	Approved By	requirements of the installed element.	text	1
		Warranty Data		
	Minneshall	The identifier assigned to a warranty.	text	1 9
	Warranty ID		1001	/
		An alphanumeric value providing a concise description		
	WarrantyDescription	of the warranty content and	text	1
		any exclusions.		
	Warranty Start Date	The date on which the warranty commences.	date time	date
		The date on which the warranty expires.	date time	date
	Warranty End Date	The physical status of the element at the time of the	uate dime	date
	1	Ine physical status of the element at the time of the inventory or audit, based on the best judgment of those		3.7
	Condition	persons familiar with the physical characteristics and	text	1
		condition.		
		Basic imperfection that implies any deformity in component		
	325020000	of a building that is owing to blemished plan, inadequate or		13.0
	Defects	flawed workmanship or deficient material and once in a while	text	1
		any blend of these.		
		Cost		
	Overall Cost	Sum of all costs needed for installing the element.	numeric	e
		Sum of all costs needed for installing the element. Cost of installing per m ² / m ² , including workforce and	NOTICIAC	Part of the second
	Installation Cost	equipment.	numeric	€/m², €/ r
	Material Cost	Cost of material per m ⁴ / m ⁴ .	numeric	€/m³, €/ r
	wietenai Cost	Phasing	1 SALIGUE	4m, 41
			120151	1.11
	Phase	Identifies the phase in which the object is created.	text	1
ocumentation:				

Information Delivery Milestone:	Design						
Purpose:	Architecture						
Actor:							
Object:	"Floor" / IfcCovering						
Geometrical Information:							
Detail:	Simplified volume representation	mpl fied volume representation modelled to the overall thickness, Major openings modelled,					
Dimensionality:	3D						
Location:	Absolute and relative to other bu	olute and relative to other building elements					
Appearance:	Single color fill	de color fill					
Parametric behaviour:	Not requested						
Alphanumeric Information:							
Identification:							
Information content	Property	Description	Data Type	Units			
		Identity Data					
	Name	Primary identifier of an object.	iext	1			
	Туре	Defines the object type, specific information about object.	text	1			
	Classification	Classification code according to chosen classification system.	text	1			
	Materiał						
	Structure	The primary material used to construct the structural layer.	text	1			
	Thermal/Air Layer	The primary material used as a thermal layer.	text	3			
	Finish	The type of finish for the wall.	text	1			
	Dimensional Data						
	Thickness	Nominal thickness (or width) of the plate.	numeric	mm			
	Gross Area	Sum of all gross areas of the covering facing the space. No opening that is included in the covering is subtracted.	numeric	m²			
	Performance Data						
	Structural/LoadBearing	Indicates whether the object is intended to carry loads (TRUE) or not (FALSE).	bcolean	YES/NO			
	Fire Rating	Fire rating for this object. It is given according to the national fire safety classification.	numeric	1			
	Has AntiStatic Surface	Indication whether the surface finish is designed to prevent electrostatic charge (TRUE) or not (FALSE).	boolean	YES/NO			
		Cost		<i>aa</i> .			
	Estimated Unit Cost	Estimated cost of element per m ³ / m ³ . It is based on the average amount of needed resources lincluding material, labor and equipment).	numeric	€/m², €/ m*			
	Estimated Cost	Estimated total cost needed for installing, based on estimated unit cost.	numeric	£			
		Phasing		202			
	Phase	Identifies the phase in which the object is created.	text	1			
Documentation:							

Information Delivery Milestone:	Construction					
Purpose:	Architecture					
Actor:						
Object:	"Floor" / IfcCovering					
Geometrical information:	Theory Theoremis					
	-	All sectors and sectors and sectors and sectors and the	the second state of the second			
Detail:		insions and geometry. All openings and penetrations are modelled	to nominal ormens	ions.		
Dimensionality:	3D					
location:	Absolute and relative to other build					
Appearance:	Color fill to distinguish different ma	terials				
Parametric behaviour:	Not requested					
Alphanumeric Information:						
dentification:		1				
nformation content:	Property	Description	Data Type	Units		
		Identity Data		-		
	Name	Primary identifier of an object.	text	1		
	Туре	Defines the object type, specific information about object.	text	1		
	. ibe		1000	10		
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1		
	Classification	Classification code according to chosen classification system.	text	1		
	Non-Anna State State State	An alphanumeric value	NUM D			
	Description	providing a concise description	text	1		
		of the element.				
	Manufacturer	The organization that manufactured and / or assembled the	text	1		
		item.	Contraction (1)			
		Material				
	Structure	The primary material used to construct the structural layer.	text	1		
	Substrate	The primary material used as a substrate.	text	1		
	Thermal/Air Layer	The primary material used as a thermal layer.	text	1		
	Membrane Layer	The primary material used as a membrane layer.	text	1		
	Structural Deck	The primary material used as a structure deck,	text	1		
	Finish	Finish selection for this object. Here specification of the	text	1		
	10000	surface finish for informational purposes.	39,222	0.000		
	Tile length/width	Size of the floor tiles.	numeric.	mm		
		Dimensional Data				
	Thickness	Nominal thickness (or width) of the plate.	numeric	mm		
	Gross Area	Sum of all gross areas of the covering facing the space. No	numeric	m²		
		opening that is included in the covering is subtracted.				
	Net Area	Sum of all net areas of the covering facing the space. All	numeric	m ²		
	openings that is included in the covering are subtracted.					
	and the second standard stand	Indicates whether the object is intended to carry loads				
	Structural/LoadBearing	(TRUE) or not (FALSE).	boolean	YES/NO		
	Fire Rating	Fire rating for this object. It is given according to the national fire safety classification.	numeric	1		
	in Mater Sectors	Indicates whether the object is water resistant (TRUE) or not	haal	YES/NO		
	Is Water Resistent	(FALSE).	boolean	TES/NO		
	Has NonSkid Surface	Indication whether the surface finish is designed to prevent slippery (TRUE) or not (FALSE).	boolean	YES/NO		
	Has AntiStatic Surface	Indication whether the surface finish is designed to prevent electrostatic charge (TRUE) or not (FALSE).	boolean	YES/NO		
		installation Data				
	Installation date	The date on which the installation was carried out.	date time	date		
	Subcontractor	A firm or person that carries out installation work.	text	1		
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1		
	Approved By	A person responsible for assuring the quality and meeting the	text	1		
		requirements of the installed element.	1979.	10		
	1.120 BC/907-1	Cost				
	Overall Cost	Sum of all costs needed for installing the element.	numeric	(
	Installation Cost	Cost of installing per m ² / m ³ , including workforce and equipment.	numeric	€/m³, €/ :		
	Material Cost	Cost of material per m ² / m ³ .	numeric	€/m², €/ r		
		Phasing				
	Phase	Identifies the phase in which the object is created.	text	1		
the second s						

nformation Delivery Milestone:	Operation			
Purpose:	Architecture			
Actor:				
	land a first of the			
)bject:	"Floor" / IfcCovering			
eometrical information:				
etail:		ensions. All penetrations, openings and connections modelled to	rough dimensions.	
Imensionality:	3D			
scation:	Absolute and relative to other built			
ppearance:	Color fill to distinguish different ma	ateriak		
arametric behaviour:	Not requested			
Iphanumeric Information:				
entification:				
formation content:	Property	Description	Data Type	Units
		Identity Data		r
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
		Holds the entity specific enumeration of predefined types to		-
	Predefined Type	further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	Classification		text	
	Desertation	An alphanumeric value	text	1
	Description	providing a concise description of the element.	test	1
	Charles and the second se	The organization that manufactured and / or assembled the	\$20227	
	Manufacturer	item.	text	1
	UBL	A valid URL hyperlink to the	text	1
		manufacturer's website.	and the second s	1
		Material		
	Structure	The primary material used to construct the structural layer.	text	1
			62102	
	Substrate	The primary material used as a substrate.	text	
	Thermal/Air Layer	The primary material used as a thermal layer.	text	1
	Membrane Layer	The primary material used as a membrane layer.	text	1
	Structural Deck	The primary material used as a structure deck.	text	1
	Finish	Finish selection for this object. Here specification of the	text	1
	Tile length/width	surface finish for informational purposes. Size of the floor tiles.	numeric	mm
	ine seight week	Dimensional Data	namene	
	Thickness	Nominal thickness (or width) of the plate.	numeric	mm
	Incaness	Sum of all gross areas of the covering facing the space. No	numeric	men
	Gross Area	opening that is included in the covering is subtracted.	numeric	m,
		Sum of all net areas of the covering facing the space. All		mi
	Net Area	openings that is included in the covering are subtracted.	numeric	m.
		Performance Data		
	Structural/LoadBearing	Indicates whether the object is intended to carry loads	boolean	YES/NO
		(TRUE) or not (FALSE)		
	0.000	Acoustic rating for this object. It is provided according to the national building code. It indicates the sound		982
	Acoustic Rating	transmission resistance of this object by an index ratio	numeric	1
		(instead of providing full sound absorbtion values).		
	Fire Rating	Fire rating for this object. It is given according to the	numeric	1
		national fire safety classification.		
	Is Water Resistent	Indicates whether the object is water resistant (TRUE) or not (FALSE).	boolean	YES/NO
		(FALSE). Indication whether the surface finish is designed to prevent	Second Contraction	i i i i i i i i i i i i i i i i i i i
	Has NonSkid Surface	slippery (TRUE) or not (FALSE).	boolean	YES/NO
	Has AntiStatic Surface	Indication whether the surface finish is designed to prevent	boolean	proc have
	mas antistatic surface	electrostatic charge (TRUE) or not (FALSE).	coordan	YES/NO
	(Installation Data		
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting	text	1
	- upp. Orea of	the requirements of the installed element.	a specific	, , , , , , , , , , , , , , , , , , ,
		Warranty Data		
	Warranty ID	The identifier assigned to a warranty.	text	1
		An alphanumeric value		
	WarrantyDescription	providing a concise description of the warranty content and	text	1
		any exclusions.		
	Warranty Start Date	The date on which the warranty commences.	date time	date
	Warranty End Date	The date on which the warranty expires.	date time	date
		The physical status of the element at the time of the		
	Condition	inventory or audit, based on the best judgment of those	text	1
		persons familiar with the physical characteristics and	a serie	×
		condition. Basic imperfection that implies any deformity in component		-
	5755	of a building that is owing to blemished plan, inadequate or		
	Defects	flawed workmanship or deficient material and once in a	text	1
		while any blend of these.		
		Cost		W
	Overall Cost	Sum of all costs needed for installing the element.	numeric	c
	Installation Cost	Cost of installing per m ² / m ³ , including workforce and	numeric	€/m³, €/ m
		equipment.	10000000000	
	Material Cost	Cost of material per m ² / m ³	numeric	€/m², €/ m
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1
ocumentation:				

Information Delivery Milestone:	Design						
Purpose:	Architecture						
Actor:							
Object:	"Ceiling" / IfcCovering						
Geometrical information:	comp / necercing						
Detail:	Simplified volume representatio	on modelled to the overall thickness. Major openings modelled.					
Dimensionality:	30						
location:	Absolute and relative to other b	uilding elements					
Appearance:	Single color fill						
Parametric behaviour:	Not requested	requested					
Alphanumeric Information:							
Identification:							
Information content	Property	Description	Data Type	Units			
	-	Identity Data					
	Name	Primary identifier of an object.	text	1			
	Туре	Defines the object type, specific information about object.	test	1			
	Classification	Classification code according to chosen classification system.	text	1			
	BuildingStorey	Defines the reference building storey.	text	1			
	Elevation	Specifies the elevation of the element.	numeric	m			
	Material						
	Structure	The primary material used to construct the structural layer.	text	7			
	Thermal/Air Layer	The primary material used as a thermal layer.	text	1			
	Finish	The type of finish for the ceiling.	text	1			
	Dimensionel Data						
	Thickness	Nominal thickness (or width) of the plate.	numeric	mm			
	Gross Area	Sum of all gross areas of the covering facing the space. No opening that is included in the covering is subtracted.	numeric	m*			
	Performance Data						
	Is False Ceiling	Indicates whether the ceiling is false (TRUE) or not (FALSE].	boolean	YES/NO			
		Cost					
	Estimated Unit Cost	Estimated cost of element per m ² / m ² . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m³, €/ m³			
	Estimated Cost	Estimated total cost needed for installing, based on estimated unit cost.	numeric	e			
		Phasing		-			
	Phase	Identifies the phase in which the object is created.	text	- As			
Documentation:	~		1				

nformation Delivery Milestone:	Construction			
Purpose:	Architecture			
Actor:				
Object:	"Ceiling" / IfcCovering			
Geometrical information:				
Detail:	Element modelled to accurate dime	ensions. Openings modelled to nominal dimensions. Location of co	ontrol joints indicate	ed, but not modelie
Dimensionality:	3D			
ocation:	Absolute and relative to other build	ding elements		
Appearance:	Color fill to distinguish different ma	aterials		
Parametric behaviour:	Not requested			
Alphanumeric Information:				
dentification:		~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~		
nformation content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
			10-1	
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	Description	An alphanumeric value providing a concise description of the element.	text	1
	Manufacturer	The organization that manufactured and / or assembled the item.	1ext	1
		Material	1	
	Structure	The primary material used to construct the structural layer.	text	1
	Substrate	The primary material used as a substrate.	text	1
	Thermal/Air Layer	The primary material used as a substrate. The primary material used as a thermal layer.	text	1
			text	
	Membrane Layer	The primary material used as a membrane layer.	text	1
	Structural Deck	The primary material used as a structure deck. Finish selection for this object. Here specification of the	text	1
	Finish	surface finish for informational purposes.	text	1
	Tile length/width	Size of the ceiling tiles.	numeric	mm
		Dimensional Data		
	Thickness	Nominal thickness (or width) of the plate.	numeric	mm
	Gross Area	Sum of all gross areas of the covering facing the space. No opening that is included in the covering is subtracted.	numeric	m²
	10110	Sum of all net areas of the covering facing the space. All	The second second	
	Net Area	openings that is included in the covering are subtracted.	numeric	m ²
		Performance Data		2
	Is False Ceiling	Indicates whether the ceiling is false [TRUE) or not (FALSE).	boolean	YE5/NO
	is Water Resistent	Indicates whether the object is water resistent (TRUE) or not	boolean	YES/NO
	and an an an an and a state of the	(FALSE).		
		Installation Data	-	
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1
		Cost	The base of the second	
	Overall Cost	Sum of all costs needed for installing the element.	numeric	¢
	Installation Cost	Cost of installing per m ² / m ³ , including workforce and equipment.	numeric	€/m², €/ m²
	Material Cost	Cost of material per m ⁴ / m ⁴ .	numeric	¢/m², ¢/ m*
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1

Information Delivery Milestone:	Operation
Purpose:	Architecture
Actor:	
Object:	"Ceiling" / Ifc
Geometrical Information:	
Oetail:	specific width.
Dimensionality:	30
Location:	Absolute and relat
Appearance:	Color fill to disting
Parametric behaviour:	Not requested
Alphanumeric Information:	
dentification:	1000
nformation content:	Prop
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Documentation Set of documents:

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e to other build			
ish different ma	aterials		
rty	Description	Data Type	Units
ny .	identity Data	Dearty 14be	onits
e	Primary identifier of an object.	text	1
	Defines the object type, specific information about object.	text	1
		text	1
d Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
ation	and the second		1
10.01	Classification code according to chosen classification system.	text	1
tion	An alphanumeric value providing a concise description	text	1
enuel1	of the element.	text	
turer	The organization that manufactured and / or assembled the	text	1
	item.	sunt	- K.
	A valid URL hyperlink to the manufacturer's website.	text	1
	Material		
ile.		tex*	1
6553	The primary material used to construct the structural layer,	text	192
ste	The primary material used as a substrate.	text	1
r Layer	The primary material used as a thermal layer.	text	1
Layer	The primary material used as a membrane layer.	text	1
Deck	The primary material used as a structure deck.	text	1
1	Finish selection for this object. Here specification of the surface finish for informational purposes.	text	1
width	Size of the ceiling tiles.	numeric	mm
	Dimensional Data		27.
05.5	Nominal thickness (or width) of the plate.	numeric	mm
rea	Sum of all gross areas of the covering facing the space. No	numeric	m²
	opening that is included in the covering is subtracted.		
ea	Sum of all net areas of the covering facing the space. All openings that is included in the covering are subtracted.	numeric	m ²
	Performance Data		
eiling	Indicates whether the ceiling is false (TRUE) or not (FALSE).	boolean	YES/NO
carag		buonean	123/190
sistent	Indicates whether the object is water resistent (TRUE) or not (FALSE).	boolean	VES/NO
	Acoustic rating for this object. It is provided according to the		
Rating	national building code. It indicates the sound transmission	numeric	1
	resistance of this object by an index ratio [instead of		
2.340/095	providing full sound absorbtion values). Indicates whether the object is water resistant (TRUE) or not	207723272	10000000
sistent	(FALSE).	boolean	YES/NO
	Installation Data		
n date	The date on which the installation was carried out.	date time	date
actor	A firm or person that carries out installation work.	text	1
Number/Tag	The Identifier assigned to installation.	numeric	1
d By	A person responsible for assuring the quality and meeting the	text	1
	requirements of the installed element. Warranty Data		
ty ID	The identifier assigned to a warranty.	text	1
	An alphanumeric value		
scription	providing a concise description	text	1
scription	of the warranty content and	ICM.	04S
art Date	any exclusions. The date on which the warranty commences.	date time	date
nd Date	The date on which the warranty commences.	date time	date
	The physical status of the element at the time of the	wave shire	0010
ion	inventory or audit, based on the best judgment of those	text	1
	persons familiar with the physical characteristics and	and a	1
	condition. Basic imperfection that implies any deformity in component		
	of a building that is owing to blemished plan, inadequate or		
15	flawed workmanship or deficient material and once in a while	test	1
	any blend of these.		3
	Cost		
	Sum of all costs needed for installing the element.	numeric	e
Cost	Cost of installing per m ² / m ³ , including workforce and	numeric	€/m², €/ m³
Cost n Cost	equipment.		
	equipment. Cost of material per m ² / m ⁴ .	numeric	€/m³, €/ m³
n Cost	equipment. Cost of material per m ¹ / m ⁴ .	numeric	€/m², €/ m³

Erasmus Mundus Joint Master Degree Programme – ERASMUS+ European Master in Building Information Modelling BIM A+

Information Delivery Milestone:	Design					
Purpose:	Architecture					
Actor:						
Object:	"Door" / IfcDoor					
Seometrical information:						
letail:	Simplified volume representatio	n. Modelled with simple frame and panel.				
Imensionality:	30					
ocation:	Absolute and relative to other b	ulicing elements				
ppearance	Single color fill					
arametric behaviour:	Not requested					
Aphanameric Information:	-					
dentification:						
nformation content:	Property	Description	Data Type	Units		
	Tioperty	Identity Data	Date 1990	- Child		
	Name	Primary Identifier of an object.	text	1 7		
				./		
	Туре	Defines the object type, specific information about object.	text	1		
	Classification	Classification code according to chosen classification system.	text	1		
	BuildingStorey	Defines the reference building storey.	text	1		
	OpeningDirection	Defines whether the door swings inside or away of the room.	text	1		
	Material					
	Panel Material	The primary material used to construct the panel.	text	1		
	Paner waterial	Finish selection for this object. Here specification of the	text	1		
	Panel Finish	surface finish for informational purposes.	text	1		
	Dimensional Data					
	Height	Total outer heigth of the door lining.	numeric	mm		
	Width	Total auter width of the door lining.	numeric	mm		
	Area	Total area of the outer lining of the door.	numeric	m²		
	OpeningWidth	Width of the wall opening.	numeric	mm		
	OpeningHeight	Height of the wall opening.	numeric	7700		
		Performance Data				
		Indication whether the element is designed for use in the				
	Is External	exterior (TRUE) or not (FALSE). If (TRUE) it is an external element and faces the outside of the building.	boolean	YES/NO		
	Fire Exit	Indication whether this object is designed to serve as an exit in the case of fire (TRUE) or not (FALSE). Here it defines an exit door in accordance to the national building code.	boolean	YES/NO		
	Fire Rating	Fire rating for this object. It is given according to the national fire safety code or regulation.	numeric	7		
	Self Closing	Indication whether this object is designed to close automatically after use (TRUE) or not (FALSE).	boolean	YES/NO		
		Cost	1			
	Estimated Unit Cost	Estimated cost of element per m ² / m ³ . It is based on the average amount of needed resources [including material,	numeric	€/m³, €/ m³		
	Estimated Cost	labor and equipment). Estimated total cost needed for installing, based on estimated unit cost.	numeric	٤		
		Phasing				
	Phase	Identifies the phase in which the object is created.	text	1		
Documentation:	10 10 10 10					
Set of documents:	Not requested					

Information Delivery Milestone:	Construction						
Purpose:	Architecture						
Actor:							
Object:	"Door" / IfcDoor						
Geometrical information: Detail:	Element modelled to accurate dire	sensions and geometry. Major framing elements are modelled.					
Detail: Dimensionality:	3D	services and geometry, wajor meming elements are modelled.					
Location:	Absolute and relative to other buil	lding elements					
Appearance:	Color fill to distinguish different m	aterials					
Parametric behaviour:	Not requested						
Alphanumeric Information:							
Identification: Information content:	Property	Description	Data Type	Units			
	rispacit	Identity Data	Parts of the	U.I.I.S			
	Name	Primary identifier of an object.	text	1			
	Туре	Defines the object type, specific information about object.	text	1			
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1			
	Classification	Classification code according to chosen classification system.	text	1			
		An alphanumeric value	Mala				
	Description	providing a concise description of the element.	text	1			
	BuildingStorey	Defines the reference building storey.	text	1			
	OpeningDirection	Defines whether the door swings inside or away of the room.	text	1			
		The organization that manufactured and / or assembled the	204				
	Manufacturer	tem.	text	1			
		Material	-	2			
	Panel Material Frame Material	The primary material used to construct the panel. The primary material used to construct the frame.	text	1			
	Frame Finish	Finish selection for this object. Here specification of the	1142				
	Frame Finish	surface finish for informational purposes.	text	/			
	Panel Finish	Finish selection for this object. Here specification of the surface finish for informational purposes.	text	1			
	Hardware Material	The primary material of the hardware.	text	1			
	Dimensional Data						
	S# Height	The distance from the top of the floor level to the bottom side of the object.	numeric	mm			
	Height	Total outer heigth of the door lining.	numeric	mm			
	Width	Total outer width of the door lining.	numeric	mm			
	Area	Total area of the outer lining of the door.	numeric	m ¹			
	OpeningWidth	Width of the wall opening. Height of the wall opening.	numeric	mm			
	OpeningHeight	Performance Data	numeric.	tites			
	is External	Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). If (TRUE) it is an external element and faces the outside of the building.	boolean	YES/NO			
	Fire Exit	entern and races the outside of the outside, Indication whether this object is designed to serve as an exit in the case of fire (TRUE) or not (FALSE). Here it defines an exit door in accordance to the national building code.	boolean	YES/NO			
	Fire Rating	Fire rating for this object. It is given according to the national	numeric	1			
	Has Treshold	fire safety code or regulation. Indication whether this object has a treshold (TRUE) or not (FALSE).	boolean	YES/NO			
	Has Grille	Indication whether this object has a grille (TRUE) or not	boolean	YES/NO			
	Has Gritie Has Antitheft System	(FALSE) indication whether this object has antitheft system (TRUE) or	boolean	YES/NO YES/NO			
		not (FALSE) Indication whether this object is designed to prevent	100 CO.000	NUMBER OF STREET			
	Has Access Control	unathorized access (TRUE) or not (FALSE)	boolean	YES/NO			
	5elf Closing	Indication whether this object is designed to close automatically after use (TRUE) or not (FALSE).	boolean	YES/NO			
	installation date	Installation Data	date time	date			
	Installation date Subcontractor	Installation Data The date on which the installation was carried out.	date time text	date /			
		Installation Data The date on which the installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation.					
	Subcontractor	Installation Data The date on which the Installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation. A person responsible for assuring the quality and meeting the	text	1			
	Subcontractor Installation Serial Number/Tag	Installation Data The date on which the installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation.	text numeric	1			
	Subcontractor Installation Serial Number/Tag	Installation Data Intellation Data Intellation Conta A firm or person that carrise out installation work. The identifier assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installed element.	text numeric	1			
	Subcontractor Installation Serial Number/Tag Approved By	Installation Data The date on which the installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installed element. Product Data An alphanumeric value representing the product, item or unit.	text numeric text	1			
	Subcontractor Installation Serial Number/Tag Approved By ModelLabel	Installation Data The date on which the Installation was carried out. A firm or present that carries out installation work. The identifier assigned to installation: A person responsible for assuring the quality and meeting the requirements of the installed element. Product Data An alphanumeric value representing the product, item or un number assigned by the manufacture of the product. An alphanumeric value for the name of the manufactured	text numeric text text	/ / /			
	Subcontractor Installation Serial Number/Tag Approved By ModelLabel	Installation Data The date on which the Installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation work. The identifier assigned to installation work. A person responsible for assuring the quality and meeting the requirements of the installed element. Product Data An alphanumeric value representing the product, item or unit number assigned by the manufacture of the product. An alphanumeric value for the name of the manufactured Item as used by the manufacturer. Cost Sum of all costs needed for installing the element.	text numeric text text	/ / /			
	Subcontractor Installation Serial Number/Tag Approved By ModelLabel ModelLabel	Installation Data The date on which the installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation. A person responsible for assumpt the quality and meeting the requirements of the installed element. Product Data An alphanumeric value for the name of the manufactured item as used by the manufacturer. Cont Sum of all costs needed for installing the element. Cost of installing per m ² /m ² , including workforce and	text numeric text text text	/ / / /			
	Subcontractor Installation Serial Number/Tag Approved By ModelLabel ModelReference Overall Cost.	Installation Data The date on which the Installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation work. The identifier assigned to installation work. A person responsible for assuring the quality and meeting the requirements of the installed element. Product Data An alphanumeric value representing the product, item or unit number assigned by the manufacture of the product. An alphanumeric value for the name of the manufactured Item as used by the manufacturer. Cost Sum of all costs needed for installing the element.	text numeric text text text numeric	/ / / / /			
	Subcontractor Installation Serial Number/Tag Approved By ModelLabel ModelReference Overall Cost Installation Cost Material Cost	Installation Data The date on which the installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation. A person responsible for assume the quality and meeting the requirements of the installed element. An siphanumeric value representing the product. An alphanumeric value for the name of the manufactured item as used by the manufacture of the product. An alphanumeric value for the name of the manufactured item as used by the manufacture of the product. Cost Sum of all costs needed for installing the element. Cost of installing per m ² (m ² , including workforce and equiprement. Cost of installing per m ² m ² . Phasing	text rumeric text text text text numeric numeric mutteric	/ / / / / / / / / / / / / / / / / / /			
Documentation:	Subcontractor Installation Serial Number/Tag Approved By ModelLabel ModelReference Overall Cost Installation Cost	Installation Data The date on which the installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation work. The identifier assigned to installation work. The identifier assigned to installation use the requirements of the installed element. Product Data An alphanumeric value representing the product, item or unit number assigned by the manufacture of the product. Ran alphanumeric value for the name of the manufactured item as used by the manufacturer. Cost Sum of all costs needed for installing the element. Cost of installing per m ² / m ² .	text numeric text text text text text numeric numeric	/ / / / { €			

nformation Delivery Milestone Purpose:	e: Operation Architecture			
	Architecture			
ctor:				
bject:	"Door" / IfcDoor			
eometrical information etal:	Element modelled to accurate dime	arians and momentary Malos framing alemants and concertions an	o modellod	
etail: imensionality:	Element modelled to accurate dime 3D	insions and geometry. Major framing elements and connections an	e modelled.	
	Absolute and relative to other build	ine elements		
ppearance:	Color fill to distinguish different ma			
arametric behaviour:	Not requested			
Iphanumeric Information:				
entification:				
formation content:	Property	Description	Data Type	Units
	-	Identity Data		10
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Dendalized Tune	Holds the entity specific enumeration of predefined types to		1
	Predefined Type	further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
		An alphanumeric value		2
	Description	providing a concise description	text	1
		of the element.		-
	BuildingStorey	Defines the reference building storey.	text	1
	OpeningDirection	Defines whether the door swings inside or away of the room.	text	1
	Manufacturer	The organization that manufactured and / or assembled the	text	1
	manufacturer	item.	text	1
	URL	A valid URL hyperlink to the manufacturer's website.	text	1
	Substrate	The primary material used as a substrate.	text	1
		Material		is conse
	Panel Material	The primary material used to construct the panel.	text	1
	Frame Material	The primary material used to construct the frame.	text	1
	Frame Finish	Finish selection for this object. Here specification of the	text	1
		surface finish for informational purposes.		19167 1
	Panel Finish	Finish selection for this object. Here specification of the surface finish for informational purposes.	text	1
	Hardware Material	The primary material of the hardware.	text	1
		Dimensional Data	-	3
	Sill Height	The distance from the top of the floor level to the bottom side	numeric	mm
	Height	of the object.	numeric	mm
	Width	Total outer heigth of the door lining. Total outer width of the door lining.	numeric	mm
	Area	Total area of the outer lining of the door.	numeric	m²
	OpeningWidth	Width of the wall opening.	numeric	mm
	OpeningHeight	Height of the wall opening.	numeric	mm
		Performance Data		
		indication whether the element is designed for use in the		
	is External	exterior (TRUE) or not (FALSE). If (TRUE) it is an external element and faces the outside of the building.	boolean	YES/NO
	Fire Exit	Indication whether this object is designed to serve as an exit in the case of fire (TRUE) or not (FALSE). Here it defines an exit door in accordance to the national building code.	boolean	YES/NO
	Fire Rating	Fire rating for this object. It is given according to the national	numeric	1
	and indial	fire safety code or regulation.	- armunde	in a constraint
	Has Treshold	Indication whether this object has a treshold (TRUE) or not (FALSE).	boolean	YES/NO
	Has Grille	Indication whether this object has a grille (TRUE) or not	boolean	YES/NO
	Hastorile	(FALSE)	opolean	TESYNO
	Has Antitheft System	Indication whether this object has antitheft system (TRUE) or not (FALSE).	boolean	YES/NO
		Indication whether this object is designed to prevent	40000	have think
	Has Access Control	unathorized access (TRUE) or not (FALSE)	boolean	YES/NO
	Self Closing	Indication whether this object is designed to close automatically after use (TRUE) or not (FA:SE). Installation Data	boolean	YES/NO
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	/
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the	text	1
		requirements of the installed element.	1.67	C.053
	Warranty ID	Warranty Data	text	1
	warranty iD	The identifier assigned to a warranty. An alphanumeric value	URA .	
	WarrantyDescription	providing a concise description of the warranty content and	test	1
	Warranty Start Date	any exclusions. The date on which the warranty commences.	date time	date
	Warranty Start Date	The date on which the warranty commences. The date on which the warranty expires.	date time	date
	wonanty End Date		une une	Gate
	Condition	The physical status of the element at the time of the inventory or audit, based on the best judgment of those persons familiar with the physical characteristics and condition.	text	с <i>Р</i>
	Defects	Basic imperfection that implies any deformity in component of a building that is owing to blemished plan, inadequate or flawed workmanship or deficient material and once in a while any blend of these.	text	7
		any blend of these. Product Data	11	
			21	S
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
	ModelReference	An alphanumeric value for the name of the manufactured Item as used by the manufacturer. Cost	text	1
	Overall Cost	Sum of all costs needed for installing the element.	numeric	6
		Cost of installing per m ² / m ⁸ , including workforce and		
	Installation Cost	equipment.	numeric	
		equipment. Cost of material per m ² / m ² .	numeric	€/m², €/ m €/m², €/ m
	Installation Cost	equipment.		

European Master in Building Information Modelling BIM A+

Information Delivery Milestone:					
Purpose:	Architecture				
Actor:					
	2.×				
Object:	"Window" / IfcWindow				
Geometrical Information:					
Detail:	Simplified volume representation	n. Modelied with simplified frame and glazing.			
Dimensionality:	30				
ocation:	Absolute and relative to other b	uilding elements			
Appearance:	Single color fill				
Parametric behavlour:	Not requested				
Alphanumeric Information:					
dentification:		1 ¹			
nformation content:	Property	Description	Data Type	Units	
		identity Data			
	Name	Primary identifier of an object.	text	1	
	Type	Defines the object type, specific information about object.	text	1	
	33%4	ensures and policy cline' shering many many agont policy.	1531	2	
	Classification	Classification code according to chosen classification system.	text	1	
	BuildingStorey	Defines the reference building storey.	text	1	
		Defines whether the window swings inside or away of the			
	OpeningType	room.	text	1	
		Material			
	Frame Material	The primary material used to construct the frame.	text	1	
	External Frame Finish	Finish selection for this object. Here specification of the	text	1	
	External righter right	surface finish for informational purposes.	text	2	
	Internal Frame Finish	Finish selection for this object. Here specification of the surface finish for informational purposes.	text	1	
	-	Dimensional Data			
	5. 1623/0639/17	The distance from the top of the floor level to the bottom			
	Sill Height	side of the object.	numeric	mm	
	Height	Total outer heigth of the window lining.		mm	
	Width	Total outer width of the window lining.	numeric	mm	
	Opening Height	Height of the wall opening.	numeric	mm	
	Opening Width	Width of the wall opening.	numeric	mm	
	Area	Total area of the outer lining of the window	numeric	m²	
	1	Performance Dota			
	Has Sill External	Indication whether the window opening has an external sill	boolean	YES/NO	
		(TRUE) or not (FALSE).			
	Has Sill Internal	Indication whether the window opening has an internal sill (TRUE) or not (FALSE).	boolean	YES/NO	
		Indication whether the element is designed for use in the			
	is External	exterior (TRUE) or not (FALSE). IF (TRUE) it is an external	boolean	YES NO	
		element and faces the outside of the building.		24	
	Fire Rating	Fire rating for this object. It is given according to the national	numeric	1	
		fire safety classification.			
		Estimated cost of element per m ² / m ³ . It is based on the		-	
	Estimated Unit Cost	average amount of needed resources (including material,	numeric	C/m2, C/m2	
		labor and equipment).			
	Estimated Cost	Estimated total cost needed for installing, based on	oumeric		
		estimated unit cost.			
		Phesing			
	Phase	identifies the phase in which the object is created.	text	1	
Documentation:					

nformation Delivery Milestone:						
urpose:	Architecture	Architecture				
ctor:						
	litter to B fat tar 1					
bject:	"Window" / IfcWindow					
eometrical information: etail:	Flammer modulind to accounts disconting and memory. Make feasing dismaster and design an modulind associate					
mensionality:	30	Element modelled to accurate dimensions and geometry. Major framing elements and glazing are modelled precisely.				
cation:	Absolute and relative to other build	ling elements				
ppearance:	Color fill to distinguish different ma					
arametric behaviour:	Not requested					
iphanumeric Information:						
entification:						
formation content:	Property	Description	Data Type	Units		
		Identity Bata				
	Name	Primary identifier of an object.	text	1		
	Туре	Defines the object type, specific information about object.	text	1		
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1		
	-	further classify the entity				
	Classification	Classification code according to chosen classification system.	text	1		
	2000 C	An alphanumeric value	222	37		
	Description	providing a concise description of the element.	test	1		
	Building Storey	Defines the reference building storey	text	1		
	OpeningType	Defines whether the window swings inside or away of the	text	1		
		room. The organization that manufactured and / or assembled the		110		
	Manufacturer	the organization that manufactured and / or assembled the item.	text	1		
		Material				
	Frame Material	The primary material used to construct the frame.	text	1		
	External Frame Finish	Finish selection for this object. Here specification of the surface finish for informational purposes.	text	1		
		Finish selection for this object. Here specification of the		8		
	Internal Frame Finish	surface finish for informational purposes.	text	1		
	Sill Material	The primary material used to construct the sill.	text	1		
	Stool Material	The primary material used to construct the stool,	text	1		
	Hardware Material	The primary material of the hardware.	text	/		
	Glass Colour	Color (tint) selection for this glazing. It is given for information purposes only.	text	1		
		Dimensional Data				
	Sil Height	The distance from the top of the floor level to the bottom	numeric	mm		
		side of the object.	10000	N CATER		
	Height	Total outer height of the window lining. Total outer width of the window lining.	numeric	immi immi		
	Opening Height	Height of the wall opening.	numeric	mm		
	Opening Width	Width of the wall opening.	numeric	mm		
	Glass Thickness	Width of glass panel, measured from inside of the panel to the outside i.e. parallel to the window (elevation) plane.	numeric	mm		
	Frame Thickness	Width of panel frame, measured from inside of panel (at glazing) to outside of panel (at lining), i.e. parallel to the	numeric	mm		
	200	window (elevation) plane.				
	Area	Total area of the outer lining of the window. Performance Data	numeric	m ²		
	Has Sill External	Indication whether the window opening has an external sill	boolean	YES/NO		
	Has all External	(TRUE) or not (FALSE).	boolean	TES/NO		
	Has Sill Internal	Indication whether the window opening has an internal sill [TRUE] or not [FALSE].	boolean	YES/NO		
	Is External	Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). If (TRUE) it is an external	8			
			hoolean	VESTNO		
	to calculat	element and faces the outside of the building.	boolean	YES/NO		
	Fire Rating	element and faces the outside of the building. Fire rating for this object. It is given according to the national	boolean	YES/NO		
	Fire Rating	element and faces the outside of the building. Fire rating for this object. It is given according to the national fire safety classification.	numeric	1		
		element and faces the outside of the building. Fire rating for this object. It is given according to the national. fire safety classification. Indication whether the element is tempered (TRUE) or not (FALSE).	Contractory of a			
	Fire Rating	element and faces the outside of the building. Fire rating for this object, it is given according to the national fire safety classification. Indication whether the element is tempered (TRUE) or not (FALSE). Indication whether the glass is layered with other materials	numeric	1		
	Fire Rating Is Tempored Is Laminated	element and faces the outsile of the building. Fire rating for this object, it is given according to the national filtre safety classification, indication whether the element is tempered (TRUE) or not (FALSE). Indication whether the glass is layered with other materials (TRUE) or not (FALSE).	numeric boolean boolean	/ YES/ND YES/NO		
	Fire Rating	element and faces the outsile of the building. Fire rating for this object, it is given according to the national (fire safety classification: indication whether the element is tempered (TRUE) or not. (FALSE). Indication whether the glass is layered with other materials (TRUE) or not.(FALSE). Indication whether the glass is coated with a material (TRUE) or not.(FALSE).	numeric boolean	/ YES/NO		
	Fire Rating Is Tempored Is Laminated	element and faces the outsile of the building. Fire rank for this object, it is given according to the national filtre addy classification. Indication whether the element is tempered (TRUE) or not (FAUSE) or not (FAUSE). Indication whether the glass is loyered with other materials (TRUE) or not (FAUSE). Indication whether the glass is costed with a material (TRUE) indication whether the glass is costed with a material (TRUE) indication whether the glass is costed with a material or not (FAUSE). Indication shether the glass includes a contained wire mesh to prevent threads (TRUE) or not (FAUSE).	numeric boolean boolean	/ YES/ND YES/NO		
	Fire Rating Is Tempored Is Laminated Is Coated Is Wired	element and faces the outside of the building. Fire rating for this object, it is given according to the national fire safety classification. Indication whether the glass is layered with other materials (FRUE) or not (FALSE). Indication whether the glass is coated with a material (TRUE) not (FALSE). Indication whether the glass is coated with a material (TRUE) not (FALSE). Indication whether the glass is coated with a material (TRUE) is prevent break-in (TRUE) or not (FALSE). Indication break	numeric boolean boolean boolean boolean	/ YES/NO YES/NO YES/NO YES/NO		
	Fire Rating Is Tempered Is Laminated Is Coated Is Wired Installation date	element and faces the outside of the building. Fire rating for this object, it is given according to the national fire safety classification. Indication whether the glass is layered with other materials (RLSE). Indication whether the glass is costed with a material (TRUE) or not (FALSE). Indication whether the glass includes a contained wire mesh to prevent break-in (TRUE) or not (FALSE). Instalation Data Instalation Data	numeric boolean boolean boolean boolean date time	/ YES/NO YES/NO YES/NO		
	Fire Rating Is Tempored Is Laminated Is Coated Is Wired	element and faces the outside of the building. Fire rating for this object, it is given according to the national fire safety classification. Indication whether the glass is layered with other materials (FRUE) or not (FALSE). Indication whether the glass is coated with a material (TRUE) not (FALSE). Indication whether the glass is coated with a material (TRUE) not (FALSE). Indication whether the glass is coated with a material (TRUE) is prevent break-in (TRUE) or not (FALSE). Indication break	numeric boolean boolean boolean boolean	/ YES/NO YES/NO YES/NO YES/NO		
	Fire Rating Is Tempored Is Laminated Is Coated Is Wired Installation date Subcontractor Installation Serial Number/Tag	element and faces the outsile of the building. Fire rank per twis object, it is given according to the national fire safety classification. Indication whether the glass is loyered with other materials (FAUS) or not (FAUS). Indication whether the glass is outed with a material (TRUE) or not (FAUS). Indication whether the glass is costed with a material (TRUE) or not (FAUS). Indication whether the glass is costed with a material (TRUE) or not (FAUS). Indication whether the glass is costed with a material (TRUE) or not (FAUS). Indication whether the glass is costed with a material (TRUE) in the face on which the installation was carried out. A firm or person that carries out installation work. The identifier asigned to installation.	numeric boolean boolean boolean date time text numeric	/ YES/NO YES/NO YES/NO YES/NO date / /		
	Fire Rating Is Tempored Is Laminated Is Coated Is Wired Installation date Subcontractor	element and faces the outside of the building. Fire ranks for this object, it is given according to the national filtre safety classification. Indication whether the element is tempered (TRUE) or not: (FALSE). Indication whether the glass is layered with other materials (TRUE) or not (FALSE). Indication whether the glass is closed with a material (TRUE) indication whether the glass is closed with a material (TRUE) indication whether the glass includes a contained wire mesh to prevent break-in (TRUE) or not (FALSE). Installation Data The date on which the installed on work. The identifier assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installed element.	numeric boolean boolean boolean boolean date time text	/ YES/NO YES/NO YES/NO YES/NO date /		
	Fire Rating Is Tempored Is Laminated Is Coated Is Wired Installation date Subcontractor Installation Serial Number/Tag	element and faces the outside of the building. Fire rank for this object, it is given according to the national fire sality classification. Indicators whether the glass is layered with other materials (FALSE). Indication whether the glass is layered with other materials (TRUE) or not (FALSE). Indication whether the glass is coated with a material (TRUE) on not (FALSE). Indication whether the glass is coated with a material (TRUE) on not (FALSE). Indication whether the glass is coated with a material (TRUE) on not (FALSE). Indication whether the glass is coated with a material (TRUE) on not (FALSE). Indication whether the glass includes a contained wire mesh to prevent break-im (TRUE) on or (FALSE). Installation Data The date on which the installation was carried out. The identifier assigned to installation. A person responsible for assuring the quality and meeting the requirements, of the installed ement. Product Data	numeric boolean boolean boolean date time text numeric	/ YES/NO YES/NO YES/NO YES/NO date / /		
	Fire Rating Is Tempored Is Laminated Is Coated Is Wired Installation date Subcontractor Installation Serial Number/Tag	element and faces the outsile of the building. Fire rank for this object, it is given according to the national filtre adapt of this object, it is given according to the national filtre adapt of this object, it is given according to the national (FASE). Indication whether the glass is layered with other materials (TRUE) or not (FASE). Indication whether the glass is outed with a material (TRUE) on not (FASE). Indication whether the glass is could were mash to prevent break-in (TRUE) or not (FASE). Indication whether the installation work. The date on which the installation work. The date on which the installation work. The date on which the installation work. The identifier assigned to installation. A person responsible for assumpt the quality and meeting the requirements of the installed element. Froduct Data An alphanymetric value representing the product, Rem or unit number assigned by the manufacturer of the product.	numeric boolean boolean boolean date time text numeric	/ YES/NO YES/NO YES/NO YES/NO date / /		
	Fire Rating b. Tempored b. Laminated is Coated is Wired installation date Subcontractor Installation Serial Number/Tag Approved By	element and faces the outsile of the building. Fire rank for this object, it is given according to the national filtre addy to show the solution of the solution of the solution indication whether the glass is loyered with other materials (FAUE) or not (FAUE). Indication whether the glass is lowered with other materials (FAUE) or not (FAUE). Indication whether the glass is could with a material (TRUE) indication whether the glass is could with a material (TRUE) indication whether the glass is could with a material (TRUE) indication whether the glass is could with a material (TRUE) indication whether the glass is could with a material (TRUE) indication whether the glass includes a contained wire mesh to preven thread (TRUE) or not (FAUE). Indication shether the installation work. The duce on which the installation work. The ducether assigned to installation. A naiphanument value representing the product Data An alphanument value representing the product. An alphanument value for the name of the manufactured Item as using by the manufacturer.	numeric boolean boolean boolean date time text numeric text	/ VES/NO VES/NO VES/NO VES/NO date / / /		
	Fire Rating Ib Tempored Ib Laminated Is Coated Is Vired Installation date Subcontractor Installation Serial Number/Tag Approved By ModelLabel ModelReference Installation	element and faces the outside of the building. Fire rank for this object, it is given according to the national filtre safety classification. Indication whether the element is tempered (TRUE) or not: (FALSE). Indication whether the glass is layered with other materials (TRUE) or not (FALSE). Indication whether the glass is classed with a material (TRUE) indication whether the glass is classed with a material (TRUE) indication whether the glass is classed with a material (TRUE) indication whether the glass includes a contained wire mesh to prevent break-in (TRUE) or not (FALSE). The date on which the installation of the date on which the installation or the The date on which the installation work. The identifier assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installed element. Involucit Data An alpharumetic value representing the product, item or unit number assigned to the manufactured Item as used by the manufactured.	numeric boolean boolean boolean boolean test numeric test test test test	/ VES/NO VES/NO VES/NO VES/NO date / / / /		
	Fire Rating Is Tempored Is Laminated Is Coated Is Vired Installation date Subcontractor Installation Serial Number/Tag Approved By ModelRabel ModelReference Decral Cost	element and faces the outsile of the building. Fire ranking for this object, it is given according to the national fire safety classification. Indication whether the glass is loyered with enter materials (FAUE) or net (FALS). Indication whether the glass is outed with a material (TRUE) or net (FALS). Indication whether the glass is coated with a material (TRUE) indication whether the glass is coated with a material (TRUE) indication whether the glass is coated with a material (TRUE) or net (FALS). Indication whether the glass is coated with a material (TRUE) indication whether the glass is coated with a material (TRUE) or net (FALS). Indication whether the glass includes a contained wire mesh is prevent threakin (TRUE) or not (FALSE). Indication whether installation work. The date on which the installation work. The date on whether the installation. A parson responsible for assuring the quality and meeting the requirements of the installation. An alphanumeric value representing the product, Rem or unit number assigned by the manufacture of the product. An alphanumeric value representing the product. Module the assigned by the manufacture of the manufacture COL Sum of all costs needed for intaling the element.	numeric boolean boolean boolean boolean boolean boolean boolean test numeric test test test test	/ VES/NO VES/NO VES/NO date / / / / / / / /		
	Fire Rating Ib Tempored Ib Laminated Is Coated Is Vired Installation date Subcontractor Installation Serial Number/Tag Approved By ModelLabel ModelReference Installation	element and faces the outside of the building. Fire rank for this object, it is given according to the national filtre safety classification. Indication whether the element is tempered (TRUE) or not: (FALSE). Indication whether the glass is layered with other materials (TRUE) or not (FALSE). Indication whether the glass is classed with a material (TRUE) indication whether the glass is classed with a material (TRUE) indication whether the glass is classed with a material (TRUE) indication whether the glass includes a contained wire mesh to prevent break-in (TRUE) or not (FALSE). The date on which the installation of the date on which the installation or the the date on which the installation work. The identifier assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installed element. Involucit Data An alpharumetic value representing the product, item or unit number assigned to the manufactured Item as used by the manufactured.	numeric boolean boolean boolean boolean test numeric test test test test	/ VES/NO VES/NO VES/NO VES/NO date / / / /		
	Fire Rating Is Tempored Is Laminated Is Coated Is Vired Installation date Subcontractor Installation Serial Number/Tag Approved By ModelRabel ModelReference Decral Cost	element and faces the outsile of the building. Fire rank for this object, it is given according to the national filtre airly classification. Indication whether the element is tempered (TRUE) or not (FASE). Indication whether the glass is layered with other materials (TRUE) or not (FASE). Indication whether the glass is cluster with a material (TRUE) on not (FASE). Indication whether the glass is cluster with a material (TRUE) on not (FASE). Indication whether the glass is cluster with a material (TRUE) on not (FASE). Indication whether the glass is cluster and the second of the second is prevent break. Intel allocation whether the installation work. The date on which the average of the quark work work is the sequerements of the installation work. An alphanument wake for the name of the manufactured tem as used by the manufacturer. Cost of installing per m ² / m ² , vicularing workforce and	numeric boolean boolean boolean boolean boolean boolean boolean test numeric test test test test	/ VES/NO VES/NO VES/NO date / / / / / / / /		

Information Delivery Mileston	
Purpose:	Architecture
Actor:	
Commetrical information	
Geometrical information: Detail:	Element modelled to
Dimensionality:	3D
Location:	Absolute and relativ
Appearance:	Color fill to distingui
Parametric behaviour:	Not requested
Alphanumeric Information:	
Identification: Information content:	Proper
	2
	Nam
	Туре
	Predefiner
	10.000 (10.00
	Classific
	Descrip
	Building S
	Opening
	1
	Manufac
	URL
	Frame Ma
	External Fran
	Internal Fran
	Sill Mate
	Stool Ma
	Hardware N
	Glass Co
	Sill Hoj
	Heigh
	Widt
	Opening H
	Opening V Glass Thic
	Frame This
	Area
	Has Sill Ex
	Has Sill In
	ls Exter
	Fire Rat
	is Tempt
	20124 22
	Is Lamin
	Is Coat
	Installation
	Subcontr Installation Serial
	Approve
	Warrant
	WarrantyDe
	Warranty St Warranty E
	Condit
	Defec
	Modella
	ModelRefe
	Overall
	Installatio

Phase

Set of document

urate dim	ensions and geometry. Major framing elements, glazing and frame p	profiles are modelle	d.
other build	ding elements		
ifferent ma	sterials		
	Description	Data Type	Units
	Identity Data Primary identifier of an object.	text	1
	Defines the object type, specific information about object.	text	1
0	Holds the entity specific enumeration of predefined types to		
e	further classify the entity	text	1
	Classification code according to chosen classification system.	text	1
	An alphanumeric value providing a concise description	text	1
	of the element.	4041	
V.	Defines the reference building storey. Defines whether the window swings inside or away of the	text	1
	room.	text	1
	The organization that manufactured and / or assembled the item.	test	1
	A valid URL hyperlink to the	text	1
	manufacturer's website. Material	1041	
t.	The primary material used to construct the frame.	text	1
nish	Finish selection for this object. Here specification of the	text	1
nish	surface finish for informational purposes. Finish selection for this object. Here specification of the	000055	
sn	surface finish for informational purposes.	text	1
62	The primary material used to construct the sill. The primary material used to construct the stool.	text	1
tal	The primary material of the hardware.	text	1
	Color (tint) selection for this glazing. It is given for information purposes only.	text	1
	Dimensional Data	2010-23	
	The distance from the top of the floor level to the bottom	numeric	mm
	side of the object. Total outer heigth of the window lining.	numeric	mm
	Total outer width of the window lining.	numeric	mm
t	Height of the wall opening.	numeric	mm
h	Width of the wall opening.	numeric	mm
3	Width of glass panel, measured from inside of the panel to the outside i.e. parallel to the window (elevation) plane.	numeric	mm
15	Width of panel frame, measured from inside of panel (at glazing) to outside of panel (at lining), i.e. parallel to the	numeric	mm
	window (elevation) plane.		m,
	Total area of the outer lining of the window, Performance Data	numeric	m*
pl.	Indication whether the window opening has an external sill	boolean	YES/NO
	(TRUE) or not (FALSE). Indication whether the window opening has an internal sill		0000000
el .	(TRUE) or not (FALSE).	boolean	VES/NO
	Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). If (TRUE) it is an external	boolean	VES/NO
	element and faces the outside of the building.	01203/0256	100000
	Fire rating for this object. It is given according to the national fire safety classification.	numeric	E
	Indication whether the element is tempered (TRUE) or not (FALSE).	boolean	YES/NO
	Indication whether the glass is layered with other materials	boolean	VES/NO
	(TRUE) or not (FALSE). Indication whether the glass is coated with a material (TRUE)	0.50.00992.0 0r0.03000001	C TRANSPORT
	or not (FALSE).	boolean	YES/NO
	Indication whether the glass includes a contained wire mesh to prevent break-in (TRUE) or not (FALSE).	boolean	YES/NO
	Installation Data		
le	The date on which the installation was carried out.	date time	date
nber/Tag	A firm or person that carries out installation work. The identifier assigned to installation.	text	1
weit istR.	A person responsible for assuring the quality and meeting the	numeric text	1
	requirements of the installed element. Warranty Oata	text	1
	The identifier assigned to a warranty.	text	
	An alphanumeric value	0.0076	<u> </u>
ion	providing a concise description of the warranty content and	Text	1
	any exclusions.		
ate	The date on which the warranty commences.	date time	date
ate	The date on which the warranty expires. The physical status of the element at the time of the	date time	date
	inventory or audit, based on the best judgment of those persons familiar with the physical characteristics and condition.	text	1
	Basic imperfection that implies any deformity in component		1
	of a building that is owing to blemished plan, inadequate or flawed workmanship or deficient material and once in a while	Text	1
	any blend of these.		
	Product Data		1
	An alphanumeric value representing the product, item or unit	text	1
	number assigned by the manufacturer of the product.		
	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	/
	Cost	Star Write -	1
	Sum of all costs needed for installing the element. Cost of installing per m ⁴ / m ⁴ , including workforce and	numeric	6
		numeric	E/m², E/m
t	equipment. Cost of material per m ² / m ¹ .	numeric	C/m ² , C/ m ²

Erasmus Mundus Joint Master Degree Programme - ERASMUS+ European Master in Building Information Modelling BIM A+

Information Delivery Milestone:	Design				
Purpose:	Architecture				
Actor:					
200000 C					
bject:	"Roof" / IfcRoof				
eometrical information:					
etail:	Simplified volume representation	. Layers modelled as generic assembly.			
mensionality:	3D				
kation:	Absolute and relative to other bu	ilding elements			
opearance:	Single color fill				
rametric behaviour:	Not requested				
Iphanumeric Information					
entification:					
nformation content:	Property	Description	Bata Type	Units	
		Identity Data			
	Name	Primary identifier of an object.	text	1	
	Type	Defines the object type, specific information about object.	text	1	
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1	
	Classification	Classification code according to chosen classification system.	text	1	
	Level	Defines the reference level.	text	1	
	Material				
	Finish	Finish selection for this object. Here specification of the surface finish for informational purposes.	text	1	
	Thermal/Air Layer	The primary material used as a thermal layer.	text	1	
	Structure	The primary material used to construct the structural layer.	text	1	
	Dimensional Data				
	Thickness	Nominal thickness (or height) of roof layers measured	numeric	30008	
	1.	perpendicular to the roof plane. Nominal thickness (or height) of the thermal layer measured	numeric	mm.	
	Thermal LayerThickness	perpendicular to the roof plane.	numeric	min	
	Slope	Angle between roof surface and horizontal plane.	numeric	degrees	
	Gross Area	Total gross area of the outer surface of the roof, It is the sum of all roof slab gross areas. Roof openings, like sky windows and other openings and cut-outs are not taken into account.	numeric	m²	
	Performance Data				
	is External	Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). If (TRUE) it is an external element and faces the outside of the building.	boolean	YES/NO	
	Fire Rating	Fire rating for this object. It is given according to the national fire safety classification.	numeric	1	
	Is UV Resistent	Indication whether the element is resistent to ultra violet rays / sunlight (TRUE) or not (FALSE).	boolean	YES/NO	
		Cost		-	
	Estimated Unit Cost	Estimated cost of element per m ² / m ² . It is based on the average amount of needed resources (including material, lator and equipment).	numeric	€/m², €/ mª	
	Estimated Cost	Estimated total cost needed for installing, based on estimated unit cost.	numeric	e	
		Phasing			
	Phase	Identifies the phase in which the object is created.	text	1	

Information Delivery Milestone: Purpose:	Architecture						
Actor:							
ACTOF:							
	lup of the part						
Object:	"Roof" / IfcRoof						
Geometrical information:	Them east en andella of the annual state	and an and the Beatland are and an along any set of the set	minut dimensions.				
Detail:	Element modelled to accurate thick modelled to actual dimensions.	mess and geometry. Penetrations and openings are modelled to no	minai dimensions. 5	intrug sources			
Dimensionality:	30						
Location:		Absolute and relative to other building elements					
Appearance		olor fill to distinguish different materials					
Parametric behaviour:	Not requested	requested					
Alphanumeric Information:							
identification:							
nformation content:	Property	Description	Data Type	Units			
		Identity Data		1. 0116			
	Name	Primary identifier of an object.	text	1			
	Туре	Defines the object type, specific information about object.	text	1			
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1			
		further classify the entity		<u> </u>			
	Classification	Gassification code according to chosen classification system. An alphanumeric value	text	/			
	Description	providing a concise description	text	1			
	A Cost	of the element.					
	Level	Defines the reference level.	text	1			
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1			
		Material	could be				
	purch.	Finish selection for this object. Here specification of the					
	Finish	surface finish for informational purposes.	text	1			
	Substrate	The primary material used as a substrate.	text	1			
	Thermal/Air Layer	The primary material used as a thermal layer.	text	1			
	Membrane Layer	The primary material used as a membrane layer.	text	1			
	Structure	The primary material used to construct the structural layer.	text	1			
	Structural Deck	The primary material used as a structure deck.	text	1			
		Dimensional Data					
	Thickness	Nominal thickness (or height) of roof layers measured	numeric	mm			
		perpendicular to the roof plane. Nominal thickness (or height) of the thermal layer measured		-			
	Thermal LayerThickness	perpendicular to the roof plane.	numeric	mm			
	Slope	Angle between roof surface and horizontal plane.	numeric	degrees			
	Gross Area	Total gross area of the outer surface of the roof. It is the sum of all roof slab gross areas. Roof openings, like sky windows and other openings and cut-outs are not taken into account.	numeric	m²			
	Net Area	Total net area of the outer surface of the roof. It is the suma of all roof slab net areas. Boof openings, like sky windows and other openings and cut-outs are taken into account.	numeric	m²			
		Performance Data					
	Is External	Indication whether the element is designed for use in the exterior (TBUE) or not (FALSE). If (TRUE) it is an external element and faces the outside of the building.	boolean	YES/NO			
	Fire Rating	Fire rating for this object. It is given according to the national fire safety classification.	numeric	1			
	Is UV Resistent	Indication whether the element is resistent to ultra violet rays / sunlight (TRUE) or not (FALSE).	boolean	YES/NO			
	A REACTING REACTING	rays / sunight (TRUE) or not (FALSE). Installation Data					
	Installation date	The date on which the installation was carried out.	date time	date			
	Subcontractor	A firm or person that carries out installation work.	text	1			
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1			
	Approved By	A person responsible for assuring the quality and meeting the	text	1			
		requirements of the installed element.	1999	1			
				1 2			
	Overall Cost	Sum of all costs needed for installing the element.	numeric	¢			
	Installation Cost	Cost of installing per m ² / m ³ , including workforce and equipment.	numeric	Q/m², Q/m²			
	Material Cost	Cost of material per m ² / m ³ .	numeric	€/m², €/ m²			
		Phasing					
	Phase	Identifies the phase in which the object is created.	text	1			
Documentation:							

nformation Delivery Milestone:	Operation			
Purpose:	Architecture			
Actor:				
Object:	"Roof" / IfcRoof			
Seometrical information:				
Jetail:	Element modelled to accurate days	ensions. All penetrations modelied to rough-opening dimensions. Fi	raming modellad as a	eparate assembly
100000		Free of the second	1. July 1. Jul	and a second sec
imensionality:	30	dia ana dia mandri		
ocation:	Absolute and relative to other build	the first state of the state of		
opearance:	Color fill to distinguish different ma Not requested	tenas		
arametric behaviour:	Not requested			
Uphanumeric Information:				
dentification: information content:	Property	Description	Data Type	Units
and the content.	Property	Identity Data	Data (ype	Units
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	7
	- coolined the	further classify the entity		· ·
	Classification	Classification code according to chosen classification system.	text	1
		An alphanumeric value		
	Description	providing a concise description	text	1
		of the element.		
	Level	Defines the reference level.	text	1
	Manufacturer	The organization that manufactured and / or assembled the	text	1
		item. A valid URL hyperlink to the	1007257 11097257	
	URL	manufacturer's website.	text	/
		Material		
	Finish	Finish selection for this object. Here specification of the	text	
		surface finish for informational purposes.		1
	Substrate	The primary material used as a substrate.	text	1
	Thermal/Air Layer	The primary material used as a thermal layer.	text	/
	Membrane Layer	The primary material used as a membrane layer.	text	1
	Structure	The primary material used to construct the structural layer.	text	1
	Structural Deck	The primary material used as a structure deck.	text	1
	Structural DECK	Dimensional Data	10.01	1
		Nominal thickness (or height) of roof layers measured	25	
	Thickness	perpendicular to the roof plane.	numeric	mm
	Thermal Layer Thickness	Nominal thickness (or height) of the thermal layer measured	numenc	mm
		perpendicular to the roof plane.		
	Slope	Angle between roof surface and horizontal plane.	numeric	degrees
		Total gross area of the outer surface of the roof. It is the sum		
	Gross Area	of all roof slab gross areas. Roof openings, like sky windows	numeric	m ²
		and other openings and cut-outs are not taken into account.		
		Total net area of the outer surface of the roof. It is the suma		
	Net Arca	of all roof slab net areas. Roof openings, like sky windows and	numeric	m ²
		other openings and cut-outs are taken into account.		
		Performance Data		-
		Indication whether the element is designed for use in the		1
	Is External	exterior (TRUE) or not (FALSE). If (TRUE) it is an external	boolean	YES/NO
		element and faces the outside of the building.		
	Fire Rating	Fire rating for this object. It is given according to the national	numeric	1
	Toplandelin Contain	fire safety classification. Indication whether the element is resistent to ultra violet rays	(Arthurson)	0.000
	is UV Resistent	/ sunlight (TRUE) or not (FALSE).	boolean	YES/NO
		Acoustic rating for this object. It is provided according to the		
	Acoustic Rating	national building code. It indicates the sound transmission	numeric	1
		resistance of this object by an index ratio (instead of	Contraction of the second s	A
		providing full sound absorbtion values). Installation Data		
	Installation data	and the second	date time	
	Installation date Subcontractor	The date on which the installation was carried out. A firm or person that carries out installation work.	date time text	date
		A firm or person that carries out installation work. The Identifier assigned to installation.	numeric	1
	Installation Serial Number/Tag		1107001	
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	/
		Warranty Data		17.
	Warranty ID	The identifier assigned to a warranty.	text	1 7
		An alphanumeric value		
	WarrantyDescription	providing a concise description	text	1
		of the warranty content and any exclusions.		
	Warranty Start Date	The date on which the warranty commences.	date time	date
	Warranty End Date	The date on which the warranty expires.	date time	date
		The physical status of the element at the time of the		
	Condition	inventory or audit, based on the best judgment of those	text	
	Summeron	persons familiar with the physical characteristics and	No. AL	/
		condition.		
		Basic imperfection that implies any deformity in component of a building that is owing to blemished plan, inadequate or		
	Defects	flawed workmanship or deficient material and once in a while	text	1
		any blend of these.		
	1	Cost		
	Overall Cost	Sum of all costs needed for installing the element.	numeric	
	Installation Cost	Cost of installing per m ² / m ³ , including workforce and	numeric	€/m², €/ m
	Material Cost	equipment.		
	Norterial Cost	Cost of material per m ² / m ⁸ .	numeric	€/m², €/ m
		Director		
	Dhave	Phasing Identifies the phase in which the phase is created	lert	1
ocumentation:	Phase	Phasing Identifies the phase in which the object is created.	text	1

Information Delivery Milestone:	Design				
Purpose:	Architecture				
Actor:					
	1.				
Object:	"Stairs" / IfcStairs				
seometrical information:					
letail:	Generic model repres	entation with simplified treads and risers. Model containing nomina	l vertical and plan d	imensions.	
Imensionality:	30				
ocation:	Absolute and relative to other but	uilding elements			
oppearance:	Single color fill				
arametric behaviour:	Not requested				
Iphanumeric Information:					
dentification:					
formation content.	Property	Description	Dota Type	Units	
		Identity Data			
	Name	Primary identifier of an object.	text	1	
	Туре	Defines the object type, specific information about object.	text	1	
	Classification	Classification code according to chosen classification system.	text	1	
		Material			
	Finish	Finish selection for this object. Here specification of the surface finish for informational purposes.	text	1	
	Thermal/Air Layer	The primary material used as a thermal layer.	text	1	
	Structure	The primary material used to construct the structural layer.	text	1	
	Dimensional Data				
	Number of Riser	Total number of the risers included in the stair.	numeric	1	
	Number of Treads	Total number of treads included in the stair.	numeric	1	
	Riser Height	Vertical distance from tread to tread. The riser height is supposed to be equal for all steps of a stair or stair flight.	numeric	mm	
	Tread Length	Horizontal distance from the front of the thread to the front of the next tread. The tread length is supposed to be equal for all steps of the stair or stair flight at the walking line.	numeric	mm	
	Length (Flight)	Total length of the stair flight along the walking line.	numeric	m	
	Gross Volume (Flight)	Total gross volume of the stair flight. Openings, recesses, and projections are not taken into account.	numeric	en.	
	Performance Data				
	is External	Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). If (TRUE) it is an external	boolean	YE5/NO	
	Fire Rating	element and faces the outside of the building. Fire rating for this object. It is given according to the national fire safety classification.	numeric	1	
	Fire Exit	Indication whether this object is designed to serve as an exit in the case of fire (TRUE) or not (FALSE). Here it defines an exit stair in accordance to the national building code	boolean	YES/NO	
	LoadBearing	Indicates whether the object is intended to carry loads (TRUE) or not (FALSE).	numeric	1	
	Has Non Skid Surface	Indication whether the surface finish is designed to prevent slippery (TRUE) or not (FALSE).	boolean	YES/NO	
		Cost			
	Estimated Unit Cost	Estimated cost of element per m ² / m ² . It is based on the average amount of need ed resources (including material, labor and equipment).	numeric	€/m², €/m²	
	Estimated Cost	Estimated total cost needed for installing, based on estimated unit cost	numeric	c	
		Phasing			
	Phase	Identifies the phase in which the object is created.	téxt	T.	
Documentation:					

nformation Delivery Milestone:	Construction						
urpose:	Architecture						
ctor:							
bject:	"Stairs" / IfcStairs						
eometrical information:							
etail:	Element modelled to accurate dime	nsions and geometry. Stair support elements modelled. Accurate p	resentation of hand	rails.			
mensionality:	30						
eation:	Absolute and relative to other build	olute and relative to other building elements					
ppearance:	Color fill to distinguish different ma	terials					
rametric behaviour:	Not requested						
Iphanumeric Information:							
entification:							
formation content:	Property	Description	Data Type	Units			
		Identity Data					
	Neme	Primary identifier of an object.	text	1			
	Type	Defines the object type, specific information about object.	text	1			
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1			
	Classification	Classification code according to chosen classification system.	text	1			
		An alphanumeric value					
	Description	providing a concise description of the element.	text	1			
	Level	Defines the reference level.	text	1			
	Manufacturer	The organization that manufactured and / or assembled the	text	1			
	Manufacturer	item,	text	1			
		Material					
	Finish	Finish selection for this object. Here specification of the	text	1			
	Substrate	surface finish for informational purposes. The primary material used as a substrate.	text	1			
	Thermal/Air Layer	The primary material used as a burstrate.	text	1			
	Membrane Layer	The primary material used as a membrane layer.	text	1			
	2.51			6			
	Structure	The primary material used to construct the structural layer.	text	1			
	Structural Deck	The primary material used as a structure deck.	text	1			
		Dimensional Data					
	Number of Riser	Total number of the risers included in the stair.	numeric	1			
	Number of Treads	Total number of treads included in the stair.	numeric	1			
	Riser Height	Vertical distance from tread to tread. The riser height is supposed to be equal for all steps of a stair or stair flight.	numeric	mm			
	Tread Length	Harizontal distance from the front of the thread to the front of the next tread. The tread length is supposed to be equal for all steps of the stair or stair flight at the walking line.	numeric	mm			
	Longth (Flight)	Total length of the stair flight along the walking line.	numeric	m			
	Gross Volume (Hight)	Total gross volume of the stair flight. Openings, recesses, and projections are not taken into account.	numeric	m*			
	Net Volume (Flight)	Total net volume of the stair flight. Openings and recesses are taken into account by subtraction, projections by addition.	numeric	m³			
		Performance Data					
	ls External	Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). If (TRUE) it is an external	boolean	YES/NO			
	Fire Rating	element and faces the outside of the building. Fire rating for this object, it is given according to the national	numeric	1			
		fire safety classification.	Concernant 1	-			
	Fire Exit	Indication whether this object is designed to serve as an exit in the case of fire [TRUE] or not (FALSE). Here it defines an exit stair in accordance to the national building code	boolean	YES/NO			
	LoadBearing	Indicates whether the object is intended to carry loads (TRUE) or not (FALSE).	numeric	1			
	Has Non Skid Surface	Indication whether the surface finish is designed to prevent slippery (TRUE) or not (FALSE).	boolean	YES/NO			
		Installation Data	20.00				
	Installation date	The date on which the installation was carried out.	date time	date			
	Subcontractor	A firm or person that carries out installation work.	text	1			
	Installation Serial Number/Tag Approved By	The Identifier assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installed element.	numeric text	1			
		Cost					
	Overall Cost	Sum of all costs needed for installing the element.	numeric	¢			
	Installation Cost	Cost of installing per m ² / m ⁴ , including workforce and equipment.	numeric	€/m², €/ m²			
	Material Cost	Cost of material per m ² / m ² .	numeric	€/m², €/ m²			
		Phasing					
	Phase	Identifies the phase in which the object is created.	text	1			

Set of document

Information Delivery Milestone:	Operation
Purpose:	Architecture
Actor:	
Object:	"Stairs" / IfcSta
Geometrical information:	
)etail:	Element modelled to
Dimensionality:	3D
Location:	Absolute and relative
Appearance:	Color fill to distinguish
Parametric behaviour:	Not requested
Alphanumeric Information:	
Identification:	
Information content:	Propert
	Name
	Type
	Predefined
	12
	Classificat
	Descripti
	Level
	Manufacti
	Finish
	Substra
	Thermal/Air
	Membrane
	Structur
	1917-1917
	Structural
	Number of
	Number of 1
	Riser Hei
	Tread Len
	Length (Fl
	Gross Volume
	Net Volume
	ls Extern
	Fire Rati
	Fire Ex
	Fire Ex
	LoadBear
	Has Non Skid
	Installation
	Subcontra
	Installation Serial
	Approved
	Warrant
	WarrantyDes
	Warranty Sta
	Warranty En
	Conditio
	Defect
	16
	1 (J20 1990)
	-
	Overall O
	-
	Installation

irs			
accurate dimi	ensions and geometry. Stair support elements modelled. Accurate p	resentation of hand	rails.
to other build	fing elements		
h different ma	¢erials		
ty .	Description	Data Type	Units
į.	Identity Data Primary identifier of an object		1 2
		text	1
	Defines the object type, specific information about object. noises the entity specific enumeration or predenined types to	text	
Туре	further elserifiction antibu	text	/
ion	Classification code according to chosen classification system.	text	1
on	An alphanumeric value providing a concise description	text	9
_	of the element.	10000	
5 26.575	Defines the reference level. The organization that manufactured and / or assembled the	text	1
arer	item.	text	1
	Material Finish selection for this object. Here specification of the	10000 m 3	
	surface finish for informational purposes.	text	1
e Layer	The primary material used as a substrate. The primary material used as a thermal layer.	text text	
Layer	The primary material used as a thermal layer. The primary material used as a membrane layer.	text	1
e	The primary material used to construct the structural layer.	text	1
Deck	The primary material used as a structure deck.	text	1
	Dimensional Data	seat	x
Riser	Total number of the risers included in the stair.	numeric	1
reads	Total number of treads included in the stair.	numeric.	1
ghit	Vertical distance from tread to tread. The riser height is supposed to be equal for all steps of a stair or stair flight.	numeric	mm
gth	Horizontal distance from the front of the thread to the front of the next tread. The tread length is supposed to be equal for all steps of the stair or stair flight at the walking line.	numeric	mm
ght)	Total length of the stair flight along the walking line.	numeric	m
(Flight)	Total gross volume of the stair flight. Openings, recesses, and	numeric	m ¹
	projections are not taken into account.		
Flight)	Total net volume of the stair flight. Openings and recesses are taken into account by subtraction, projections by addition.	numeric	m ³
	Performance Data		
	Indication whether the element is designed for use in the		
lał	exterior (TRUE) or not (FALSE). If (TRUE) it is an external element and faces the outside of the building.	boolean	YES/NO
ng	Fire rating for this object. It is given according to the national	numeric	1
	fire safety classification.		
	Indication whether this object is designed to serve as an exit in the case of fire (TRUE) or not (FALSE). Here it defines an exit stair in accordance to the rational building code	boolean	YES/NO
ing	Indicates whether the object is intended to carry loads (TRUE)	numeric	1
956 1940-1940	or not (FALSE). Indication whether the surface finish is designed to prevent	1709/2006081	AD.
Surface	slippery (TRUE) or not (FALSE). Installation Data	boolean	YES/NO
date	Installation Dista	date time	date
ctor	A firm or person that carries out installation work.	text	1
iumber/Tag	The Identifier assigned to installation.	numeric	1
Вү	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	/
	Warranty Data		
ID	The identifier assigned to a warranty.	text	1
	An alphanumeric value providing a concise description		Si
aription	of the warranty content and any exclusions,	text	1
rt Date	The date on which the warranty commences.	date time	date
d Date	The date on which the warranty expires.	date time	date
	The physical status of the element at the time of the inventory or audit, based on the best judgment of those		<i>a</i> .
n	persons familiar with the physical characteristics and condition.	tect	1
	Basic imperfection that implies any deformity in component of a building that is owing to blemsished plan, inadequate or flawed workmanship or deficient material and once in a while any blend of these.	text	1
10	Cost		121
st	Sum of all costs needed for installing the element. Cost of installing per m ² / m ² , including workforce and	numeric	¢
Cost	equipment.	numeric	€/m², €/ m³
ost	Cost of material per m ² / m ³ .	numeric	€/m², €/ m³
	Phasing		

Erasmus Mundus Joint Master Degree Programme – ERASMUS+ European Master in Building Information Modelling BIM A+

Information Delivery Milestone:	Design					
Purpose:	Structural					
Actor:						
Object:	"Structural Wall" / IfcWall	1				
Geometrical information:						
Detail	Simplified volume representation. M	Addelled accurately in terms of the overall geometry and thickness.	2			
Dimensionality:	3D					
Location:	Absolute and relative to other build	ing elements				
Appearance:	Single color fill					
Parametric behaviour:	Not requested					
Alphanumeric Information:						
Identification:						
Information content:	Property	Description	Data Type	Units		
		identity Data				
	Name	Primary identifier of an object.	test	1		
	Type	Defines the object type, specific information about object.	text	1		
	Classification	Classification code according to chosen classification system.	text	2		
	Cinstitution		SPAC			
	Material					
	Structural Material	The primary material used to construct the structural layer.	text	1		
	Dimensional Data					
	20-2700	Total nominal length of the wall along the wall center line	10	-		
	Length	(even if different to the wall path).	numeric	m		
		Total nominal width (or thickness) of the wall measured				
	Width	perpendicular to the wall path. It should only be provided, if it	numeric	m		
		is constant along the wall path.				
	Height	Total nominal height of the wall.	numeric	m		
	Gross Side Area	Area of the wall as viewed by an elevation view of the middle plane of the wall, it does not take into account any wall	numeric	m²		
	Gross side krea	modifications (such as openings).	Trainer R.			
		Volume of the wall, without taking into account the openings	numeric	m²		
	Grass Valume	and the connection geometry.	numeric	· m-		
		Performance Data				
	Structural/LoadBearing	Indicates whether the object is intended to carry loads (TRUE)	bcolean	YES/NO		
		or not (FALSE). Structural Data				
	*If ConcreteEstimated	Structural Data				
	Reinforcement quantity	Estimated quantity of reinforcement for the unit.	numeric	kg		
	"If ConcreteEstimated					
	Reinforcement weight per unit of	Estimated weight of reinforcement calculated per unit of volume.	numeric	kg/m3		
	volume	1.00111000				
	Cost					
		Estimated cost of element per m ² / m ³ . It is based on the	12012103A2			
	Estimated Unit Cost	average amount of needed resources (including material, labor and equipment).	numeric	Q/m², Q/m²		
		Estimated total cost needed for installing, based on estimated				
	Estimated Cost	unit cost.	numeric			
		Phasing				
	Phase	Identifies the phase in which the object is created.	text	1		
Documentation:						

nformation Delivery Milestone: urpose:	Construction Structural					
ctor:						
ctor:	1					
	1100 - 1 1 1 1 1 1 1 0 1 1 1 1					
Object:	"Structural Wall" / IfcWall					
Seometrical Information:						
Detail:	elements.	nsions. Penetrations are modelled to nominal dimensions for maj	or wall openings and	d large mechanical		
Dimensionality:	3D					
ocation:	Absolute and relative to other buildi	ine elements				
	Color fill to distinguish different mat					
lopearance:	Not requested	znan				
arametric behaviour:	Not requested					
Aphanumeric Information: Sentification: Iformation content:						
	Property	Description	Data Type	Units		
		Identity Data		-		
	Name	Primary identifier of an object.	text	1		
	Type	Defines the object type, specific information about object.	text	1		
		Holds the entity specific enumeration of predefined types to				
	Predefined Type	holds the entity specific enumeration of predefined types to further classify the entity	text	1		
	51 DECEM		25.75	12		
	Classification	Classification code according to chosen classification system.	text	1		
		An alphanumeric value				
	Description	providing a concise description	text	1		
		of the element.	Den de la			
	Manufacturer	The organization that manufactured and / or assembled the	text	1		
		item.		<u>8</u>		
		Material				
	Structural Material	The primary material used to construct the structural layer.	text	1		
		Dimensional Data		1		
				1		
	Length	Total nominal length of the wall along the wall center line (even if different to the wall path).	numeric	m		
		Total nominal width (or thickness) of the wall measured				
	Width	perpendicular to the wall path. It should only be provided, if	numeric	m		
		it is constant along the wall path.		0.220		
	Height	Total nominal height of the wall.	numeric	m		
		Area of the wall as viewed by an elevation view of the middle				
	Net Side Area	plane. It does take into account all wall modifications (such as	numeric	m²		
		openings).	1.110-2-110-11-2			
	Net Volume	Volume of the wall, after subtracting the openings and after	numeric	ma		
		considering the connection geometry.				
	Gross Side Area	Area of the wall as viewed by an elevation view of the middle plane of the wall. It does not take into account any wall	numeric	m ²		
	Gross Side Area	modifications (such as openings).	numeric	1050		
	1.15 V.12 (01)	Volume of the wall, without taking into account the openings	57			
	Gross Volume	and the connection geometry.	numeric	m ³		
		Performance Data				
	5250 55722 10226 200	Indicates whether the object is intended to carry loads	12022010	1000000		
	Structural/LoadBearing	(TRUE) or not (FALSE).	boolean	YES/NO		
		Structural Data				
	*# Concrete/Reinforcement weight					
	per unit of volume (for each size of	Weight of reinforcement calculated per unit of volume.	numeric	kg/m3		
	the rebar)					
	*If Concrete/Reinforcement quantity		12000000	(CO-1		
	(for each size of the rebar)	Quantity of reinforcement of different size for the unit.	numeric	kg		
	*If Concrete/Total Reinforcement					
	quantity	Total quantity of reinforcement needed for the unit.	numeric	kg		
		Classification of the concrete strength in accordance with the	COMPOSITION OF			
	*If Concrete/Strength Class	concrete design code which is applied in the project.	numeric	Mpa		
		Installation Data				
	Installation date	The date on which the installation was carried out.	date time	date		
	Subcontractor	A firm or person that carries out installation work.	text	1		
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1		
		A person responsible for assuring the quality and meeting the				
	Approved By	requirements of the installed element.	text	1		
		Product Data				
	*if Precast /Production Date	Production date (stripped from form).	date time	date		
		Cost	and the second	and a		
	Over all Cost		Puise and a	6		
	Overall Cost	Sum of all costs needed for installing the element.	numeric			
	Installation Cost	Cost of installing per m ² / m ⁴ , including workforce and equipment,	numeric	€/m², €/ m3		
	Material Cost	Cost of material per m ² / m ³ .	numeric	€/m², €/ m³		
	Material Case	Phasing	numeric	etm., et m.		
		Autorid		-		
	Phase	Identifies the phase in which the object is created.	text	1		

nformation Delivery Milestone:	Operation			
Purpose:	Structural			
Actor:				
	The second secon	P		
)bject:	"Structural Wall" / IfcWall			
eometrical information:	Flamont monialing to come of the	ning All suprovisions' areasts day for an analysis and a for a	units an and the state	land
etall.	Element modelled to accurate dimer 3D	nsions. All connections, ornate details and openings modelled to re	augh-opening dimens	1013.
imensionality: scation:	3D Absolute and relative to other building	na elements		
poearance:	Color fill to distinguish different mate			
arametric behaviour:	Not requested	Citaty .		
Iphanumeric Information:				
entification:				
formation content:	Property	Description	Data Type	Units
		identity Data		
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
			test.	
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	0.7.5		122	
	Classification	Classification code according to chosen classification system.	text	1
		An alphanumeric value	202	10
	Description	providing a concise description of the element.	text	1
		of the element. The organization that manufactured and / or assembled the	20.00	
	Manufacturer	item.	text	1
	URL	A valid URL hyperlink to the	text	1
		manufacturer's website. Material	(17)	11 - 13 E.
			1	
	Structural Material	The primary material used to construct the structural layer.	text	1
		Dimensional Data		
	Length	Total nominal length of the wall along the wall center line	numeric	m
	reißn	(even if different to the wall path).	10112016	392
	Width	Total nominal width (or thickness) of the wall measured perpendicular to the wall path. It should only be provided, if it	numeric	m
	**iciti	is constant along the wall path.	numers.	in
	Height	Total nominal height of the wall.	numeric	m
	NWARADAR	Area of the wall as viewed by an elevation view of the middle		
	Net Side Area	plane. It does take into account all wall modifications (such as	numeric	m ²
	and a second	openings). Volume of the wall, after subtracting the openings and after		
	Net Volume	considering the connection geometry.	numeric	m²
		Area of the wall as viewed by an elevation view of the middle		
	Gross Side Area	plane of the wall. It does not take into account any wall	numeric	m²
	5. W/R	modifications (such as openings). Volume of the wall, without taking into account the openings	- 0 P	
	Gross Volume	and the connection geometry.	numeric	m²
		Performance Data		
	Structural/LoadBearing	Indicates whether the object is intended to carry loads (TRUE)	boolean	YE5/NO
	a constant a constant a	or not (FALSE). Structural Data		
	*If Concrete/Reinforcement weight	Structural Dasa		
		Weight of reinforcement calculated per unit of volume.	numeric	kg/m3
	*if Concrete/Reinforcement quantity (for each size of the rebar)	Quantity of reinforcement of different size for the unit.	numeric	kg
	*if Contrete/Total Reinforcement	Total quantity of reinforcement needed for the unit.	numeric	kg
	quantity		trainer c	14
	*# Concrete/Strength Class	Dissification of the concrete strength in accordance with the concrete design code which is applied in the project. Installation Data	numeric	Мра
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the	text	1
	Abbroad Bi	requirements of the installed element.	test	1
	Contraction of the second second	Product Data	7.42.22.02.02.00	80.00
	*# Precast/Production Date	Production date (stripped from form).	date time	date
		Warranty Data		
	Warranty ID	The identifier assigned to a warranty.	text	1
	WarrantyDescription	An alphanumeric value providing a concise description of the warranty content and	text	1
		any exclusions.		
	Warranty Start Date	The date on which the warranty commences.	date time	date
	Warranty End Date	The date on which the warranty expires.	date time	date
	Condition	The physical status of the element at the time of the inventory or audit, based on the best judgment of those persons familiar with the physical characteristics and condition.	text	1
	Defects	White the physical characteristics and constructs. Basic imperfection that implements any deformity in component of a building that is owing to biemished plan, inadequate or flawed workmanship or deficient material and once in a while any blend of these.	text	1
		Cost		
	Overall Cost	Sum of all costs needed for installing the element.	numeric	6
	Installation Cost	Cost of installing per m ³ / m ⁴ , including workforce and	numeric	€/m², €/ m
	mstandtion cost	equipment.		
			numeric	€/m², €/ m
	Material Cost	Cost of material per m ² / m ⁸ .	Fighting to	
	Material Cost Phase	Use of material per m ⁻ / m ⁻ . Phasing Identifies the phase in which the object is created.	text	1

Information Delivery Milestone:	Design						
Purpose:	Structural						
Actor:							
	A						
Object:	"Column" / IfcColumn						
Seometrical information:							
etall:	Simplified volume representation. N	fodelled accurately in terms of the overall geometry, so that the co	ollisions are avoided.				
imensionality:	3D						
ocation:	Absolute and relative to other building elements						
ppearance:	Single color fill						
arametric behaviour:	Not requested						
lphanumeric Information:							
entification:							
formation content:	Property	Description	Data Type	Units			
		Identity Data		_			
	Name	Primary identifier of an object.	text	1			
		Defines the object type, specific information about object.	text	1			
	Type	Defines the object type, specific information about object.	text	1			
	Classification	Classification code according to chosen classification system.	text	1			
	Level	Defines the reference level.	text.	1			
	Material						
	Structural Material	The primary material used to construct the structural layer.	text	1			
	Dimensional Data						
	Length	Total length of the column not taking into account any cut-					
	Section Shape	out's or other processing features. Specifies the section shape of the column.	text	1			
	Section Dimensions/Diametar	The nominal width / diameter of the column section.	numeric	mm			
	Section Dimensions/Drametar	Total gross volume of the column, not taking into account	numesc	mans			
	"If Concrete/Procest Gross Volume	possible processing features (cut-out's, etc.) or openings and recesses.	numeric	mª			
		Performance Data					
	ls External	Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). If (TRUE) it is an external	boolean	YES/NO			
	Structural/LoadBearing	element and faces the outside of the building. Indicates whether the object is intended to carry loads (TRUE) or not (FALSE).	boolean	YES/NO			
	Fire Rating	Fire rating for the element, it is given according to the national fire safety classification.	numeric	1			
		Structural Data					
	*If ConcreteEstimated Reinforcement quantity	Estimated quantity of reinforcement for the unit.	numeric	kg			
	*# ConcreteEstimated Reinforcement weight per unit of volume	Estimated weight of reinforcement calculated per unit of volume.	numeric	kg/m3			
	Cost						
	Estimated Unit Cost	Estimated cost of element per m ² / m ³ , it is based on the average amount of needed resources [including material, lobor and equipment).	numeric	۲/m², ۲/m			
	Estimated Cost	Estimated total cost needed for installing, based on estimated unit cost.	numeric	£			
		Phasing					
	Phase	identifies the phase in which the object is created.	text	1			
Documentation:	Phase	identifies the phase in which the object is created.	text	1			

Procession Procession Assockes and electric to other building demonst: Coder III to disclopably different nuterials. Coder III to disclopably different nuterials. Coder III to disclopably different nuterials. Internet Information: Rel requested Updamumeric III different nuterials. Name Progenty Description Information: Name Progenty Description Information: Name Progenty Description Information: Name Progenty Description Information code according to cheen classification systemets Progenty classification systemets Description Online account systemets Information code according to cheen classification systemets Description Online account systemets Information code according to cheen classification systemets Description Online account systemets Information code according to count and classification systemets Description Online account systemets Information code account systemets Description Online account systemets Information code account systemets Description			
bject: *Column*/ / fCCOlumn cometrical information: Enveror modelled to accurate dimensions and geometry. Prestrations and connections are monitolatly: Bo color: Aboute and relative to exter building denters: Color fit to discognite dimensions and geometry. Prestrations and connections are monitolatly: Bo color: Color fit to discognite dimensions and geometry. Prestrations and connections are monitolatly: Bo color: Color fit to discognite dimensions Nor regulated Defines the object type, specific information about objec Predefined Type Defines the object type, specific information about objec Predefined Type Unders of the color of predefined type Local Defines the object type, specific information about objec Predefined Type Unders de reference level. Mane/faturer Local Defines the object type, specific information about objec Predefined Type Local Color active color of the strateging Decription Decription Decription Decription The type of file for the strateging Local Decription The type of file for the strateging Structural Material The type of file for the strateging the account part of the object type Local Local Local Constructure Answer Section Dimension(Dimension) about the structural lype vision(File) Structural Material The type of file for the strate column. Section Dimension(Dimension) Vision(File) Structural Material Section Dimension(Dimension) Vision(File) Section Dimension(Dimension) Vision(File) Section Dimension(Dimension) Vision(File) Section Dimension(Dimension) Vision (File) Section Dimension(Dimension) Vision(File) Section Dimension(Dimension) Vision(File) Section Dimension(Dimension) Vision(File) Section Dimension(Dimension) Vision(File) Section Dimension(Dimension) Section Dimension(Dimension) Section Dimension(Dimension) Section			
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Planet Element modelle/or la curule dimension and generative, Prinetrations and connections are in priorizodativy: Planet modelle/or la curule dimension and generative, Prinetrations and connections are in priorizodative; Planet modelle/or la curule dimension and generative, Prinetrations and curumstich priorizodative; Priorizodative; Operations: Color Ris of displayible different muterials moments behaviour; Not requested			
Section and relative to other building stemasts operation: Abalate and relative to other building stemasts operation: Not requested Voltamumeric Information: Not requested Voltamumeric Information: Name Voltamumeric Information about object Name Voltamumeric Information code according to chosen classification syst Classification Classification Classification information code according to chosen classification syst Description: The organization code according to chosen classification syst Total world flucturer Description: Total world flucturer The organization code according to chosen classification syst Structural Material The primary material used to construct the structural lay ordination code according to column not taking into account any columption of the column. Volget Structural Material The primary material used to construct the scheen classification structural lay ordin oreschole actions. Vo	modelled	to cominal dimensi	ions
Absolute and retrice to anther building elements Operation: Color 116 of oblights different nuterials: Instancements (Information:) Ret requested Information content: Property Description Information content: Description Provement content Information content: Description Ording to control description Information content: Description Ording to control description Information: Information: Description Information: Description Define: the reference level. Information: Description Define: the reference level. Information: Description Define: the reference level. Information: Description Define: the reference lev	induction i	ie name a net o	
Instrumentic Information: Normative Endotation Information Content: Progetty Description Information content: Progetty Description Type Defines the object type, specific information about object Predefined Type Predefined Type Initial States (information about object) Predefined Type Defines the object type, specific information about object Predefined Type Initial States (information about object) Classification Classification Classification of the endotes (information about object) Defines the reference level. An abplanumeric value providing is concide accounting to chosen classification syst Defines the reference level. Manufacturer The optimapy material suid to construct the structural lay intervel. Defines the reference level. Manufacturer The optimapy material suid to construct the structural lay intervel. Structural Maneral The ingrain distructure and / or assembled lay intervel. Demetional Data Description freat length The ingrain distructure and / or assembled lay intervel. Structural Prescription freat length of the column not taking into account position freat. Structural Prescription freat length of t			
Not requested Valianument: Information: information context:			
Wahamumeric Information: Property Description Information content: Property Description Information content: Property Description Information content: ProvedInted Type Description Information content: ProvedInted Type Description Information content: Description ProvedInted Type CassIfication Obsolitation code seconding to chosen classification syst Description Offeres the reference level. Manutation: The system of Description Offeres the reference level. Manutation: Structural Material The system of Description Manutation Intersite Structural Material The system of Description Manutation Intersite Structural Material The system of Description and the column. Manutation of the column. Intersite Structural Material The system of Description and the column. Description and the column. Intersite Structural Material The system of Description and the column. Description and the column. Intersite Structural Material The system of Description and the			-
Progency Description Name Primary Identifier of an object. Type Defines the object type, specific information about object the specific information about object type, specific information about object the specific information about object the specific information about object type, specific information about object the specific information about object the specific information about object type, specific information about object the specint information about object the specific information abo			
Name Primary Identifier of an object. Type Primary Identifier of an object. Type Prodense the object type, specific information about object type according to chosen desaffleation syst. Classification Classification object descording to chosen desaffleation syst. Description providence descording to chosen desaffleation syst. Level Defines the object descording to chosen desaffleation syst. Manufacturer The opinational model in the andiation about object descording to chosen desaffleation syst. Manufacturer The opinational model in the andiational desaffleation syst. Manufacturer The opinational model in the andiation on tables in the structural large of the object in the andiational data. Structural Material The primary material used to construct the structural large on the object in the andiation on tables into account and counts' or other groups and model in the object in the andiation of the column station. Structural Material The nominal width / diameter of the column station. "If Concent/Detar Surface Area Total and volume of the column in tables into account post station in the opination account, set is or opening and meet structural Material Nelight Total and volume of the column in the indig into account post station in the object is interested of structure in the object interested of structure in the object interested of structure in the			
Name Primary identifier of an object. Type Defines the object type, specific information about object processes/list information about object about object about about about about the about about about ab		Data Type	Units
Type Defines the object type, specific information about object (Inter-classify the entity specific enumeration of prodefined type (Luther classify the entity) Classification Classification code according to chosen classification syst providing a code description Description An obhanumeric value providing a code description Level Oeffines the reference level. Manufacturer The organization that manufactured and / or assembled item. Structural Material The type of finish for the steel column. Structural Material The type of finish for the steel column. Structural Material The type of finish for the column not taking into account any column or taking into account post processing features (cut-out's, etc.) or openings and nece foral area of the column, taking into account post processing features (cut-out's, etc.) or openings and nece into account postile processing features (cut-out's, etc.) or openings and recessing features (cut-out's, etc.) or openings and recessing features (cut-out's, etc.) or openings and recessing. Velight Total area velopit of the column, not taking into account and account postris processing features (cut-out's, etc.) or openings and			
Predefined Type Holds the entity specific enumeration of predefined type Classification Classification classify the entity Description An alphanumeric value providing a cocice description United to the reference level. Manufacture Manufacture The appreciation Structural Material The providing a cocice description 1 Total length of the common total construct the structural Material Structural Material The providing and the common total construct the structural Material 1 Structural Material The providing total construct the column. 1 Structural Material The providing tota construct the structural material construct the structural function and the column. 1 Structural Material The providing tota construct the structural construct. 1 Structural Material The providing total construct the structural construct. 1 Structural Material The normal width / dismeter of the column. 1 Structural Material The and providing into account post providing into account		text	1
Predefined Type Holds the entity specific enumeration of predefined type Classification Classification classify the entity Description An alphanumeric value providing a cocice description United to the reference level. Manufacture Manufacture The appreciation Structural Material The primation that manufactured and / or assembled level. Structural Material The primation that manufactured and / or assembled level. Structural Material The primation that manufactured and / or assembled level. Structural Material The primation that manufactured and / or assembled level. Structural Material The primation structured and / or assembled level. Structure Structure Amauntary in the structured and / or assembled level. Immensional base counts or other processing features. Structure Structure Amauntary in the structure and primation and presenting features. India structure and the active and a primation manufage primation account post processing features (Lovel and a primation manufage primation account post processing features (Lovel and account post primation account post primation and the account post primation account post primatis. Welght	ect.	text	1
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Description providing a concise description of the element. Level Oxfores the reference level. Manufacturer The crysmicron that manufactured and / or assembled here. Structural Material The primary material used to construct the structural lay infine of finish for the scele column. Structural Material The primary material used to construct the structural lay infine of finish for the scele column. Structural Material The primary material used to construct the structural ray infinish Structural Material The primary material used to construct the structural ray infinish Structural Material The primary material used to column. Structural Material Test and a primary material used to column. Structural Material The structural function of the column in the structural function of the structural function of the column in the structural function of the column in the structural function of the column in the interval processing flaatures (out-out's, etc.) opening and receiver. "If Concerner/Inscal/Net Volume Test and structural is designed for use in the oxietion (TRUE) on at (FALSE). "If Concerner/Inscal/Net Forcess Volume Test and structural is designed for use in the oxietion (TRUE) on at (FALSE). "If Concerner/Inscal/Net Forcess Volume Indication whether the object is indened for the unit. If Concerner/Inscal/Net Forcess	stem.	text	1
Manufacturer The organisation that manufactured and / or assembled intention Manufacturer The primary material used to construct the structural lay *if Seer/Finish The type of finish for the steel column. Immediand Bata Demosional Bata Length Optimisin without any column section. Section Dimension/Diametar The nominal with/ diameter of the column section. *if Concrets/Precise/Net Volumn Total area of the extrusind surface of the column section. *if Concrets/Precise/Net Surface Area Total area of the extrusind surface of the column not taking into account possible processing features (cut-outs, etc.) or openings and receiver. *if Concrets/Precise/Gross Volumn Total area of the column, not taking into account possible processing features (cut-outs, etc.) or openings and receives. *if Concrets/Precise/Gross Volumn Total area of the column, not taking into account, possible processing features (cut-outs, etc.) or openings receives. *if Concrets/Recise/Gross Volumn Total area of the column, not taking into account, possible processing features (cut-outs, etc.) or openings receives. *if Concrets/Recise/Gross Volumn Total area of the column, not taking into account, possible processing features (cut-outs, etc.) or openings receives. *if Concrets/Recise/Gross Volumn Total area of the column, not taking into account possible processing features (cut-outs, e		text	1
Item. Material Structural Material The primary material used to construct the structural lay "# seer/Finish The type of finish for the steel column. Immenioal Structural Material Test length of the column to taking bits. Section shape Specifies the section shape of the column. Section Shape Section Dimension/Diametian The normal with // diameter of the column section. "# Concrete/Procest/Net Volum Total net volume of the column (stating into account posi- processing features) "# Concrete/Procest/Net Volum Total net volume of the column, taking into account posi- processing features (cut-out's, etc.) or openings and rec- sons. "# Concrete/Procest/Guter Surface Area into account possing features (cut-out's, etc.) or openings processes. Total net volght of the column, not traing into account possing processing features (cut-out's, etc.) or openings processes. "# Concrete/Procest/Gross Volume Total net volght of the column, not traing into account possing processing features (cut-out's, etc.) or openings processes. "# Concrete/Procest/Gross Volume Indication whether the element is displayed for use in the acterior (TRUE) or not (FALSE); if (TRUE) or openings processes. "# Concrete/Procest/Gross Volume Indicates whether the element is displayed for use in the acterior (TRUE) or not (FALSE); if (TRUE) or openings processes. "# Concrete/ForceTal/Gross Volume Indicates whether the element is displayed for use in the acterior (TR		text	1
	dthe	text	1
Structural Material The primary material used to construct the structural lay intoser/Finish The type of finish for the scele column. Using th Total length of the column not taking into account any co- out's or other processing features: Section Dimension/Diametar The nominal width / diameter of the column. "If Concent/Process/(Net Volumn "If Concent/Process/(Net Volumn Total net volume of the column, taking into account posi- processing features (cut-out's, etc.) or opinings and tee- pring structural lay of the structure structure in the account posi- processing features (cut-out's, etc.) or opinings and teel net weight of the column without add on parts, tak into account possing informaries (cut-out's, etc.) or opinings recesse. "If Concents/Process/(Gross Volum) Total net weight of the column, not taking processing features (cut-out's, etc.) opening and recesses. "If Concents/Process/(Gross Volum) Total net weight of the column, not taking into account possible processing features (cut-out's, etc.) or openings recesses. "If Concents/Process/(Gross Volum) Total and recesses. "If Concents/Process/(Gross Volum) possible processing features (cut-out's, etc.) or openings recesses. "If Concents/Process/(Gross Volum) Indicates whether the element is an enternal obtain structural/LoadBearing indicates whether the element is a second to take (column) or net (fixEs); if (TMUE) in its an enternal of recessing features (cut-out's, etc.) or openings recesses. "If Concents/Recentorement weight per unit of volume. Fee resting for the clement is			
************************************	-		1
Dimensional Data Length Cetal length of the column not taking into account any column, or other processing features. Section Dimension/Diametar Specifies the section shape of the column. "If Concent/Procest/Net Volume The nominal width / diameter of the column section. "If Concent/Procest/Net Volume Total area of the extruded sorfaces of the column is thing into account possing features (cut-out*, etc.) or openings and nection. "If Concent/Procest/Net Volume Total area of the extruded sorfaces of the column into a generated is into account possible processing features (cut-out*, etc.) or openings and receives. Weight Total area of the column, not taking into account possible processing features (cut-out*, etc.) or openings and receives. "If Concents/Netsel/Gross Volume Desking features (cut-out*, etc.) or openings are cereives. "If Concents/Netsel/Gross Volume Indication subthere the desking of the column, not taking into account possible processing features (cut-out*, etc.) or openings are cereives. Structural/LoadBearing Indication subthere the desking of the column. Structural/LoadBearing Indication subthere the desking of to end in the processing for the end of the relation. "If Concents/Reinforcement weight Per end of the relation. "If Concents/Reinforcement quantity Weight of reinforcement of dilifferent size for the unit.	iver.	text	1
Dimensional Data Length Total length of the column not taking into account any court' or other processing features. Section Dimension/Diametar The nominal width / diameter of the column. "# Concreat/Neck/Net Volume Total net volume of the column, taking into account postports of the column. "# Concreat/Neck/Net Volume Total net volume of the column, taking into account postports and neck "# Concreat/Neck/Net Volume Total net volume of the column, taking into account postports path "# Concreat/Neck/Net Volume Total net volume of the column, not taking into account postports path Weight Total net volume of the column, not taking into account possible processing features (cut out's, etc.) or openings necesses. "# Concreat/Necks/Gross Volume Deprings and recesses. "# Concreat/Necks/Gross Volume Indication whether the designed for use in the oxies of the column, not taking into account possible processing features (cut out's, etc.) or openings necesses. Structura/LoadBearing Indication whether the designed for use in the oxies whether the dosigned for use in the national fire safety classification. "# Concreat/Reinforcement weight Fire rating for the celement. It is given according to the national fire safety classification. "# Concreat/Reinforcement weight Group of the colume. "# Concreat/Reinforcement weight Veight		text	1
definition d			
Section Shape Specifies the section shape of the column. Section Dimension/Diametar The nominal width / diameter of the column, section. "If Concrete/Precent/Net Volume Total net volume of the column, stating in account pass processing features (curved, sect) and young features (curved, sect) on openings and nee processing features (curved), section and young and nee into account the end cap areas), normally generated as perimeter' length. "If Concrete/Precent/Gross Volume Total new weight of the column, not taking into account pass perimeter's length. "If Concrete/Precent/Gross Volume Total area of the column, not taking into account possible processing features (curved), sec.) or openings processes. "If Concrete/Precent/Gross Volume Total area weight of the column, not taking into account possible processing features (curved), sec.) or openings processes. Structural/LoadBearing Total area weight of the column, not taking into account possible processing features (curve) (sec.) or openings processes. Fire Rating Indication webster the elegist is intended to carry loads (f or not fALSE). Fire Rating Performance Data "If Concrete/Renforcement weight per unit of volume (for each size of the relat) Submit of reinforcement of different size for the unit. "If Concrete/Strength Class (concrete design cod which the installation was carried out. Total apartity of reinforcement of different size for the unit. "If Concrete/Str	cut-	numeric	m
Section Dimension,/Diametar Tetal net volume of the column, taking into account pos- section of the column, taking into account pos- accossing features (cut-out", etc.) or oponings and rec- section of the column (not taking) into account pos- into account the end cap areas), normally generated as permeter* * length. Weight Weight Weight Tetal resorts possible processing features (cut-out", etc.) or oponings and recession. *# Concerse/Necras/Gross Volume *# Concerse/Necras/Gross Volume *# Concerse/Necras/Gross Volume *# Concerse/Necras/Gross Volume *# Concerse/Necras/Gross Volume possible processing features (cut-out", etc.) or oponings recesse. Performance Daci Indicates weight of the column, not taking into account to account the existence to account possible recesses. Performance Daci Indicates weight of the column, not taking into account possible processing features (cut-out", etc.) or oponings recesse. Performance Daci Indicates weight the object is intended to carry leads (f or not (FALG) Fire Rating *# Concerse/Reinforcement weight per unit of volume (for each size of *# Concerse/Strength Class Classification of the concerse strength in according to the national flexifier of each size of *# Concerse/Strength Class (carrity of reinforcement calculated per unit of volume. *# Concerse/Strength Class (carrity data) or neinforcement of different size for the unit. *# Concerse/Strength Class (carrity data) of heads (data) in according to the concert design code which is applied in the according with *# Concerse/Strength Class (carrity data) or neinforcement size of the call on the concreate strength in according with *# concerse/Strength Class *# Concerse/Strength Class *# Concerse/Strength Class *# Memory/Strength Class *# Memory/St	\rightarrow	1.25.25	
"If Concess/Precisi/Net Volume Total net volume of the column, taking into account possing features (sur-out", etc.) or openings and nee processing features (sur-out", etc.) or openings and received surfaces of the column (not taking into account possible processing features (sur-out", etc.) or openings and receives. "If Concess/Precisi/Gross Volume Total area of the exhunded surfaces of the column (not taking into account possible processing features (sur-out", etc.) or openings and receives. "If Concess/Precisi/Gross Volume Total area of the exhunded surfaces of the column, not taking into account possible processing features (surface), etc.) opening and receives. "If Concess/Precisi/Gross Volume Total area of the exhunded surfaces (surface), etc.) openings and receives. "If Concess/Precisi/Gross Volume Total area of the column, not taking into account possible processing features (surface), etc.) or spenings areases. "If Concess/Precisi/Gross Volume Total area of the column, not taking into account possible processing features (surface), etc.) or spenings areases. Structura/LoadBearring Indicator whether the object is intended to carry loads (in an etf.ALSE). "If Concests/Reinforcement quantity of reinforcement a designed for use in the action of the relation. "If Concests/Reinforcement quantity of reinforcement of different size for the unit. "If Concests/Reinforcement quantity of reinforcement of different size for the unit. "If Concests/Reinforcement quantity of reinforcement of different size of the tautation. "If Concests/Reinforcement quantity of reinforcement of different size of the tautatio.	\rightarrow	text	/
Concentry/Texact/Veter Southing processing features (cut-out*s, etc.) or openings and nece ***Concentry/Focation/Duter Surface Area into account peersize areas, normally generated as perimeter ** tength. ***Concentry/Focation/Processing features (cut-out*s, etc.) or openings and receives. processing features (cut-out*s, etc.) or openings necessing features (cut-out*s, etc.) or openings necessing. *********************************	-	numeric	mm
*#Concessing/Outer Surface Area Into account the end cap aread, normally generated as generated ** length. Weight Total net weight of the column without add on parts, tak into account possible processing features (cut-out's, etc.) openings and receises. *#Concessing/Reciss/Gross Volume Total net weight of the column, not taking into account possible processing features (cut-out's, etc.) or openings receises. *#Concessing/Reciss/Gross Volume Performance Data Indication whether the element is designed for was in the control of TRUE() on pt(FRLS) if (TRUE) it is factored for any into a control of the head in part (FRLS) if the column, not taking into account possible processing features (cut-out's, etc.) or openings receives. Performance Data Indication whether the element is designed for was in the control of TRUE() on pt(FRLS) if (TRUE) it is factored for any index () or on etc.(FRLS). File Rating File Rating File rating for the element. It is given according to the national for or not (FRLS). *#Concenter/Receiver (for each size of the relate) Weight of reinforcement calculated per unit of volume. The relate) *#Concenter/Strength Class Classification of the concreat strength in according to the concreat strength in according with concenter design code which the installation work. *#Concenter/Strength Class Classification of the concreat strength in according with concenter design code which the installation work. *#Concenter/Strength Class Total quantity of reinforcement needed for the		numeric	m*
Total net weight Total net weight of the column without ado on parts, and openings and receises. ****/********************************		numeric	m²
************************************		numeric	kg
Performance Data Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). (TRUE) it is an external element and faces the outside of the building. Indicates whether the object is intended to carry loads (or not (FALSE). Fire Rating Fire Rating Fire Rating Fire Rating **Concerte/Reinforcement weight per unit of volume (for each size of unit) **Concerte/Reinforcement quantity (for each size of the rebar) **Concerte/Reinforcement quantity of reinforcement of different size for the unit. (for each size of the rebar) **Concerte/Strength Class Concerte design code which is applied in the proyet. Loadbearing capacity Maximum load that can be applied to the structure. Installation date The identifier assigned to unitalition uses carried out. Subcontractor A firm or person that carries out installation work. Installation Serial Number/Tag The identifier assigned to unitallation Koptoved by Approved by Approved by Approved by Sum of all costs needed for installing the element.		numeric	mª
Indication whether the element is designed for use in the other of (TRUE); or not (FALSE); if (TRUE) is an esternal element and faces the outside of the building. Structural/LoadBearing indicates whether the object is intended to carry loads (T or not (FALSE); if TRUE) is an esternal or not (FALSE). Fire Rating Fire Rating Fire Rating Fire rating for the element. It is given according to the national fire safety classification. Structural Data "#Concerter/Reinforcement weight per unit of volume (for each size of the rebar) "#Concerter/Reinforcement quantity (for each size of the rebar) "#Concerter/Reinforcement quantity (for each size of the rebar) "#Concerter/Reinforcement quantity of reinforcement needed for the unit. Loadbearing capacity Maximum load that can be applied in the project. Loadbearing capacity Maximum load that can be applied in the project. Loadbearing capacity Amatimum load that can be applied in the project. Subcontractor A firm or person that carries out installation work. Installation date Approved By Approved By Production Date Production date [stripped from form). Cost C			
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Structural/LoadBearing Indicates whether the object is intended to carry loads (1 or of KASE). Fire Rating Fire rating for the element. It is given according to the national fire safety classification. *#Concerter/Reinforcement equantly (If or each size of the rebar) Weight of reinforcement calculated per unit of volume. *#Concerter/Reinforcement quantly (If or each size of the rebar) Weight of reinforcement calculated per unit of volume. *#Concerter/Reinforcement quantly Total quantity of reinforcement of different size for the unit. *#Concerter/Reinforcement quantity Classification of the concerte strength in accordance with concrete design code which is applied in the project. Loadbearing capacity Maximum load that can be applied to the structure. Installation date The date on which the installation work. Approved By The date on which the installation. Approved By Approved By *#Measur/Production Date Production date (stripped from form). *#Measur/Production Date Production date (stripped from form).		boolean	YES/NO
Fire Rating Fire rating for the element. It is given according to the national fire safety classification. ***Concerte/Reinforcement velopit Structural Data ***Concerte/Reinforcement velopit Structural Data ***Concerte/Reinforcement quantity (for each size of the rebar) Quantity of reinforcement calculated per unit of volume. ************************************	(TRUE)	boolean	YES/NO
Structural Data *** Concrete/Reinforcement weight per unit of volume (for each size of the rebar) Weight of reinforcement calculated per unit of volume. *** Concrete/Reinforcement quantity (for each size of the rebar) Quantity of reinforcement all different size for the unit. *** Concrete/Total Reinforcement quantity Total quantity of reinforcement needed for the unit. *** Concrete/Total Reinforcement quantity Classification of the concrete strength in accordance with concrete design code which a applied to the structure. *** Concrete/Strength Class Classification of the concrete strength in accordance with concrete design code which a applied to the structure. Installation date The date on which the installation work. Installation date The date on which the installation work. Subcontractor A firm or person that carries out installation. Approved By Production date [stripped from form]. *** Mexau/Production Date Production date [stripped from form]. *** Mexau/Production Date Production date [stripped from form]. Cost Sum of all costs needed for installing the element.		numeric	1
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# Concente/Reinforcement quantity (for each size of the retar) * **# Concente/Total Reinforcement countity Total quantity of reinforcement of different size for the unit. **# Concente/Total Reinforcement countity Total quantity of reinforcement needed for the unit. *## Concente/Strength Class Classification of the concrete strength in accordance with concrete design code which a sopiled in the project. Loadbearing capacity Maximum load that can be applied to the structure. Installation date Installation date The date on which the installation work. Installation Serial Number/Tag The identifier assigned to ansultation. Approved By A procent of the installed element. ***Concente/Froaduction Date Production date ****Concenter By Production date (stripped from Incrn). Count Count ************************************		numeric	kg/m3
countity Total quantity of relationment needed to the unit. "#d Concent/Strength Class Classification of the concent strength in accordance wit concere design code which is applied in the project. Loadbearing capacity Maximum bad that can be applied to the structure. Installation date Installation date The date on which the installation work, Installation Senial Neumber/Tag Approved By Approved By requirements of the installation. Product Data "Information" Product Data "Information" Product Data "Information" Cost Overall Cost Sum of all costs needed for installing the element.		numeric	kg
Inconcent/vergen case concerted design code which is applied in the project. Loadbearing capacity Maximum load that can be applied to the structure. Installation date The date on which the installation tota Installation date The date on which the installation work. Subcontractor A firm or person that carries out installation work. Installation Serial Number/Tag The identifier assigned to installation. Approved By A person responsible for assuring the quality and meeting requirements of the installated element. *#If Mecast/Production Date Production date (stripped from form). Cost Sum of all costs needed for installing the element.		numeric	kg
Installation Data Installation Data Installation Data Installation Data Installation Data Subcontractor A firm or person that carries out installation work Installation Senial Number/Trag The identifier assigned to installation. Approved By A person responsible for assuring the quality and meeting requirements of the installed element. Product Data Installation Cost Overall Cost Sum of all costs needed for installing the element.	th the	numeric	Мра
installation date installation date installation date installation date installation date installation Serial Number/Tag Approved By Approved By Production Date information		numeric	kg/m²
Subcontractor Å firm or person that carries out installation work. Installation Senial Number/Tag The identifier assigned to installation. Approved By A person responsible for assuring the quality and meeting requirements of the installed element. **#Incost/Production Date Product Data **#Incost/Production date [stripped from from]. Overall Cost Sum of all costs needed for installing the element.		date time	date
Installation Senial Number/Trag The Identifier assigned to installation. Approved By A prosen responsible for assuming the quality and meeting requirements of the installed element. Product Data ###Neckst/Production Date [stripped from form]. Cost Overall Cost Sum of all costs needed for installing the element.		text	1
Approved By A person responsible for assuring the quality and meeting requirements of the installed element. Product Data *#//Product/Production Date Production date (stripped from form). Cost Overall Cost Sum of all costs needed for installing the element.		numeric	1
Product Data *#/Production Date Production date [stripped from form]. Cost Overall Cost Sum of all costs needed for installing the element.	ng the	text	1
Cost Overall Cost Sum of all costs needed for installing the element.		date time	date
Overall Cost Sum of all costs needed for installing the element.		wate title	June
	- 1	numeric	E
Installation Cost of installing per m ² / m ² , including workforce and equipment.		numeric	¢/m², ¢/ m²
Material Cost Cost of material per m / m ² / m ⁴ .	-	numeric	€/m², €/ m³
Phasing			-
Phase Identifies the phase in which the object is created.		text	/

Information Delivery Milestone:	Operation
Purpose:	Structural
Actor:	1
Object:	"Column" / If
Geometrical information:	Element modelled
Detail:	*Element modelled
Dimensionality:	3D
Location: Appearance:	Absolute and relat Color fill to disting
Parametric behaviour:	Not requested
Alphanumeric Information:	
identification: Information content:	Brea
	Prop
	Na
	Ty
	Predefin
	-
	Classifi
	Descr
	1
	Le
	-
	U
	1
	Structura
	*#Stee
	-
	Len
	Section Dimen
	Section Dimens
	*if Contrete/Prec
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	We
	*If Concrete/Preca
	is Ext
	Structural/L
	Fire R
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	the n *# Concrete/Reinfo
	(for each size
	*IF Concrete/Tota quar
	*# Concrete/S
	Loadbearin
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	WarrantyD
	Warranty
	Warranty
	Cond
	Def
	"If Precast/Pro
	Overa
	Installat
	100000
	Materi
R	Phy
Documentation: Set of documents:	Not requested
and an	

c.1.			
Column			
n accurate dime	sions. All connections, ornate details and openings modelled to a	chual dimensions	
	nchors and other embedded objects.		
ve to other building			
ish different mate	erials		
rty	Description	Data Type	Units
	Identity Data	Data () Pa	- Conta
ne .	Primary identifier of an object.	text	1
e	Defines the object type, specific information about object.	text	1
2	Holds the entity specific enumeration of predefined types to	10000	
d Type	further classify the entity	text	/
stion	Classification code according to chosen classification system.	text	1
	An alphanumeric value		
tion	providing a concise description	text	1
	of the element.		-
9	Defines the reference level.	text	1
turer	The organization that manufactured and / or assembled the item.	text	1
1	A valid URL hyperlink to the	text	1
2	manufacturer's website. Material		<u> </u>
			1
Aaterial	The primary material used to construct the structural layer.	text	1
inish	The type of finish for the steel column.	text	1
	Dimensional Data		1
h	Total length of the column not taking into account any cut- out's or other processing features.	numeric	m
hape	Specifies the section shape of the column.	text	1
ons/Diametar	The nominal width / diameter of the column section.	numeric	mm
200 (850)	Total net volume of the column, taking into account possible		6.1
t/Net Volume	processing features (cut-out's, etc.) or openings and recesses.	numeric	m ³
	Total area of the extruded surfaces of the column (not taking	-	1
Surface Area	into account the end cap areas), normally generated as	numeric	m²
	perimeter * length. Total net weight of the column without add-on parts, taking		
nt.	into account possible processing features (cut-out's, etc.) or	numeric	kg
	openings and recesses.		
/Gross Volume	Total gross volume of the column, not taking into account possible processing features (cut-out's, etc.) or openings and	numeric	ma
Citra Perante	recesses.		
	Performance Data		r
mal	Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). If (TRUE) it is an external	boolean	YES/NO
152	element and faces the outside of the building.	Jourcan	(Laynu)
adBearing	Indicates whether the object is intended to carry loads (TRUE)	boolean	YES/NO
191 1	or not (FALSE). Fire rating for the element. It is given according to the		-
ting	national fire safety classification.	numeric	/
	Structural Data		-
cement weight for each size of	Weight of reinforcement calculated per unit of volume.	numeric	kg/m3
Nor each size or Nar]			-6/ms
cement quantity		-	
f the rebar)	Quantity of reinforcement of different size for the unit.	numeric	ke
Reinforcement	Table with a labeled and a state of the state	2	112
ity	Total quantity of reinforcement needed for the unit.	numeric	kg
ength Class	Classification of the concrete strength in accordance with the concrete design code which is applied in the project.	numeric	Mpa
capacity	concrete design code which is applied in the project. Maximum load that can be applied to the structure.	numeric	kg/m²
	Installation Data		
n date	The date on which the installation was carried out.	date time	date
actor	A firm or person that carries out installation work.	text	1
Number/Tag	The Identifier assigned to installation.	numeric	1
d By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	/
	Warranty Data		
ty ID	The identifier assigned to a warranty.	text	1
	An alphanumeric value		
scription	providing a concise description of the warranty content and	text	/
	any exclusions.		
art Date	The date on which the warranty commences.	date time	date
nd Date	The date on which the warranty expires.	date time	date
	The physical status of the element at the time of the inventory or audit, based on the best judgment of those		
on	persons familiar with the physical characteristics and	text	/
	condition.		
	Basic imperfection that implies any deformity in component of a building that is owing to blemished plan, inadequate or		1
ts	of a building that is owing to blemished plan, inadequate or flawed workmanship or deficient material and once in a while	text	
ь	of a building that is owing to blemished plan, inadequate or flawed workmanship or deficient material and once in a while any blend of these.	text	
	of a building that is owing to blemished plan, inadequate or fawed workmanship or deficient material and once in a while any blend of these. Product Data	201465	1
	of a building that is owing to blemished plan, inadequate or flawed workmanship or deficient material and once in a while any blend of these. Product Data Production date (stripped from form).	text date time	date
uction Date	of a building that is owing to blemished play, inadequate or flowed workmanohip or deficient material and once in a while any blend of these. Product Data Production date (stripped from form). Cost	date time	
uction Date	of a building that is owing to blemished play, inadequate or flaved workmanship or deficient material and once in a while any blend of these. Product Data Production date (stripped from form). Cost Sum of all costs needed for installing the element.	date time numeric	e
uction Date	of a building that is owing to blemished play, inadequate or flaved workmanship or deficient material and once in a while any blend of these. Product Data Production date (stripped from form). Cost Sum of all costs needed for installing the element. Cost of installing per m ² / m ² , including workforce and eucliment.	date time	€ €/m³, €/ m³
ts uction Date Cost Cost Cost	of a building that is owing to blemished play, inadequate or flaved workmanship or deficient material and once in a while any blend of these. Product Data Production date (stripped from form). Cost Sum of all costs needed for installing the element. Cost of installing per m ² / m ² , including workforce and equipment. Cost of material per m / m ² / m ³ .	date time numeric	e
uction Date Cost n Cost	of a building that is owing to blemished play, inadequate or flaved workmanship or deficient material and once in a while any blend of these. Product Data Production date (stripped from form). Cost Sum of all costs needed for installing the element. Cost of installing per m ² / m ² , including workforce and eucliment.	date time numeric numeric	€ €/m³, €/ m³

Erasmus Mundus Joint Master Degree Programme – ERASMUS+ European Master in Building Information Modelling BIM A+

nformation Delivery Milestone:	Design			
Purpose:	Structural			
Actor:				
Object:	"Beam" / IfcBeam			
eometrical information:				
etail:	Simplified volume representation. M	lodelled accurately in terms of the overall geometry, so that the o	ollisions are avoided.	
imensionality:	30			
acation	Absolute and relative to other build	ing elements		
ppearance:	Single color fill			
arametric behaviour:	Not requested			
Iphanumeric Information:				
entification:				
formation content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
				1.1.1
	Туре	Defines the object type, specific information about object.	text	1
	Classification	Classification code according to chosen classification system.	text	1
	Level	Defines the reference level.	text	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
	2	Material		1000 C
	Structural Material	The primary material used to construct the structural layer.	text	1
	JU OCOUR DI MEDICES KEI		ACC .	2 · · · ·
		Dimensional Data		
	*if ShielSection Dimensions	The nominal width / height of the beam section.	numeric	mm
	Length	Total length of the beam, not taking into account any cut- out's or other processing features.	numeric	m
	"# Concrete/PrecastHeight	The nominal height of the beam.	numeric	m
	"If Concrete/PrecastWidth	The nomina width of the beam.	numeric	m
	*If Concrete/Precast Gross Volume	Total gross volume of the beam, not taking into account possible processing features (cut-out's, etc.) or openings and recesses.	numeric	m ^a
	*If Concrete/Gross Surface Area	Total area of the beam, normally generated as perimeter * length + 2 * cross section area. It is the sum of OuterSurfaceArea + [2 KCrossSectionArea] and shall only be given, if the OuterSurfaceArea and CrossSectionArea cannot be established separately.	numeric	m ²
	lî.	Performance Data		
	is External	Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). If (TRUE) it is an external element and faces the outside of the building.	boolean	YES/NO
	Structural/LoadBearing	Indicates whether the object is intended to carry loads (TRUE) or not (FALSE).	boolean	YES/NO
	Fire Rating	Fire rating for the element. It is given according to the national fire safety classification.	numeric	1
		Structural Data		
	*If Concreme/Estimated Reinforcement, quantity	Estimated quantity of reinforcement for the unit.	numeric	kg
	"If Concrete/Estimated Reinforcement weight per unit of volume	Estimated weight of reinforcement calculated per unit of volume.	numeric	kg/m3
		Cost		
	Estimated Unit Cost	Estimated cost of element per m ² / m ³ . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/ m²
	Estimated Cost	Estimated total cost needed for installing, based on estimated unit cost.	numeric	¢
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1

nformation Delivery Milestone:	Construction			
Purpose:	Structural			
Actor:				
Object:	"Beam" / IfcBeam			
Geometrical information:				
Jetail:		nsions and geometry. Penetrations and connections are modelled	to nominal dimensi	ons.
Dimensionality:	30			
ocation:	Absolute and relative to other build			
Appearance: Parametric behaviour:	Color fill to distinguish different mat Not requested	et als		
Aphanumeric Information:	not requested			
dentification:	-			
nformation content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	/
	Description	An alphanumeric value providing a concise description	text	1
	Description	of the element.	iext	× ×
	Level	Defines the reference level.	text	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
		The organization that manufactured and / or assembled the	10000000	
	Manufacturer	item.	text	1
		Material		
	Structural Material	The primary material used to construct the structural layer.	text	7
				1
	*If Steel/Finish	The type of finish for the steel beam. Dimensional Data	text	/
	*If Steel/Section Dimensions	The nominal width / height of the beam section.	numeric	mm
	Length	Total length of the beam, not taking into account any cut-	numeric	m
		out's or other processing features.	102623-056	
	*# Concroto/PrecastHeight	The nominal height of the beam.	numeric	m
	*if Concrete/PrecastWidth	The nomina width of the beam.	numeric	m
	*If Concrete/Precast Net Volume	Total net volume of the beam, taking into account possible processing features (cut-out's, etc.) or openings and recesses.	numeric	m²
	*If Concrets/Outer Surface Area	Total area of the extruded surfaces of the beam (not taking into account the end cap areas), normally generated as perimeter * length.	numeric	m²
		Performance Data		
	h Danual	Indication whether the element is designed for use in the	hasters	WIT BUD
	is External	exterior (TRUE) or not (FALSE). If (TRUE) it is an external element and faces the outside of the building.	boolean	YE5/NO
	Structural / 4D	Indicates whether the object is intended to carry loads	healese	VECANO
	Structural/LoadBearing	(TRUE) or not (FALSE).	boolean	YES/NO
	Fire Rating	Fire rating for the element. It is given according to the national fire safety classification.	numeric	1
		Structural Data		
	*# Concrete/Reinforcement weight			
		Weight of reinforcement calculated per unit of volume.	numeric	kg/m3
		Quantity of reinforcement of different size for the unit.	numeric	kg
	"# Concrete/Total Reinforcement guantity	Total quantity of reinforcement needed for the unit.	numeric	kg
	*if Concrete/Strength Class	Classification of the concrete strength in accordance with the	numeric	Мра
	Loadbearing capacity	concrete design code which is applied in the project. Maximum load that can be applied to the structure.	numeric	kg/m ^a
	second vill cabacity	Installation Data		-gim
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the	text	1
		requirements of the installed element. Product Data		
	*If Procest/Production Date		date time	date
	Therecast/Production Date	Production date (stripped from form).	date time	date
	Overall Cost	Sum of all costs needed for installing the element.	numeric	e
	0.00100.0000	Cost of installing per m ² /m ³ , including workforce and	10	04
	Installation Cost	equipment.	numeric	¢/m², €/ m³
	Material Cost	Cost of material per m / m ³ / m ⁴ .	numeric	€/m², €/ m*
	Phase	Phasing Identifies the phase in which the object is created.	text	

nformation Delivery Milestone:	Operation			
Purpose:	Structural			
Actor:				
	-			
Object:	"Beam" / IfcBeam			
ieometrical information:				
etail:		ensions. All connections, ornate details and openings modelled t	o actual dimensions.	
Connector alla a	*Element may include reinforcing.	anchors and other embedded objects.		
Rimensionality:	Absolute and relative to other build	ing elements		
opearance:	Color fill to distinguish different ma			
arametric behaviour:	Not requested			
Iphanumeric Information:				
entification:				
formation content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
		Holds the entity specific enumeration of predefined types to		144
	Predefined Type	further classify the entity	text	1
	Classification	Classification code according to chosen classification	text	1
		system. An alphanumeric value		
	Description	An alphanumenc value providing a concise description	text	1
	1000 March 1	of the element.	1.13000	85
	Level	Defines the reference level.	text	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
		The organization that manufactured and / or assembled the		
	Manufacturer	item.	text	1
	URL	A valid URL hyperlink to the	text	1
		manufacturer's website. Material		
			10504	100
	Structural Material	The primary material used to construct the structural layer.	text	1
	"If Steel/Finish	The type of finish for the steel beam.	text	1
		Dimensional Data		
	*# Steel/Section Dimensions	The nominal width / height of the beam section.	numeric	mm
	Length	Total length of the beam, not taking into account any cut-	numeric	т
		out's or other processing features.		
	*If Concrete/PrecastHeight	The nominal height of the beam.	numeric	m
	*If Concrete/PrecastWidth	The nomina width of the beam.	numeric	m
	*#Concrete/Precast Net Volume	Total net volume of the beam, taking into account possible processing features (cut-out's, etc.) or openings and	numeric	m³
		recesses.	0.400000000	
		Total area of the extruded surfaces of the beam (not taking		12
	"Il Concrete/Outer Surface Area	into account the end cap areas), normally generated as perimeter * length.	numeric	m ²
		Performance Data		
		Indication whether the element is designed for use in the	-	
	is External	exterior (TRUE) or not (FALSE). If (TRUE) it is an external	boolean	YES/ND
	27 - 18 - 18 - 18 - 18 - 18 - 18	element and faces the outside of the building. Indicates whether the object is intended to carry loads		
	Structural/LoadBearing	(TRUE) or not (FALSE).	boolean	YES/NO
	Fire Rating	Fire rating for the element. It is given according to the	numeric	1
	The Round	national fire safety classification.	manieric	1
		Structural Data		
	"If Concrete/Reinforcement weight per unit of volume (for each size of	Weight of reinforcement calculated per unit of volume.	numeric	kg/m3
	the rebar)		251225	
	*/f Concrete/Reinforcement quantity		1.527.83	10
	(for each size of the rebar)	Quantity of reinforcement of different size for the unit.	numeric	kg
	+if Concrete/Total Reinforcement		Villiander 7	322-1
	quantity	Total quantity of reinforcement needed for the unit.	numeric	kg
	*if Concrete/Strength Class	Classification of the concrete strength in accordance with	numeric	Mpa
		the concrete design code which is applied in the project. Maximum load that can be applied to the structure.	numeric	kg/m²
	Loadbearing capacity	Maximum load that can be applied to the structure.	numeric	kg/m²
	Installation data		date time	date
	Installation date Subcontractor	The date on which the installation was carried out. A firm or person that carries out installation work.	text	date /
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1
		A person responsible for assuring the quality and meeting		
	Approved By	the requirements of the installed element.	text	1
		Warranty Data		
	Warranty ID	The identifier assigned to a warranty.	text	1
		An alphanumeric value		
	WarrantyDescription	providing a concise description of the warranty content and	text	1
		any exclusions.		
	Warranty Start Date	The date on which the warranty commences.	date time	date
	Warranty End Date	The date on which the warranty expires.	date time	date
	1000	The physical status of the element at the time of the inventory or audit, based on the best judgment of those		
	Condition	persons familiar with the physical characteristics and	text	1
		condition.		
	6295	Basic imperfection that implies any deformity in component		
	Defects	of a building that is owing to blemished plan, inadequate or flawed workmanship or deficient material and once in a	text	1
		while any blend of these.		
		Product Data		
	+if Precast/Production Date	Production date (stripped from form).	date time	date
		Cost		
	Overall Cost	Sum of all costs needed for installing the element.	numeric	e
	Installation Cost	Cost of installing per m ² / m ¹ , including workforce and	numeric	€/m², €/m
	Material Cost	equipment. Cost of material per m / m ² / m ³ .	numeric	€/m², €/ n
		Lease or marginar bar m/ m. / m. /	multinet iC	4/07') 6/ B
		Phasing		
			text	1
ocumentation:	Phase	Phasing Identifies the phase in which the object is created.	text	1

Erasmus Mundus Joint Master Degree Programme - ERASMUS+

European Master in Building Information Modelling BIM A+

nformation Delivery Milestone:	Design						
Purpose:	Structural						
Actor:							
Object:	"Slab" / IfcSlab						
Seometrical information:							
etail:		Nodelled accurately in terms of the overall geometry, so that the co	illisions are avoided.				
imensionality:	3D						
ocation:	Absolute and relative to other build	ing elements					
ppearance:	Single color fill						
arametric behaviour:	Not requested						
Aphanumeric Information:	A1.						
dentification:							
nformation content:	Property	Description	Data Type	Units			
		identity Data					
	Name	Primary identifier of an object.	text	1			
	Туре	Defines the object type, specific information about object.	text	1			
	Classification	Classification code according to chosen classification system.	text	/			
	Level	Defines the reference level.	text	1			
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m			
	Material						
	Structural Material	The primary material used to construct the structural layer.	text	1			
	Structural Deck	The primary material used as a structure deck.	text	1			
	Dimensional Data						
	Gross Area	Total area of the extruded area of the slab. Openings, recesses and projections are not taken into account.	numeric	m²			
	Gross Volume	Total gross volume of the slab. Openings, recesses, and projections are not taken into account.	numeric	m ³			
	Tickness	The nominal overall thickness of the slab.	numeric	mm			
	*If Precast/Topping Tickness	The nominal thickness of the topping.	numeric	mm			
	Performance Data						
	Is External	Indication whether the element is designed for use in the exterior (TRUE) or not [FALSE]. If (TRUE) it is an external element and faces the outside of the building.	boolean	YES/NO			
	Structural/LoadBearing	Indicates whether the object is intended to carry loads (TRUE) or not (FALSE).	boolean	YES/NÓ			
	Fire Rating	Fire rating for this object. It is given according to the national fire safety classification.	numeric	1			
		Structural Data					
	*If Concreme/Estimated Reinforcement quantity	Estimated quantity of reinforcement for the unit.	numeric	kg			
	"If Concrete/Estimated Reinforcement weight per unit of volume	Estimated weight of reinforcement calculated per unit of volume.	numeric	kg/m3			
	Cost						
	Estimated Unit Cost	Estimated cost of element per m ² / m ³ . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m³, €/ m³			
	Estimated Cost	Estimated total cost needed for installing, based on estimated unit cost.	numeric	c			
		Phasing	<u>_</u>				
	Phase	Identifies the phase in which the object is created.	text	/			

nformation Delivery Milestone: Purpose:	Construction Structural					
Actor:	and the fail of th					
Object:	"Slab" / IfcSlab					
Geometrical information:						
Oetail:	Element modelled to accurate dime	nsions and geometry. Penetrations and joints are modelled to nor	ninal dimensions. Sk	oping surfaces		
	included					
Dimensionality:	3D					
Location:	Absolute and relative to other build					
Appearance:	Color fill to distinguish different mat	tenais				
Parametric behaviour: Alphanumeric Information:	Not requested					
Identification:						
Information content:	Property	Description	Data Type	Units		
		Identity Data				
	Name	Primary identifier of an object.	text	1		
	Type	Defines the object type, specific information about object.	text	1		
	100-					
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1		
	Classification	Classification code according to chosen classification system.	text	1		
	Classification		1CM	1		
	Description	An alphanumeric value	text	120		
	Description	providing a concise description of the element.	text	1		
	Level	Defines the reference level.	text	1		
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m		
			Train Active			
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1		
		Material				
	Structural Material	The primery meterial used to get the start of the	text	1		
		The primary material used to construct the structural layer.				
	Structural Deck	The primary material used as a structure deck.	text	1		
		Dimensional Data				
	Net Area	Total area of the extruded area of the slab. Openings and recesses are taken into account by subtraction, projections by addition.	numeric	m ²		
	Net Volume	Total net volume of the slab. Openings and recesses are taken into account by subtraction, projections by addition.	numeric	m ³		
	Tickness	The nominal overall thickness of the slab.	numeric	mm		
	*If Precast/Topping Tickness	The nominal thickness of the topping.	numeric	mm		
		Performance Data	in a literature			
		Indication whether the element is designed for use in the				
	Is External	exterior (TRUE) or not (FALSE). If (TRUE) it is an external element and faces the outside of the building.	boolean	YES/NO		
	Structural/LoadBearing	Indicates whether the object is intended to carry loads (TRUE) or not (FALSE)	boolean	YES/NO		
		(TRUE) or not (FALSE). Fire rating for this object. It is given according to the national	10000000			
	Fire Rating	fire safety classification.	numeric	1		
		Structural Data		4		
	*If Concrete/Reinforcement weight per unit of volume (for each size of the rebar)	Weight of reinforcement calculated per unit of volume.	numeric	kg/m3		
	*If Concrete/Reinforcement quantity (for each size of the rebar)	Quantity of reinforcement of different size for the unit.	numeric	ίε		
	"If Concrete/Total Reinforcement quantity	Total quantity of reinforcement needed for the unit.	numeric	kg		
	*If Concrete/Strength Class	Classification of the concrete strength in accordance with the	numeric	Mpa		
		concrete design code which is applied in the project.				
	Span Direction	Installation Data				
	Installation date	The date on which the installation was carried out.	date time	date		
	Subcontractor	A firm or person that carries out installation work.	text	/		
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1		
	and a second sec	A person responsible for assuring the quality and meeting the		176		
	Approved By	requirements of the installed element.	text	1		
		Product Data				
	*if Precast/Production Date	Production date (stripped from form).	date time	date		
		Cost				
	Overall Cost	Sum of all costs needed for installing the element.	numeric	E		
	Installation Cost	Cost of installing per m ² / m ³ , including workforce and equipment.	numeric	€/m², €/ m³		
	Material Cost	Cost of material per m / m ² / m ²	numeric	€/m², €/ m ¹		
		Phasing				
	Phase	Identifies the phase in which the object is created.	text	1		

Information Delivery Milestone:	Operation			
Purpose:	Structural			
Actor:				
	"Clab" / Hetlab			
Object: Segmetrical information	"Slab" / IfcSlab			
Seometrical information:	Element modelled to accurate dimen	ssions. All connections, openings and joints modelled to actual di	mansions.	
Petail:	*Element may include reinforcing an			
Imensionality:	3D			
ocation:	Absolute			
ppearance:	Not requested			
arametric behaviour:	Not requested			
Uphanumeric Information: Sentification:				
formation content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
		Holds the entity specific enumeration of predefined types to		
	Predefined Type	further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
		An alphanumeric value		
	Description	providing a concise description	text	1
		of the element.		
	Level	Defines the reference level.	text	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
	Manufacturer	The organization that manufactured and / or assembled the	text	1
		item.	ICAL.	
	URL	A valid URL hyperlink to the manufacturer's website.	text	1
		Material		
	Structural Material	The primary material used to construct the structural layer.	text	1
				2
	Structural Deck	The primary material used as a structure deck. Dimensional Data	text	/
		Total area of the extruded area of the slab. Openings and		-
	Net Area	recesses are taken into account by subtraction, projections by	numeric	m
		addition.	400000.0-0	
	Net Volume	Total net volume of the slab. Openings and recesses are taken	numeric	m³
	Net volume	into account by subtraction, projections by addition.	numera.	100
	Tickness	The nominal overall thickness of the slab.	numeric	mm
	"If Precast/Topping Tickness	The nominal thickness of the topping.	numeric	mm
		Performance Data		
	Is External	Indication whether the element is designed for use in the	boolean	YES/NO
	IS EXCITUD	exterior (TRUE) or not (FALSE). If (TRUE) it is an external element and faces the outside of the building.	COONSI	reaying
	Structural/LoadBearing	Indicates whether the object is intended to carry loads (TRUE)	boolean	YES/ND
		or not (FALSE).	Loonean	They no
	Fire Rating	Fire rating for this object. It is given according to the national fire safety classification.	numeric	1
		Structural Data	s	0
	*If Concrete/Reinforcement weight	and the second		100/63
	per unit of volume (for each size of the rebar)	Weight of reinforcement calculated per unit of volume.	numeric	kg/m3
	Contract on the Children of States and States and			
	*If Concrete/Reinforcement quantity (for each size of the rebar)	Quantity of reinforcement of different size for the unit.	numeric	kg
	*If Countie/Total Reinforcement			0.000
	guantity	Total quantity of reinforcement needed for the unit.	numeric	kg
	*# Concrete/Strength Class	Classification of the concrete strength in accordance with the	numeric	Моа
	-	concrete design code which is applied in the project.		- militer
	Span Direction	Installation Data		ś.
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	date time text	date /
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1
		A person responsible for assuring the quality and meeting the		10
	Approved By	requirements of the installed element.	text	1
	Contraction of the second second second	Product Data	Martine	n an
	*If Precast/Production Date	Production date (stripped from form).	date time	date
	Warranty ID	Warranty Data The identifier assigned to a warranty.	text	1
	even alley to	An alphanumeric value	unt	/
	WarrantyDescription	providing a concise description	text	ĩ
	wairairycescription	of the warranty content and	IEAI	0
	Warranty Start Date	any exclusions. The date on which the warranty commences.	date time	date
	Warranty End Date	The date on which the warranty expires.	date time	date
		The physical status of the element at the time of the		
	Condition	inventory or audit, based on the best judgment of those persons familiar with the physical characteristics and	text	1
	Defects	condition. Basic imperfection that implies any deformity in component of a building that is owing to blemished plan, inadequate or flowed workmanship or deficient material and once in a while any blend of these.	text	1
		Cost		
	Overall Cost	Sum of all costs needed for installing the element.	numeric	£
	Installation Cost	Cost of installing per m ³ / m ³ , including workforce and	numeric	€/m², €/m
	Material Cost	equipment. Cost of material per m / m ² / m ² .		2
	Winter fall COST	every or matients per my miny mine	numeric	€/m², €/ m
		Phasing		
	Phase	Phasing Identifies the phase in which the object is created.	text	1

Information Delivery Mileston		Design Structural						
Purpose:	Sudctural							
Actor:								
Object:	"Foundation" / IfcFooting	/ IfcPile						
Geometrical information:								
Detail:		Addelled accurately in terms of the overall geometry, so that the co	allisions are avoided.	<u> </u>				
Dimensionality:	3D							
Location:	Absolute and relative to other build	lute and relative to other building elements						
Appearance:	Single color fill	le color fill						
Parametric behaviour:	Not requested	equested						
Alphanumeric Information:								
dentification:								
information content;	Property	Description	Data Type	Units				
		identity Data						
	Name	Primary identifier of an object.	text	1				
	Туре	Defines the object type, specific information about object.	test	1				
	Classification	Classification code according to chosen classification system.	text	1				
	Level	Defines the reference level.	text	1				
		Material						
	Structural Material	The primary material used to construct the structural layer.	text	1				
	Dimensional Data							
	Width	Total nominal width (or thickness) of the footing. For strip footings it is measured perpendicular to the footing path (or Longitudia aws). For other footings it is one of the horizontal elimensions. It should only be provided, if it is constant.	numeric	π				
	Length	Length of the footing, not taking into account any cut-out's or other processing features. For strip footings it is measured along the path, for other footings it is one of the horizontal dimensions. It should only be provided, if it is constant.	numeric	m				
	Height	Total nominal height of the footing.	numeric	m				
	*if ple/Depth	Total length of the pile not taking into account any cut-out's or other processing features.	numeric	m				
	"If pile/Diameter	Diameter of the cross section of the pile.	numeric	m				
	Gross Surface Area	Total area of the footing, normally generated as perimeter * length + 2 * cross section area: It is the sum of OuterSurfaceArea + [2 X CrossSectionArea] and shall only be given, if the OuterSurfaceArea and CrossSectionArea cannot be established separately.	numeric	m²				
	Gross Volume	Total gross volume of the footing, not taking into account possible processing features (cut-out's, etc.) or openings and recesses.	numeric	m*				
		Structural Data						
	*If Concrete/Estimated Reinforcement_quantity	Estimated quantity of reinforcement for the unit.	numeric	kg				
	*it Concerte/Estimated Reinforcement weight per unit of volume	Estimated weight of reinforcement calculated per unit of volume.	numeric	kg/m3				
		Cost						
	Estimated Unit Cost	Estimated cost of element per m ² / m ³ . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/ m³				
	Estimated Cost	Estimated total cost needed for installing, based on estimated unit cost. Phasing	numeric	e				
	Phase	Phasing Identifies the phase in which the object is created.	text	1				

Information Delivery Milestone:	Construction						
Purpose:	Structural						
Actor:							
		2000.00					
Object:	"Foundation" / IfcFooting	/ IfcPile					
Geometrical information:	Phone and all a faile fa						
Detail:	Element modelled to accurate dime included.	nsions and geometry. Penetrations and joints are modelled to no	minal dimensions. 5	oping surfaces			
Dimensionality:	30	ec.					
Location	Absolute and relative to other build	ing elements					
Appearance:	Color fill to distinguish different mat	terials					
Parametric behaviour:	Not requested						
Alphanumeric Information:							
Identification:							
Information content:	Property	Description	Data Type	Units			
		Identity Data					
	Name	Primary identifier of an object.	text	1			
	Type	Defines the object type, specific information about object.	text	1			
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1			
	Classification	Classification code according to chosen classification system.	text	1			
		An alphanumeric value	200.00				
	Description	providing a concise description of the element.	text	7			
	Level	Defines the reference level.	text	1			
	and a second state and second	The organization that manufactured and / or assembled the	-22322				
	Manufacturer	item.	text	1			
		Material					
	Structural Material	The primary material used to construct the structural layer.	text	1			
		Dimensional Data					
	Width	Total nominal width (or thickness) of the footing. For strip footings it is measured perpendicular to the footing path (or longitudial axis). For other footings it is one of the horizontal dimensions. It should only be provided, if it is constant.	numeric	m			
	Length	Length of the footing, not taking into account any cut-out's or other processing features. For strip footings it is measured along the path, for other footings it is one of the horizontal dimensions. It should only be provided, if it is constant.	numeric	m			
	Height	Total nominal height of the footing.	numeric	m			
	tif pile/Depth	Total length of the pile not taking into account any cut-out's	numeric	m			
		or other processing features.	172320152	- 10A			
	*If sile/Diameter	Diameter of the cross section of the pile.	numeric	m			
	*If precent/Cap Height	Total nominal height of the cap.	numeric	m			
	*If precast/Cap Length *If precast/Cap Width	Total nominal length of the cap. Total nominal width of the cap.	numeric	m			
	Gross Surface Area	Total area of the footing, normally generated as perimeter * length + 2 * cross section area. It is the sum of OuterSurfaceArea +(2 x CrossSectionArea) and shall only be given, if the OuterSurfaceArea and CrossSectionArea cannot be established separately.	numeric	m²			
	Duter Surface Area	Total area of the extruded surfaces of the footing (not taking into account the end cap areas), normally generated as perimeter * length.	numeric	m²			
	Net Volume	Total net volume of the footing, taking into account possible processing features (cut-out's, etc.) or openings and necesses.	numeric	m ³			
		Structural Data					
	*If Concrete/Reinforcement weight per unit of volume (for each size of the rebar)	Weight of reinforcement calculated per unit of volume.	numeric	kg/m3			
	*If Concrete/Reinforcement quantity (for each size of the rebar)	Quantity of reinforcement of different size for the unit.	numeric	kg			
	*If Concrete/Total Reinforcement quantity	Total quantity of reinforcement needed for the unit.	numeric	kg			
	Loadbearing capacity	Maximum load that can be applied to the structure.	numeric	kg/m ¹			
	Installation date	The date on which the installation was carried out.	date time	date			
	Subcontractor	A firm or person that carries out installation work.	text	1			
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1			
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1			
		Cost					
	Overall Cost	Sum of all costs needed for installing the element.	numeric	¢			
	Installation Cost	Cost of installing per m ² / m ³ , including workforce and equipment.	numeric	Q/m ² , Q/m ²			
			100000000	Q/m ² , Q/m ⁸			
	Material Cost	Cost of material per m ² / m ⁴ .	numeric				
	Material Cost	Cost of material per m ² / m ⁴ , Phasing		[Qm, Qm			
Documentation:	Material Cost Phase		text	/ /			

tion Delivery Mile

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nformation Delivery Milestone:	Operation			
Purpose:	Structural			
Actor:				
Object:	"Foundation" / IfcFooting /	/ IfcPile		
Geometrical information:				
letail		nsions. All penetrations and joints modelled to actual dimensions.		
	*Element may include reinforcing an	nd post tension elements.		
Rimensionality:	30			
ocation:	Absolute and relative to other buildin			
ppearance:	Color fill to distinguish different mate	eras.		
arametric behaviour:	Not requested			
Iphanumeric Information:				
fentification: formation content:	Property	Description	Data Type	Units
	Property	Identity Data	Cora (Abc	Units
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	/
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1
		further classify the entity		
	Classification	Classification code according to chosen classification system.	test	/
	877 Con March 2000	An alphanumeric value	00000	
	Description	providing a concise description	text	1
	Level	of the element. Defines the reference level.	text	,
		Defines the reference level. The organization that manufactured and / or assembled the		
	Manufacturer	Item.	text	1
	URL	A valid URL hyperlink to the	text	,
	URL	manufacturer's website.	text	1
		Material		
	Structural Material	The primary material used to construct the structural layer.	text	1
		Dimensional Data		
				-
		Total nominal width (or thickness) of the footing. For strip		
	Width	footings it is measured perpendicular to the footing path (or	numoric	m
	0.000000000	longitudial axis). For other footings it is one of the horizontal dimensions. It should only be provided, if it is constant.	3356316552	
		winnerseens, it a routin only be provided, if it is constant.		
		Length of the footing, not taking into account any cut-out's or		
	Length	other processing features. For strip footings it is measured	numeric	m
	congra	along the path, for other footings it is one of the horizontal	the new concerned to the new c	
		dimensions. It should only be provided, if it is constant.		
	Height	Total nominal height of the footing.	numeric	m
	*# pile/Depth	Total length of the pile not taking into account any cut-out's	numeric	m
		or other processing features.		
	*if pile/Diameter	Diameter of the cross section of the pile.	numeric	m
	*If precast/Cap Height	Total nominal height of the cap.	numeric	m
	*if precast/Cap Length	Total nominal length of the cap.	numeric	m
	"If precast/Cap Width	Total nominal width of the cap.	numeric	m
		Total area of the footing, normally generated as perimeter * length + 2 * cross section area. It is the sum of		
	Gross Surface Area	OuterSurfaceArea + (2 x CrossSectionArea) and shall only be	numeric	rm ³
	Statistic and South Statistics	given, if the OuterSurfaceArea and CrossSectionArea cannot	AND CONTRACT	
		be established separately.		
		Total area of the extruded surfaces of the footing (not taking		
	Outer Surface Area	into account the end cap areas), normally generated as	numeric	m²
		perimeter * length.		
	Net Volume	Total net volume of the footing, taking into account possible	numeric	m*
		processing features (cut-out's, etc.) or openings and recesses.		
		Structural Data		
	*#Concrete/Reinforcement weight			1000
		Weight of reinforcement calculated per unit of volume.	numeric	kg/m3
	the rebar)			
	*If Concrete/Reinforcement quantity	Quantity of reinforcement of different size for the unit.	numeric	kg
	(for each size of the rebar]		0.000000000	1.25
	*# Concrete/Total Reinforcement	Total guantity of reinforcement needed for the unit.	numeric	kg
	quantity			
	Loadbearing capacity	Maximum load that can be applied to the structure.	numeric	kg/m ²
		Installation Data	-	
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element	text	1
		requirements of the installed element. Warranty Data		
	Warranty ID	The identifier assigned to a warranty.	text	1
		An alphanumeric value		
	WarrantyDescription	providing a concise description	text	1
	The second	of the warranty content and	and a	1
	illingen free ber	any exclusions.	datas	
	Warranty Start Date	The date on which the warranty commences.	date time	date
	Warranty End Date	The date on which the warranty expires.	date time	date
		The physical status of the element at the time of the inventory or audit, based on the best judgment of those		
	Condition	persons familiar with the physical characteristics and	text	1
		condition.		
		Basic imperfection that implies any deformity in component		
	Defects	of a building that is owing to blemished plan, inadequate or	text	1
		flawed workmanship or deficient material and once in a while		1 1
		any blend of these.		
		- CON	numeric	¢
	Church Fact	Sum of all costs needed for installing the simulation		
	Overall Cost	Sum of all costs needed for installing the element, Cost of installing per m ² / m ³ including workforce and		
	Overall Cost Installation Cost	Sum of all costs needed for installing the element. Cost of installing per m ² / m ³ , including workforce and equipment.	numeric	€/m², €/ m
		Cost of installing per m ² / m ³ , including workforce and		
	Installation Cost	Cost of installing per m ² / m ³ , including workforce and equipment.	numeric	€/m², €/ m €/m², €/ m
	Installation Cost	Cost of installing per m ² / m ³ , including workforce and equipment. Cost of material per m ² / m ³ .	numeric	

 $\underline{ \mbox{Erasmus Mundus Joint Master Degree Programme} - ERASMUS + }$

European Master in Building Information Modelling BIM A+

Information Delivery Milestor Purpose:	ne: Design Mechanical			
	mechanical			
Actor:				
Object:	"Duct" / IfcDuctSegmen	ts		
Seometrical information:				
etail:		ayout with approximate size and shape. Approximate clearances mo	delled.	
imensionality:	30			
ocation	Absolute and relative to other be	uilding elements		
ppearance:	Single color fill			
arametric behaviour:	Not requested			
Iphanumeric Information:				
lentification				
formation content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
	Type	Defines the object type, specific information about object.	text	1
	Classification	Classification code according to chosen classification system.	text	t
		Defines the system for the connectors that are located on air		
	System Classification	terminals, equipment and futures. For example, connectors for air terminals could have a system classification of Supply the Pote of the state future for	text	1
	0	Air, Return Air or Exhaust Air.	text	
	System Type	Type of system e.g., supply air. A name that uniquely defines system. It may be user-defined	text	1
	System Name	or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.		-
	Room Name	Room name where component to be/is installed	text	1
	Room Number	Room number where component to be/is installed.	text	1
	Room Volume	Volume of the room where component to be/is installed.	numeric	m*
	Level	Defines the reference level. Material	text	1
	Material	The primary material used to construct the object.	test	7
	Finish	Finish selection for this object. Here specification of the surface finish for informational purposes.	lext	1
		Dimensional Data		
		Length of the segment, calculated at midpoint of cross-		1
	Length	section, equal to the distance between inlet and outlet ports.	numeric	mm
	Width	The nominal width of the duct segment.	numeric	mm
	Height	The nominal height of the duct segment.	numeric	mm
	Diametar	The nominal diameter of the duct segment.	numeric	mm
	Section Area	Area of the cross section, including the duct itself and the interior flow space	numeric	mm ^r
		Performance Data		
	Has Exterior insulation	TRUE If the duct has exterior insulation. FALSE if it does not.	bolean	YES/NO
	Weight	The weight of the unit.	numeric	kg
		Mechanical Data		
	Air Flow Rate Range	Air flowrate range within which the air terminal is designed to operate.	numeric	Liter/Minute
	Air Flow Rate	The actual airflow rate as designed.	numeric	Liter/Minute
	Temperature Range	Allowable minimum and maximum temperature.	numeric	°C
	Air Pressure	The pressure within a container due to the compression of atmospheric gases.	numeric	Fa
		Cost		
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material,	numeric	ε
	Estimated Unit Cost	labor and equipment). Estimated cost of element per m ² / m ² . It is based on the average amount of needed resources (including material,	numeric	€/m², €/ m³
		labor and equipment).		
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1
locumentation:				

nformation Delivery Milestone:	Construction			
Purpose:	Mechanical			
Actor:				
A DECISION				
Object: Seometrical information:	"Duct" / IfcDuctSegment			
Detail:		shape and spacing. Actual clearancess modelled. Nominal floor an	d wall penetration (elements modeled.
Dimensionality:	3D			
location	Absolute and relative to other build			
Appearance:	Color fill to distinguish different ma	aterials		
Parametric behaviour:	Not requested			
Alphanumeric Information: dentification:				
nformation content:	Property	Description	Data Type	Units
	Troperty	Identity Data	and the	Cuity
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	1994			
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
		Defines the system for the connectors that are located on air		
	System Classification	terminals, equipment and futures. For example, connectors	text	1
		for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.		· · · ·
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined	text	1
		or automatically generated.	10000	
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be/is installed.	text	1
	Room Valume	Volume of the room where component to be/is installed.	numeric	m ^s
	Level	Defines the reference level.	text	1
	Upper End Top Elevation Lower End Bottom Elevation	Defines the elevation at the top of the upper end. Defines the elevation at the bottom of the lower end.	numeric	m
		The organization that manufactured and / or assembled the		
	Manufacturer	item.	text	1
		Material		
	Material	The primary material used to construct the object.	text	1
	Finish	Finish selection for this object. Here specification of the	text	1
		surface finish for informational purposes. Dimensional Date		
			1	1
	Length	Length of the segment, calculated at midpoint of cross- section, equal to the distance between inlet and outlet ports.	numeric	mm
	Width	The nominal width of the duct segment.	numeric	mm
	Height	The nominal height of the duct segment.	numeric	mm
	Diametar	The nominal diameter of the duct segment.	numeric	mm
	Section Area	Area of the cross section, including the duct itself and the	numeric	mm ²
	4955000707024	Interior flow space. Performance Data	and the second	
	Has Exterior Insulation	TRUE if the duct has exterior insulation. FALSE if it does not.	bolean	YES/NO
	Weight	The weight of the unit. Mechanical Data	numeric	kg
		Mechanical Data Air flowrate range within which the air terminal is designed	- 17-01-5.55	
	Air Flow Rate Range	Air flowrate range within which the air terminal is designed to operate.	numeric	Liter/Minute
	Air Flow Rate	The actual airflow rate as designed.	numeric	Liter/Minute
	Temperature Range	Allowable minimum and maximum temperature.	numeric	r
	Air Pressure	The pressure within a container due to the compression of	numeric	Pa
		atmospheric gases. Installation Data		
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	date /
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1
	1	A person responsible for assuring the quality and meeting		
	Approved By	the requirements of the installed element.	text	1
	Overall Cost	Sum of all costs needed for installing.	numeric	6
		Cost of installing one unit, including workforce and	The second second	
	Installation Cost	equipment.	numeric	¢
	Material Cost	Cost of material for installing one unit.	numeric	£
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1
ocumentation:	Plane	inderkines the prime in which the object is created.	1924	

Information Delivery Milestone	: Operation Mechanical
Purpose: Actor:	mechanical
Actor:	
Object:	"Duct" / IfcD
Geometrical information:	
Detail:	Element modelled
Dimensionality:	30
Location:	Absolute and rela
Appearance:	Color fill to disting
Parametric behaviour:	Not requested
Alphanumeric Information:	0
dentification: information content:	
monnedon concent.	Pro
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al			
DuctSegment			
fied to accurate size,	shape and spacing. Actual clearancess modelled. Actual floor and v	wall penetration eler	ments modeled.
relative to other built			
tinguish different ma	aterials		
ñ.			
roperty	Description	Data Type	Units
	identity Data		1
Name	Primary identifier of an object.	text	1
Туре	Defines the object type, specific information about object.	text	1
			,
efined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	/
sification	Classification code according to chosen classification system.	text	1
		MAL.	. <i>K</i> .
	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors		
Classification	for air terminals could have a system classification of Supply	text	1
100 YON YOU	Air, Return Air or Exhaust Air.	10000	-
tem Type	Type of system e.g., supply air.	text	1
tem Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1
Abbreviation	A user-defined abbreviation for a system.	test	1
orn Name	Room name where component to be/is installed.	text	1
m Number	Room number where component to be/is installed.	text.	1
m Volume	Volume of the room where component to be/is installed.	numeric	m ¹
0.1.14.04.00.0000	Defines the reference level.	CT COMPANY	
Level		text	/
d Top Elevation Bottom Elevation	Defines the elevation at the top of the upper end. Defines the elevation at the bottom of the lower end.	numeric	m
	The organization that manufactured and / or assembled the		1
nufacturer	item,	text	1
URL	A valid URL hyperlink to the	text	1
	manufacturer's website. Material		<u> </u>
Aaterial	The primary material used to construct the object.	text	1
in which have the	Finish selection for this object. Here specification of the	000022	1
Finish	surface finish for informational purposes.	text	1
	Dimensional Data		1
- anath	Length of the segment, calculated at midpoint of cross-	numeric	mm
length	section, equal to the distance between inlet and outlet ports.	numenç	mm
Width	The nominal width of the duct segment.	numeric	mm
Height	The nominal height of the duct segment.	numeric	mm
iametar	The nominal diameter of the duct segment.	numeric	mm
tion Area	Area of the cross section, including the duct itself and the	numeric	mm ²
	Interior flow space. Performance Data		1
		1404000	
erior Insulation	TRUE If the duct has exterior insulation. FALSE If it does not.	bolean	YES/NO
Weight	The weight of the unit.	numeric	kg
	Mechanical Data		1
w Rate Range	Air flowrate range within which the air terminal is designed to	numeric	Liter/Minute
Flow Rate	operate. The actual airflow rate as designed.	numaric	Liter/Minute
rature Range	Allowable minimum and maximum temperature.	numeric	°C
Pressure	The pressure within a container due to the compression of	numeric	Pa
, .coure	atmospheric gases.	numeric	(ra
	Installation Data		1
lation date	The date on which the installation was carried out.	date time	date
contractor	A firm or person that carries out installation work.	text	
Serial Number/Tag	The identifier assigned to installation. A person responsible for assuring the quality and meeting the	numeric	1
proved By	requirements of the installed element.	text	1
	Warranty Data		
irranty ID	The identifier assigned to a warranty.	text	1
	An alphanumeric value		
ty Description	providing a concise description of the warranty content and	text	1
	any exclusions.	an ann Allanni C	
ity Start Date	The date on which the warranty commences.	date time	date
nty End Date	The date on which the warranty expires.	date time	dəte
	The physical status of the element at the time of the		
indition	inventory or audit, based on the best judgment of those persons familiar with the physical characteristics and	text	/
	condition.		
	Basic imperfection that implies any deformity in component		
Defects	of a building that is owing to blemished plan, inadequate or	text	1
	flawed workmanship or deficient material and once in a while any blend of these.		
	Cost		
	Sum of all costs needed for installing.	numeric	E
erall Cost		100000	e
1999 - March	Cost of installing one unit, including workforce and	numeric	1 1
llation Cost	equipment.	2002/2002	-
llation Cost	equipment. Cost of material for installing one unit.	numeric	¢
erall Cost Bation Cost terial Cost Phase	equipment.	2002/2002	e

nformation Delivery Mileston	e: Design Mechanical								
Purpose:	Mechanical								
Actor:									
Object:	"Air Terminal" / IfcAirTe	rminal							
Seometrical information:									
Detail:		ayout with approximate size and shape. Approximate clearances more	delled.						
Dimensionality:	3D								
Location:	Absolute and relative to other bu	ilding elements							
Appearance:	Single color fill								
Parametric behaviour:	Not requested								
Alphanumeric information:									
dentification									
nformation content:	Property	Description	Data Type	Units					
		Identity Data							
	Name	Primary identifier of an object.	text	1					
			text						
	Туре	Defines the object type, specific information about object.	text	/					
	Classification	Classification code according to chosen classification system.	text	1					
	Classification	Classification code according to chosen classification system.	text	1					
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	1					
	System Type	Type of system e.g., supply air.	text	1					
		A name that uniquely defines system. It may be user-defined							
	System Name	or automatically generated.	text	1					
	System Abbreviation	A user-defined abbreviation for a system.	text	1					
	Room Name	Room name where component to be/is installed.	text	1					
	Room Number	Room number where component to be/is installed.	lext	1					
	Room Volume	Volume of the room where component to be/is installed.	numeric	m ³					
	Level	Defines the reference level.	text	1					
		Material							
	Material	The primary material used to construct the object.	text	1					
	Finish	The type of finish for the air terminal.	text	1					
		Dimensional Data							
	Width	The nominal width of the air terminal.	numeric	m					
	Height	The nominal height of the air terminal,	numeric	m					
	DuctWidth	The nominal width of the duct.	numeric	m					
	DuctHeight	The nominal height of the air terminal.	numeric	m					
	Volume	The nominal width of the air terminal.	numeric	m ³					
		Performance Data		ФЛ					
	Has Thermal Insulation	IF TRUE, the air terminal has thermal insulation.	boolean	YES/NO					
	Has Sound Attenuator	IF TRUE, the air terminal has sound attenuation.	boolean	YES/NO					
	Has integral Control	If TRUE, a self powered temperature control is included in the AirTerminal.	boolean	YES/NO					
		Mechanical Data							
	AirFlow Rate Range	Air flowrate range within which the air terminal is designed	numeric	Uter/Minute					
		to operate.							
	AirFlow Rate	The actual airflow rate as designed.	numeric	Liter/Minute					
	Temperature Range	Temperature range within which the air terminal is designed to operate.	numeric	.с					
	Neck Area	Neck area of the air terminal.	numeric	mm ²					
	Throw Length	The horizontal or vertical axial distance an airstream travels ofter leaving an Air Terminal before the maximum stream velocity is reduced to a specified terminal velocity under terchimed coefficient if the under scheder of the Air Elements	numeric	mm					
		isothermal conditions at the upper value of the Air Flow rate Range.							
	Maximum Sound Level	The average maximum noise level.	numeric	dB					
	Pressure Drop	Drop in total pressure between inlet and outlet at nominal air- flow rate.	numeric						
	Airflow Type	Enumeration defining the functional type of air flow through the terminal.	text	1					
		Installation Data		-					
	Mounting Type	The way the air terminal is mounted to the ceiling, wall, etc.	text	1					
		Cost	0703						
		Estimated cost for installing one unit. It is based on the		1					
	Estimated Cost	average amount of needed resources (including material, labor and equipment).	numeric	د					
	Estimated Unit Cost	Estimated cost of element per m ² / m ³ . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	¢/m², ¢/m²					
		Phasing							
	Phase	Identifies the phase in which the object is created.	text	1					
	rnibe	contraction of the business of the standard of the standard							

NAME AND ADDRESS OF A DESCRIPTION OF A D	Construction			
Purpose:	Mechanical			
Actor:				
Object:	"Air Terminal" / IfcAirTern	minal		
Seometrical information:	1			
Detail	Element modelled to pomical size	shape and spacing. Actual clearancess modelled. Nominal floor an	dural constration o	lamente modele
25.25		stape and spacing. Actuar clearancess modelied, Normina Noci and	a wae perecation e	penients modere
Dimensionality	30			
location:	Absolute and relative to other build			
Appearance:	Color fill to distinguish different ma	sterials		
Parametric behaviour:	Not requested			
Nphanumeric Information:				
dentification:				~
nformation content:	Property	Description	Data Type	Units
		Identity Data		80
	Name	Primary identifier of an object.	text	1
	7	Defines the object type, specific information about object.	text	1
	Туре		text	
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1
		further classify the entity		
	Classification	Classification code according to chosen classification system.	text	1
		Defines the system for the connectors that are located on air		-
		terminals, equipment and fixtures. For example, connectors		
	System Classification	for air terminals could have a system classification of Supply	text	1
		Air, Return Air or Exhaust Air.		
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined	text	1
	-	or automatically generated.		-
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be/is installed.	text	1
	Room Valume	Volume of the room where component to be/is installed.	numeric	m³
				-
	Description	An alphanumeric value		1.12
	Description	providing a concise description of the element.	text	1
	C		1	-
	Elevation from Level	Specifies the elevation of the element relative to its level.	numeric	m
	Level	Defines the reference level.	text	1
		The organization that manufactured and / or assembled the		1 0
	Manufacturer	item.	text	1
		Material		-
	Material	The primary material used to construct the object.	test	1
	Finish	The type of finish for the air terminal.	text	1
		Dimensional Data		
	Width	The nominal width of the air terminal.	numeric	mm
	Height	The nominal height of the air terminal.	numeric	mm
	DuctWidth	The nominal width of the duct.	numeric	(T100
	DuctHeight		numeric	1
		The nominal height of the air terminal.		mm
				-
	Volume	The nominal width of the air terminal.	numeric	m³
	Volume	Performance Data	numeric	
	Volume Has Thermal Insulation	Performance Data If TRUE, the air terminal has thermal insulation.	numeric boolean	VES/NO
	Volume	Performance Data If TRUE, the air terminal has thermal insulation. If TRUE, the air terminal has sound attenuation.	numeric	
	Volume Has Thermal Insulation Has Sound Attenuator	Performance Data If TRUE, the air terminal has themail insulation. If TRUE, the air terminal has sound attenuation. If TRUE, self powered temperature control is included in the	numeric boolean	VES/NO VES/NO
	Volume Has Thermal Insulation	Performance Data If TRUE, the air terminal has thermal insulation. If TRUE, the air terminal has sound attenuation. If TRUE, a self powered temperature control is included in the Air/terminal.	numeric boolean boolean	VES/NO VES/NO
	Volume Has Thermal Insulation Has Sound Attenuator	Performance Data If TRUE, the air terminal has thermal insulation. If TRUE, the air terminal has sound attenuation. If TRUE, a self powered temperature control is included in the AirTerminal. Mechanical Data	numeric boolean boolean	VES/NO VES/NO
	Volume Has Thermal Insulation Has Sound Attenuator	Performance Data If TRUE, the air terminal has shernal insulation. If TRUE, the air terminal has sound attenuation. If TRUE, a self powered temperature control is included in the AirTerminal. Mechanical Data Air Rowrate range within which the air terminal is designed	numeric boolean boolean	VES/NO YES/NO YES/NO
	Volume Has Thermal Insulation Has Sound Attenuator Has Integral Control AirFlow Rate Range	Performance Data If TRUE, the air terminal has thermal insulation. If TRUE, the air terminal has solid attenuation. If TRUE, a self powered temperature control is included in the Air/Terminal. Michanical Data Air flowrate range within which the air terminal is designed to operate.	numeric boolean boolean boolean numeric	VES/NO VES/NO VES/NO Liter/Minu
	Volume Has Thermal Insulation Has Sound Attenuator Has Integral Control	Performance Data If TRUE, the air terminal insulation, If TRUE, the air terminal has solend attenuation. If TRUE, a self powered temperature control is included in the AirTerminal. Mechanical Data for downate range within which the air terminal is designed to operate. The actual airflow rate as designed.	numeric boolean boolean boolean	VES/NO VES/NO VES/NO Liter/Minu
	Volume Has Thermal Insulation Has Sound Attenuator Has Integral Control AirFlow Rate Range	Performance Data If TRUE, the air terminal has shernal insulation. If TRUE, the air terminal has sound attenuation. If TRUE, are affer powered temperature control is included in the AirTerminal. Mechanical Data Air Rowrate range within which the air terminal is designed to operate. The actual airflow rate as designed. Temperature range within which the dar terminal is designed	numeric boolean boolean boolean numeric	VES/NO VES/NO VES/NO Liter/Minu
	Volume Has Thermal Insulation Has Sound Attenuator Has Integral Control AirFlow Rate Range AirFlow Rate Temperature Range	Performance Data If TRUE, the air terminal has thermal insulation. If TRUE, the air terminal has sound attenuation. If TRUE, as self-powered temperature control is included in the Ariterminal. Mechanical Data Air flowrate range within which the air terminal is designed to operate. The actual airflow rate as designed. Temportary range within which the air terminal is designed to operate.	numeric boolean boolean boolean numeric numeric numeric	VES/NO VES/NO VES/NO Liter/Minu Liter/Minu
	Volume Has Thermal Insulation Has Sound Attenuator Has Integral Control AirFlow Rate Range AirFlow Rate	Performance Data If TRUE, the air terminal has thermal insulation. If TRUE, the air terminal has sound attenuation. If TRUE, a self powered temperature cortrol is included in the AirTerminal. Mechanical Data Air Reverse range within which the air terminal is designed to operate. Temperature range within which the air terminal is designed to operate. Recovered and the air terminal is designed to operate. Recovered the air terminal is designed to operate. Recovered the air terminal.	numeric boolean boolean boolean numeric numeric	VES/NO VES/NO VES/NO Liter/Minu Liter/Minu
	Volume Has Thermal Insulation Has Sound Attenuator Has Integral Control AirFlow Rate Range AirFlow Rate Temperature Range	Performance Deta If TRUE, the air terminal has thermal insulation. If TRUE, the air terminal has solid attenuation. If TRUE, the air terminal has solid attenuation. If TRUE, a self powered temperature control is included in the AirTerminal. Michaenical Data Air Rowrate range within which the air terminal is designed to operate. Rechare of the air terminal. Rechare of the air terminal.	numeric boolean boolean boolean numeric numeric numeric	VES/NO VES/NO VES/NO Liter/Minu Liter/Minu 2C
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	Volume Hes Thermal Insulation Has Sound Attenuator Has Integral Control AirFlow Rate Range AirFlow Rate Temperature Range Neck Area	Performance Data IT TRUE, the air terminal has thermal insulation. If TRUE, the air terminal has submit attenuation. If TRUE, the air terminal has sound attenuation. If TRUE, a self-powered temperature control is included in the AirTerminal. Mechanical Data Air flowrate range within which the air terminal is designed to operate. The actual airflow rate as designed. Temportaure range within which the air terminal is designed to operate. Neck area of the air terminal. The horizontal or vertical axial distance an airstream travels after leaving in Air Terminal before the maximum stream velocity is raduced to a specified terminal velocity under isothermal conditions the upper value of the Air Thow rate	numeric boolean boolean humeric numeric numeric numeric	VES/NO VES/NO VES/NO Uter/Minu Uter/Minu "C mm ²
	Volume Has Thermal Insulation Has Sound Attenuator Has Integral Control AirFlow Rate Range AirFlow Rate Range Neck Area Therow Langth Maximum Sound Level	Performance Data If TRUE, the air terminal has thermal insulation. If TRUE, the air terminal has thermal insulation. If TRUE, the air terminal has some attenuation. If TRUE, a self powered temperature control is included in the Air/Terminal. Michanical Data Air flowrate range within which the air terminal is designed to operate. If the actual airflow rate as designed. The actual airflow rate as designed. The actual airflow rate as designed. The horizontal or vertical axial distance an airstream travels after learing an Air Terminal before the maximum stream velocity is radued to as a specifies minuin velocity under toothort air conduct as a specifies minuin velocity ander toothort air conduct as a specifies minuin velocity under toothorts and as a specifies minuin velocity under toothorts.	numeric boolean boolean numeric numeric numeric numeric numeric numeric	VES/NO VES/NO VES/NO Uter/Minu Uter/Minu "C mm"
	Volume Has Thermal Insulation Has Sound Attenuator Has Integral Control AirFlow Rate Range AirFlow Rate Range Neck Area Throw Length	Performance Data IT TRUE, the air terminal has thermal insulation. IT TRUE, the air terminal has sound attenuation. IT TRUE, the air terminal has designed to operate. The actual airflow rate as designed. Temporatum range within which the air terminal is designed to operate. Neck area of the air terminal. Neck area of the air terminal. Neck area of the air terminal. Neck area of the air terminal before the maximum stream velocity is routed to a specific terminal velocity in routed to a specific terminal velocity under isothermal conditions at the upper value of the Air Flow rate Range. The average maximum noise level. Drog in total pressure between intex and outlet at nominal air flow rate.	numeric boolean boolean numeric numeric numeric numeric numeric	VES/NO VES/NO VES/NO Uter/Minu Uter/Minu "C mm"
	Volume Has Thermal Insulation Has Sound Attenuator Has Integral Control AirFlow Rate Range AirFlow Rate Range Neck Area Therow Langth Maximum Sound Level	Performance Data IT TRUE, the air terminal has thermal insulation. If TRUE, the air terminal has sound attenuation. If TRUE, the air terminal has sound attenuation. If TRUE, a self powered temperature control is included in the AirTerminal. Mechanical Data Air flowrate range within which the air terminal is designed to operate. The actual airflow rate as designed. Temportare range within which the air terminal is designed to operate. The actual airflow rate as designed. The horizontal or vertical axial distance an airstream travels after leaving on Air Terminal before the maximum stream velocity is raduced to a specifies terminal velocity under isothermal conditions at the upper value of the Air Flowrate Range. The average maximum noise level. Drop in total pressure between inter and outlet at nominal air flow rite. Enumeration defining the functional type of air flow through	numeric boolean boolean numeric numeric numeric numeric numeric numeric	VES/NO VES/NO VES/NO Uter/Minu Uter/Minu "C mm"
	Volume Has Thermal Insulation Has Sound Attenuator Has Integral Control AirFlow Rate Range AirFlow Rate Range AirFlow Rate Range Neck Area Therow Length Maximum Sound Level Pressure Drop	Performance Data IT TRUE, the air terminal has thermal insulation. IT TRUE, the air terminal has sound attenuation. If TRUE, the air terminal has sound attenuation. If TRUE, a self powered temperature control is included in the AirTerminal. Michael Data AirTeventer ange within which the air terminal is designed to operate. The actual airTow rate as designed. The actual airTow rate as designed. The character ange within which the air terminal is designed to operate. Neck area of the air terminal before the maximum stream velocity is rotuded to a specific arcminal velocity under tooftions at the upper value of the Air Flow rate Range. The average maximum noise level. Dreg in total pressure between inter and outlet at nominal air flow rite. Enumeration defining the functional type of air flow through the terminal.	numeric boolean boolean numeric numeric numeric numeric numeric numeric	VES/NO VES/NO VES/NO VES/NO Ulter/Minu 'C mm ² dB
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	Volume Has Thermal Insulation Has Sound Attenuator Has Integral Control AirFlow Rate Range AirFlow Rate Range AirFlow Rate Range Neck Area Throw Length Maximum Sound Level Pressure Droo AirFlow Type Noounting Type Installation Serial Number/Tag	Performance Data IT TRUE, the air terminal has thermal insulation. IT TRUE, the air terminal has sound attenuation. IT Rourster range within which the air terminal is designed to operate. The actual airflow rate as designed. Temporator range within which the air terminal is designed to operate. Neck area of the air terminal to the air terminal to operate. It he horizontal or vertical axial distance an airstream travels after leaving an Air Terminal before the maximum stream velocity is roluced to a specific arcminal velocity under toothermal conditions at the upper value of the Air Flow rate Range. The average maximum noise level. Drop in total pressure between intel and outlet at nominal air flow rate. The way the air terminal is mounted to the colling, wall, etc. The date on which the installation was carried out. The bore on that carries out installation. The bore on that carries out installation Cost Sum of all costs needed for installing.	numeric boolean boolean numeric numeric numeric numeric numeric numeric text text text text	VES/NO VES/NO VES/NO VES/NO Uter/Minu VER/Minu VER/Minu VER/Minu VER/Minu VER/Minu VER/NO VER/NO VES
	Volume Hes Thermal Insulation Has Sound Attenuator Has Integral Control AirFlow Rate Range AirFlow Rate Range AirFlow Rate Temperature Range Neck Area Throw Length Maximum Sound Level Pressure Droo AirFlow Type Installation date Subcontractor Installation Serial Number/Tag Approved By	Performance Data IT TRUE, the air terminal has thermal insulation. IT TRUE, the air terminal has sourd attenuation. IT Rearrange within which the air terminal is designed to operate. The actual airflow rate as designed. Temperature range within which the air terminal is designed to operate. Neck area of the air terminal. Neck area of the air terminal. The actual airflow rate as designed. Reck area of the air terminal. Neck area of the air terminal before the maximum stream velocity is roluced to a specific terminal velocity under velocity in roluced to a specific terminal velocity under velocity in roluced to a specific terminal velocity under velocity in roluced to a specific terminal velocity under velocity in roluced to a specific terminal velocity under velocity in roluced to a specific terminal velocity under velocity in roluced to a specific terminal velocity and the air terminal is not the air terminal. In average maximum noise level. Drog in total pressure between inter and outlet at nominal air fow rate. Investmention defining the functional type of air flow through the terminal. Installation Data The way the air terminal is mounted to the celling, wall, etc. The identific assigned to installation work. The identific assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installading work. Cost Sum of all costs needed for installing. Cost of installing one unit, including workforce and	numeric bookean bookean numeric numeric numeric numeric numeric numeric text text text text text	VES/NO VES/NO VES/NO Uter/Minu °C mm² rum dB / / / date / / /
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nformation Delivery Milestone:	and the second se			
Purpose:	Mechanical			
Actor:				
	1			
Object:	"Air Terminal" / IfcAirTerr	minal		
Seometrical information:	Element and delivery	three and coupling. Actual classification of the	dollad	
Actail: Kmensionality:	Element modelled to accurate size, 3D	shape and spacing. Actual size for all supports and clearancess mo	ice led.	
Amensionality: position:	Absolute and relative to other build	ing clamants		
ppearance:	Color fill to distinguish different ma			
arametric behaviour:	Not requested			
Iphanumeric Information:				
lentification:				
formation content:	Property	Description	Data Type	Units
		Adentity Data		
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, spedific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1
	Presented type	further classify the entity	text	2
	Classification	Classification code according to chosen classification system.	text	1 -
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply	text	1
		Air, Return Air or Exhaust Air.		
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be/is installed.	text	1
	Room Volume	Volume of the room where component to be/is installed.	numeric	m*
	Description	An alphanumeric value providing a concise description	text	7
	Elevation from Level	of the element. Specifies the elevation of the element relative to its level.	numeric	m
	Level	Defines the reference level.	text	1
	Manufacturer	The organization that manufactured and / or assembled the	lext	,
	URL	item. A valid URL hyperlink to the	text	1
		manufacturer's website. Material	975,97 1	 /
	Material	The primary material used to construct the object.	text	1
	Finish	The type of finish for the air terminal.	text	1
		Dimensional Data		
	Width	The nominal width of the air terminal.	numeric	mm
	Height	The nominal height of the air terminal.	numeric	mm
	DuctWidth	The nominal width of the duct.	numeric	mm
	DuctHeight	The nominal height of the air terminal.	numeric	mm
	Volume	The nominal width of the air terminal. Performance Data	numeric	m ²
	Has Thermal Insulation	If TRUE, the air terminal has thermal insulation.	boolean	YES/NO
	Has Sound Attenuator	If TRUE, the air terminal has sound attenuation.	boolean	YES/NO
	Has Integral Control	If TRUE, a self powered temperature control is included in the	boolean	YES/NO
	mas integrai Control	AirTerminal. Mechanical Data	boolean	1E5/NO
	12/25/04/04/27/77	Air flowrate range within which the air terminal is designed to	35910-224	1000-020-01-0
	AirFlow Rate Range	operate.	numeric	Liter/Minut
	AirFlow Rate	The actual airflow rate as designed.	numeric	Liter/Minut
	Temperature Range	Temperature range within which the air terminal is designed to operate.	numeric	°C
	Neck Area	Neck area of the air terminal.	numeric	
		The horizontal or vertical axial distance an airstream travels		mm ²
				mm²
	Throw Length	after leaving an Air Terminal before the maximum stream velocity is reduced to a specified terminal velocity under isothermal conditions at the upper value of the Air Flow rate	numeric	mm² mm
		after leaving an Air Terminal before the maximum stream velocity is reduced to a specified terminal velocity under sothermal conditions at the upper value of the Air Flow rate Range.	numeric	mm
	Maximum Sound Level	after leaving an Air Terminal before the maximum stream velocity is reduced to a specified terminal velocity under isothermal conditions at the uaper value of the Air Flow rate Range. The average maximum noise level.	numeric numeric	
		after leaving an Air Terminal before the maximum scream velocity is recarded to a specified retirmial velocity under isothermal conditions at the upper value of the Air How rate flange. The average maximum noise level. Drog in total pressure between intet and outlet at nominal air- flow rate.	numeric	mm
	Maximum Sound Level	after leaving an Air Terminal before the maximum stream velocity is reduced to a specified terminal velocity under isothermal conditions at the upper value of the Air Flow cate Range. The average maximum noise level. Drop in total pressure between initet and outfet at nominal air-	numeric numeric	mm
	Maximum Sound Level Pressure Drop Airflow Type	after leaving an Air Terminal before the maximum stream velocity is reduced to a specified retirmial velocity under isothermal conditions at the upper value of the Air How rate flange. The average maximum noise level. Drop in total pressure between inlet and outtet at nominal air- flow rate. Enumeration defining the functional type of air flow through the terminal. Installation Data	numeric numeric numeric text	mm dB /
	Maximum Sound Level Pressure Drop Airflow Type Mounting Type	after leaving an Air Terminal before the maximum stream velocity is recarded to a specified retirmial velocity under isothermal conditions at the upper value of the Air How rate flarge. The average maximum noise level. Drop in total pressure between inlet and outlet at nominal air- flow rate. Enumeration defining the functional type of air flow through the terminal. Installation Deta The way the air terminal is mounted to the ceiling, wall, etc.	numeric numeric numeric text	mm dB /
	Maximum Sound Level Pressure Drop Airflow Type Mounting Type Installation date	after leaving an Air Terminal before the maximum stream velocity is reduced to a specified retirminal velocity under lasthermal conditions at the upper value of the Air Flow rate flange. The average maximum noise level. Drop in total pressure between inlet and outlet at nominal air- flow rate. Enumeration defining the functional type of air flow through the terminal. Unstallation Data The way the air terminal is mounted to the ceiling, wall, etc. The date on which the installation was carried out.	numeric numeric numeric text text date time	mm dB / / date
	Maximum Sound Level Pressure Drop Airflow Type Mounting Type Installation date Subcontractor	after leaving an Air Terminal before the maximum stream velocity is reduced to a specified retirmial velocity under isothermal conditions at the upper value of the Air Flow rate Range. The average maximum noise level. Drop in total pressure between inlet and outtet at nominal air flow rate. Enumeration defining the functional type of air flow through the terminal. <u>Installation Data</u> The way the air terminal is mounted to the ceiling, wall, etc. The date on which the installation work:	numeric numeric numeric text text date time text	mm d8 / / / date /
	Maximum Sound Level Pressure Drop Airflow Type Mounting Type Installation date Subcontractor Installation Serial Number/Tag	after leaving an Air Terminal before the maximum stream velocity in reduced to a specified retirmial velocity under isothermal conditions at the upper value of the Air Flow rate flange. The average maximum noise level. Drop in total pressure between inlet and outlet at nominal air flow rate. Enumeration defining the functional type of air flow through the terminal. Installation Deta The way the air terminal is mounted to the ceiling, wall, etc. The idea on which the installation was carried out. A firm or person that carries out installation.	numeric numeric numeric text text date time text numeric	mm d8 / / / date / /
	Maximum Sound Level Pressure Drop Airflow Type Mounting Type Installation date Subcontractor	after leaving an Air Terminal before the maximum stream velocity is reduced to a specified retirmial velocity under isothermal conditions at the upper value of the Air Flow rate flange. The average maximum noise level. Drop in total pressure between inlet and outlet at nominal air- flow rate. Enumeration defining the functional type of air flow through the terminal. Installation Data The way the air terminal is mounted to the ceiling, wall, etc. The date on which the installed in work: The identifier assigned to installation.	numeric numeric numeric text text date time text	mm d8 / / / date /
	Maximum Sound Level Pressure Drop Airflow Type Mounting Type Installation date Subconstor Installation Serial Number/Tag Approved By	after leaving an Air Terminal before the maximum stream velocity is reduced to a specified terminal velocity under isothermal conditions at the upper value of the Air Flow rate flanger. The average maximum noise level. Drop in total pressure between inlet and outlet at nominal air- flow rate. Enumeration defining the functional type of air flow through the terminal. Installation Data The way the air terminal is mounted to the ceiling, wall, etc. The identify any end to the ceiling, wall, etc. The identify any end to the stallation work. A firm or perion that carries out installation work. A person responsible for assuring the quality and maeting the requirements of the installed element. Warranty Data	numeric numeric numeric text text date time text numeric text	mm dB / / date / / / /
	Maximum Sound Level Pressure Drop Airflow Type Mounting Type Installation date Subcontractor Installation Serial Number/Tag	after leaving an Air Terminal before the maximum stream velocity is reduced to a specified retirmial velocity under isothermal conditions at the usper value of the Air Flow rate Range. The average maximum noise level. Drop in total pressure between inlet and outtet at nominal air flow rate. Enumeration defining the functional type of air flow through the terminal. <u>Internation defining the functional type of air flow through</u> the terminal. <u>Internation defining the installation between the level</u> . The date on which the installation work: The date on which the installation. A person reportible for assumpt the quality and meeting the requirements of the installed element. <u>Warranty Data</u> The identifier assigned to a warranty.	numeric numeric numeric text text date time text numeric	mm d8 / / / date / /
	Maximum Sound Level Pressure Drop Airflow Type Mounting Type Installation date Subconstor Installation Serial Number/Tag Approved By	after leaving an Air Terminal before the maximum stream velocity is recarded to a specified retirmial velocity under sothermal conditions at the upper value of the Air Flow rate flange. The average maximum noise level. Drop in total pressure between inlet and outlet at nominal air- flow rate. Insurcation defining the functional type of air flow through the terminal. Installation Deta The way the air terminal is mounted to the ceiling, wall, etc. The date on which the installation was carried out. A firm or pressure that carries out installation. The identifier assigned to installation. A preson responsibile for assuring the quality and meeting the requirements of the installed dement. Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty content and	numeric numeric numeric text text date time text numeric text	mm dB / / date / / /
	Maximum Sound Level Pressure Drop Airflow Type Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID	after leaving an Air Terminal before the maximum stream velocity is reduced to a specified retirmial velocity under isothermal conditions at the usper value of the Air Flow rate Range. The average maximum noise level. Drop in total pressure between inlet and outtet at nominal air flow rate. Enumeration defining the functional type of air flow through the terminal. <u>Internation defining the functional type of air flow through</u> the terminal. <u>Internation defining the functional type of air flow through</u> the terminal. The way the air terminal is mounted to the celling, wall, etc. The date on which the installation was carried out. A firm or person that carries out installation to installation. The identifier assigned to installation. A person repossible for assuming the quality and meeting the requirements of the installed element. Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a conside description	numeric numeric text text date time text text text text	mm d8 / / date / / / /
	Maximum Sound Level Pressure Droo Airflow Type Mounting Type Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty/D Warranty/Description	after leaving an Air Terminal before the maximum stream velocity is recarded to a specified retirmial velocity under sothermal conditions at the upper value of the Air Flow rate flargh. The average maximum noise level. Drop in total pressure between inlet and outlet at nominal air flow rate. Insureation defining the functional type of air flow through the terminal. Installation Deta The way the air terminal is mounted to the ceiling, wall, etc. The date on which the installation was carried out. A firm or person that carries out installation the identifier assigned to installation. A preson responsible for assuring the quality and meeting the requirements of the installed dement. Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty content and any exclusions.	numeric numeric text text date time text text text text	mm dB / / date / / / / / /
	Maximum Sound Level Pressure Drop Airflow Type Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty Description Warranty Start Date	after leaving an Air Terminal before the maximum aream velocity is reduced to a specified retirmial velocity under isothermal conditions at the usper value of the Air Flow rate Range. The average maximum noise level. Drop in total pressure between inlet and outtet at nominal air- flow rate. Enumeration defining the functional type of air flow through the terminal. <u>Internation defining the functional type of air flow through</u> the terminal. <u>Internation defining the functional type of air flow through</u> the terminal. <u>Internation defining the functional type of air flow through</u> the terminal. <u>Internation of the installation work:</u> The date on which the installation work: The identifier assigned to installation. A preson responsible for assume type togailing and maeting the requirements of the installation work: An alphanumeric value providing a conside description of the warranty content and any exclusions. The date on which the warranty commences. The date on which the warranty commences and pressor samilars with the physical state state the state of the internation of the other physical state state the state other physical state state the state stat	numeric numeric text text date time text text text text text text	mm d8 / / date / / / / / / / / / / / / / / / / / / /
	Maximum Sound Level Pressure Droo Airflow Type Mounting Type Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty/Description Warranty/Description Warranty Start Date Warranty End Date	after leaving an Air Terminal before the maximum stream velocity is recard to a specified retirmial velocity under sothermal conditions at the upper value of the Air Flow rate flargh. The average maximum noise level. Drop in total pressure between inlet and outlet at nominal air- flow rate. Insureration defining the functional type of air flow through the terminal. Installation Deta The way the air terminal is mounted to the ceiling, wall, etc. The date on which the installed on work: The identifier assigned to installation. A preson responsible for assuring the quality and meeting the requirements of the installed dement. Warranty Datu The identifier assigned to a warranty. An alphanumeric value providing a concise description of the wars thy content and any exclusions. The date on which the warranty commences. The date on which the warranty projens.	numeric numeric text text date time text text text text text date time date time	mm dB / / date / / / / / / date date
	Maximum Sound Level Pressure Drop Airflow Type Installation date Subcond date Subcond date Warranty ID Warranty ID Warranty Start Date Warranty End Date Condition	after leaving an Air Terminal before the maximum aream velocity is reduced to a specified retirmial velocity under landber mal conditions at the usper value of the Air Flow rate fange. The average maximum noise level. Drop in total pressure between inlet and outtet at nominal air flow rate. Enumeration defining the functional type of air flow through the terminal. <u>Installation Data</u> The way the air terminal is mounted to the ceiling, wall, etc. The date on which the installation was carried out. A firm or genom that carries out installation a firm or genom that carries out installation work. The identifier assigned to installation. A person responsible for assuming the quality and meeting the requirements of the installation of the warratly contended. An alphanumeric value providing a conside description of the warratly contended. The identifier assigned to a warranty. An alphanumeric value providing a conside description of the warratly contended. The date on which the warranty commences. The date on which the warranty commences.	numeric numeric numeric text bast date time text text text text text text text	mm dB / date / / / / / / / / / / / / / / / / / / /
	Maximum Sound Level Pressure Drop Airflow Type Installation date Subcond date Subcond date Warranty ID Warranty ID Warranty Start Date Warranty End Date Condition	after leaving an Air Terminal before the maximum aream velocity is reduced to a specified retirmial velocity under isothermal conditions at the usper value of the Air Flow rate Range. The average maximum noise level. Drop in total pressure between inlet and outtet at nominal air flow rate. Enumeration defining the functional type of air flow through the terminal. Internation of the functional type of air flow through the terminal. The date on which the installation was carried out. The date on which the installation work: The date on which the installation work: The date on which the installation work: The date on which the installation. A preson responsible for assume the quality and maeting the requirements of the installation. A parson responsible for assume the quality and maeting the requirements of the installation work. The identifier assigned to a warranty Data The identifier assigned to a warranty and may exclusion. The date on which the warranty commerces. The date on which the warranty commerces and conce in a while any been of all coxis n	numeric numeric numeric text bast date time text text text text text text text	mm dB / / date / / / / / / / / / / / / / / / / / / /
	Maximum Sound Level Pressure Drop Airflow Type Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty ID Warranty End Date Umarranty End Date Condition Defects	after leaving an Air Terminal before the maximum aream velocity is reduced to a specified retirmial velocity under isothermal conditions at the upper value of the Air Flow rate fange. The average maximum noise level. Drop in total pressure between inlet and outlet at nominal air- flow rate. Enumeration defining the functional type of air flow through the terminal. Installation Data The way the air terminal is mounted to the ceiling, wall, etc. The date on which the installation was carried out. A firm or pressure between installation work. The kidentifier assigned to installation. A firm or pressure between the quality and meeting the requirement of the installed element. Warrainty Data The identifier assigned to installation A alphanumeric value providing a concise description of the warranty content and any exclusions. The date on which the warranty continences. The based on the best judgment of those persons familiar with the by hysical characteristics and condition. Basic imperfection that inglies any deformity in component of a building that is owing to binned plan, madeuse or flawed vorking the isoning to binned plan, madeuset or flawed vorking the isoning to binned plan, madeuset or flawed vorking the isoning to binned plan, madeuset or flawed vorking on or deficient material and once in a while eny blend of these. Cost Sum of all costs needed for installing.	numeric numeric numeric teat teat date time teat teat teat teat teat teat teat te	mm dB / date / / date / / / / / / / / / / / / /
	Maximum Sound Level Pressure Droo Airflow Type Mounting Type Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty/Description Warranty/Cescription Warranty Start Date Warranty End Date Condition Defects Overall Cost	after leaving an Air Terminal before the maximum aream velocity is reduced to a specified retirmial velocity under landber mal conditions at the upper value of the Air Flow rate fange. The average maximum noise level. Drop in total pressure between inlet and outst at nominal air flow rate. Enumeration defining the functional type of air flow through the terminal. <u>Internation defining the functional type of air flow through</u> the terminal. <u>Internation defining the functional type of air flow through</u> the terminal. <u>Internation defining the functional type of air flow through</u> the terminal. <u>Internation defining the functional type of air flow through</u> the terminal. <u>Internation defining the functional type of air flow through</u> the date on which the installation was carried out. The date filler assigned to installation. A person responsible for assuming the quality and matching the requirements of the installation of the warrarby content and any exclusions. The identifier assigned to a warranby. An alphanumeric value providing a conside description of the warrarby content and any exclusions. The date on which the warranby continences. The date on which the warranby contenences. The date on which the warranby contenent at the time of the inventory or audit, based on the best judgment of those persons families with the physical knarter fills as and condition. Easic timeefection that timplies any deformity in component of a building that is owing to bienished plan, inadequate or flawed workman high or definient material and once in a while any blend of these. <u>Cost</u>	numeric numeric text text text text text text text tex	mm dB / / date / / / date / / / date / / / / / / / / / / / / /
	Maximum Sound Level Pressure Droo Airflow Type Mounting Type Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty ID Warranty End Date Condition Defects Overall Cost Installation Cest	after leaving an Air Terminal before the maximum aream velocity is reduced to a specified retirmial velocity under isothermal conditions at the upper value of the Air Flow rate fange. The average maximum noise level. Drop in total pressure between inlet and outlet at nominal air- flow rate. Enumeration defining the functional type of air flow through the terminal. Installation Data The way the air terminal is mounted to the ceiling, wall, etc. The date on which the installation was carried out. A firm or pressure between installation work. The kidentifier assigned to installation. A firm or pressure between the quality and meeting the requirement of the installed element. Warrainty Data The identifier assigned to installation A alphanumeric value providing a concise description of the warranty content and any exclusions. The date on which the warranty continences. The based on the best judgment of those persons familiar with the by hysical characteristics and condition. Basic imperfection that inglies any deformity in component of a building that is owing to binned plan, madeuse or flawed vorking the isoning to binned plan, madeuset or flawed vorking the isoning to binned plan, madeuset or flawed vorking the isoning to binned plan, madeuset or flawed vorking on or deficient material and once in a while eny blend of these. Cost Sum of all costs needed for installing.	numeric numeric text text date time text text text text text date time date time date time text text	mm dB / / / / / / / / / / / / / / / / / /

nformation Delivery Milestone:	lesign						
Purpose:	Mechanical						
Actor:							
	M						
Object:	"Coil" / IfcCoil						
Seometrical information:							
letail:	Element modelled in schematic l	layout with approximate size and shape. Approximate clearances mo	delled.				
limensionality:	3D						
ocation:	Absolute and relative to other b	uilding elements					
ippearance:	Single color fill						
arametric behaviour:	Not requested						
Uphanumeric Information:							
dentification:		2002 MA					
Information content:	Property	Description	Data Type	Units			
		Identity Data					
	Name	Primary identifier of an object.	text	1			
	Туре	Defines the object type, specific information about object.	text	1			
	Classification	Classification code according to chosen classification system.	text	1			
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	1			
	System Type	Type of system e.g., supply air.	text	1			
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1			
	System Abbreviation	A user-defined abbreviation for a system.		1			
	Level	Defines the reference level.	text	1			
	Material						
	Material	The primary material used to construct the object.	text	1			
		Dimensional Data					
	Length	The nominal length of the coil.	numeric	mm			
	Width	The nominal width of the coil.	numeric	mm			
	Height	The nominal height of the coil.	numeric	mm			
		Mechanical Data					
	Air Flow Rate Range	Possible range of airflow that can be delivered.	numeric	Liter/Minute			
	Air Flow Rate	The actual airflow rate as designed.	numeric	Liter/Minute			
	Air Pressure Drop	Reduction in air pressure / Pressure loss.	numeric	Pa			
	Cost						
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material, labor and equipment).	numeric	¢			
	Estimated Unit Cost	Estimated cost of element per m ² / m ² . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	5/m², 6/ m²			
		Phasing		897			
	Phase	Identifies the phase in which the object is created.	text	1 7			

Information Delivery Milestone:	Construction					
Purpose:	Mechanical					
Actor:						
	the sub-field of the					
Object:	"Coil" / IfcCoil					
eometrical information:						
etall:	Element modelled to nominal size,	shape and spacing. Actual clearancess modelled. Nominal floor and	d wall penetration el	ements modeled.		
limensionality:	30					
ocation:	Absolute					
Appearance:	Color fill to distinguish different materials					
Parametric behaviour:	Not requested					
Alphanumeric Information:						
dentification:						
nformation content:	Property	Description	Data Type	Units		
		Identity Data				
	Name	Primary identifier of an object.	text	1		
	Туре	Defines the object type, specific information about object.	text	1		
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1		
	Classification	Classification code according to chosen classification system.	text	1		
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fictures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	1		
	System Type	Type of system e.g., supply air.	text	1		
		A name that uniquely defines system. It may be user-defined				
	System Name	or automatically generated.	text	1		
	System Abbreviation	A user-defined abbreviation for a system.	text	1		
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m		
	Epuel	Defines the reference level.	test	1		
	LEVEI	An alphanumeric value	ICAL	1		
	Description	providing a concise description of the element.	text	1		
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1		
		Material				
	Material	The primary material used to construct the object.	text	1		
		Dimensional Data				
	Length	The nominal length of the coil.	numeric	mm		
	Width	The nominal width of the coll.	numeric	mm		
	Height	The nominal height of the coil.	numeric	1000		
		Mechanical Data				
	Air Flow Rate Range	Possible range of airflow that can be delivered.	numeric	Liter/Minute		
	Air Flow Rate	The actual airflow rate as designed.	numeric	Liter/Minute		
	Heat Transfer Coefficient	The heat transfer coefficient expresses the amount of heat transferred between a fluid (either a liquid or gas) and a solid	numeric	W/m²*C		
		surface by convection.				
	Air Pressure Drop	Reduction in air pressure / Pressure loss.	numeric	Pa		
	ECCENT ALC: NO.	Installation Data	444.00	24440		
	Installation date Subcontractor	The date on which the installation was carried out. A firm or person that carries out installation work.	date time text	date /		
	Installation Serial Number/Tag	The Identifier assigned to Installation.	numeric	1		
		A person responsible for assuring the quality and meeting the		-		
	Approved By	requirements of the installed element. Product Data	text	1		
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	7		
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1		
		Cost		35		
	Overall Cost	Sum of all costs needed for installing.	numeric	c		
	Installation Cost	Cost of installing one unit, including workforce and equipment.	numeric	c		
	Material Cost	Cost of material for installing one unit.	numeric	E		
	Phase	Phasing Identifies the phase in which the object is created.	text			
				- E		

nformation Delivery Milestone:	Operation						
urpose:	Mechanical						
ictor:							
	X						
bject:	"Coll" / IfcColl						
eometrical information:							
etail	Element modelled to accurate size.	shape and spacing. Actual clearancess modelled. Actual floor and	d wall penetration el	ements modeled			
imensionality:	30						
ocation:	Absolute Color fill to distinguish different ma	Absolute					
ppearance: arametric behaviour:	Not requested	itenais					
Iphanumeric Information:	NOL TEL DESIRG						
Ientification:							
formation content:	Property	Description	Data Type	Units			
	Tiopent	Identity Data	our the	Unic			
	Name	Primary identifier of an object.	text	I			
			1.0227-25	-			
	Туре	Defines the object type, specific information about object.	text	1			
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1			
	1000000000000	further classify the entity	10555	58			
	Classification	Classification code according to chosen classification system.	text	1			
		Defines the system for the connectors that are located on air					
	System Classification	terminals, equipment and fixtures. For example, connectors	text	7			
		for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	11111C	<u> </u>			
	System Type		text	1			
		Type of system e.g., supply air. A name that uniquely defines system. It may be user-defined					
	System Name	or automatically generated.	text	1			
	System Abbreviation	A user-defined abbreviation for a system.	text	1			
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m			
	Contraction of the second	per en	19689976775 A	53322			
	Level	Defines the reference level.	text	1			
	Description	An alphanumeric value providing a concise description	text	1			
	and the second s	of the element.		· ·			
	Manufacturer	The organization that manufactured and / or assembled the	text	1			
		item.	(1997) (1997)	<u>, (</u>			
	URL	A valid URL hyperlink to the manufacturer's website.	text	1			
		Material					
	Material	The primary material used to construct the object.	text	1			
		Dimensional Data					
	Length	The nominal length of the coil.	numeric	mm			
	Width	The nominal width of the coil.	numeric	mm			
	Height	The nominal height of the coll.	numeric	mm			
		Mechanical Data		10000			
	Air Flow Rate Range	Possible range of airflow that can be delivered.	numeric	Liter/Minut			
	Air Flow Rate	The actual airflow rate as designed.	numeric	Liter/Minut			
		The heat transfer coefficient expresses the amount of heat					
	Heat Transfer Coefficient	transferred between a fluid (either a liquid or gas) and a	numeric	W/m ² °C			
	Air Pressure Drop	solid surface by convection.	numeric	Pa			
	All Plessure brop	Reduction in air pressure / Pressure loss. Installation Data	ingeneen.				
	Installation date	The date on which the installation was carried out.	date time	date			
	Subcontractor	A firm or person that carries out installation work.	text	oate /			
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1			
		A person responsible for assuring the quality and meeting.					
	Approved By	the requirements of the installed element.	text	1			
		Warranty Data					
	Warranty ID	The identifier assigned to a warranty.	text	1			
		An alphanumeric value					
	Warranty Description	providing a concise description of the warranty content and	text	1			
		or the warranty content and any exclusions.					
	Warranty Start Date	The date on which the warranty commences.	date time	date			
	Warranty End Date	The date on which the warranty expires.	date time	date			
		The physical status of the element at the time of the					
	Condition	inventory or audit, based on the best judgment of those	text	7			
		persons familiar with the physical characteristics and condition.		55			
		Basic imperfection that implies any deformity in component					
	Defects	of a building that is owing to blemished plan, inadequate or	text	7			
	District 13	flawed workmanship or deficient material and once in a	in Al	1			
		while any blend of these. Product Data					
				-			
	ModelLabel	An alphanumeric value representing the product, item or	text	1			
		unit number assigned by the manufacturer of the product.		-			
		An alphanumeric value for the name of the manufactured	text	1			
	ModelReference						
	ModelReference	item as used by the manufacturer.					
		Cost	(all second and	-			
	ModelReference Overall Cost	Cost Sum of all costs needed for installing.	numeric	£			
		Cost	numeric numeric	e e			
	Overall Cost	Cost Sum of all costs needed for installing. Cost of installing one unit, including workforce and equipment.					
	Overall Cost Installation Cost	Cost Sum of all costs needed for installing. Eost of installing one unit, including workforce and	numeric	e			
	Overall Cost Installation Cost	Cost Sum of all costs needed for installing. Cost of installing one unit, including workforce and equipment. Cost of material for installing one unit.	numeric	e			

nformation Delivery Mileston	Mechanical			
Purpose:	wiechanical			
Actor:				
2 Line	WEAR'S ALE-EAR			
Object:	"Fan" / IfcFan			
Seometrical Information:				
)etail:		out with approximate size and shape. Approximate clearances mo	delled.	
Dimensionality:	30			
ocation:	Absolute and relative to other built	ding elements		
lppearance:	Single color fill			
arametric behaviour	Not requested			
Nphanumeric Information:				
dentification:				
iformation content:	Property	Description	Data Type	Units
		identity Data		
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	L.
	Classification	Classification code according to chosen classification system.	text	1
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fistures. For example, connectors for air terminals could have a system dassification of Supply Air, Return Air or Exhaust Air.	text	×
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Level	Defines the reference level.	text	1
		Material	611 M 71 -	
	Material	The primary material used to construct the object.	text	1
		Dimensional Data		
	Length	The nominal length of the fan.	numeric	mm
	Width	The nominal width of the fan.	numeric	mm
	Height	The nominal height of the fan.	numeric	mm
		Mechanicai Cata		
	Air Flow Rate Range	Possible range of airflow that can be delivered.	numeric	Liter/Minute
	Air Flow Rate	The actual airflow rate as designed.	numeric	Liter/Minute
	Operation Temperature Range	Allowable operation ambient air temperature range.	numeric	
	Operational Criteria	Time of operation at maximum operational ambient air temperature.	numeric	hour
	Disscharge Pressure Loss	Fan discharge pressure loss associated with the discharge arrangement.	numeric	Pa
	Disscharge Velocity	The speed at which air discharges from the fan through the fan housing discharge opening.	numeric	m/s
	Fan Power Rate	Fan power consumption.	numeric	w
	Fan Efficiency	Fan mechanical efficiency.	numeric	%
	Motor Drive Type	Motor drive type e.g., DIRECT DRIVE: Direct drive	text	1
	Nominal Power Rate	Nominal fan power rate.	numeric	W
	Nominal Total Pressure	Nominal total pressure rise across the fan.	numeric	Pa
	Overall Efficiency	Total efficiency of motor and fan.	numeric	8
		Cost		
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material, labor and equipment).	numeric	¢
	Estimated Unit Cost	Estimated cost of element per m ² / m ² . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	6/m², 6/ m³
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1

Information Delivery Milestone:	Construction						
Purpose:	Mechanical						
Actor:							
				-			
Object:	"Fan" / IfcFan						
Geometrical information:							
Detail:	Element modelled to nominal size,	shape and spacing. Actual clearancess modelled. Nominal floor ar	d wall penetration e	ements modeled.			
Dimensionality:	3D	80					
Location: Appearance:		for fill to distinguish different materials					
Parametric behaviour:	Not requested						
Alphanumeric Information:							
dentification:							
nformation content:	Property	Description	Data Type	Units			
		Identity Data		-			
	Name	Primary identifier of an object.	text	1			
	Туре	Defines the object type, specific information about object.	text	7			
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1			
	Classification	Classification code according to chosen classification system.	text	1			
	Classification		text	1			
		Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors					
	System Classification	for air terminals could have a system classification of Supply	text	1			
		Air, Return Air or Exhaust Air.		-			
	System Type	Type of system e.g., supply air.	text	1			
	System Name	A name that uniquely defines system. It may be user-defined	text	1			
	Contrast Abb an instance	or automatically generated.	2011	1			
	System Abbreviation	A user-defined abbreviation for a system,	text				
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m			
	Level	Defines the reference level.	text	1			
	1000000000000	An alphanumeric value	1000				
	Description	providing a concise description	text	1			
		of the element. The organization that manufactured and / or assembled the		-			
	Manufacturer	item.	text	1			
		Material					
	Material	The primary material used to construct the object.	text	1			
		Dimensional Data					
	Length	The nominal length of the fan.	numeric	mm			
	Width	The nominal width of the fan.	numeric	mm			
	Height	The nominal height of the fan.	numeric	mm			
		Mechanical Data					
	Air Flow Rate Range	Possible range of airflow that can be delivered.	numeric	Liter/Minute			
	Air Flow Rate	The actual airflow rate as designed.	numeric	Liter/Minute			
	Operation Temperature Range	Allowable operation ambient air temperature range.	numeric	°C			
				-			
	Operational Criteria	Time of operation at maximum operational ambient air temperature	numeric	hour			
	Operational Criteria	temperature.	3 0/54 0 4 7	1000 C			
		temperature. Fan discharge pressure loss associated with the discharge arrangement.	numeric numeric	hour Fa			
	Operational Criteria	temperature. Fan discharge pressure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the	3 0/54 0 4 7	1000 C			
	Operational Criteria Disscharge Pressure Loss Disscharge Velocity	temperature. Fan discharge pressure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the fan housing discharge opening.	numeric numeric	Fa m/s			
	Operational Criteria Disscharge Pressure Loss Disscharge Velocity Fan Power Rate	temperature. Fan discharge pressure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the fan housing discharge opening. Fan jower consumption.	numeric numeric numeric	Fa m/s W			
	Operational Criteria Disscharge Pressure Loss Disscharge Velocity Fan Power Rate Fan Efficiency	temperature. Fan discharge pressure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the fan hower consumption. Fan mechanical efficiency.	numeric numeric numeric numeric	Pa m/s W %			
	Operational Criteria Disscharge Pressure Loss Disscharge Velocity Fan Power Rate. Fan Efficiency Motor Drive Type	temperature. Fan discharge pressure loss associated with the discharge arrangement. This apeed at which air discharges from the fan through the fan housing discharge opening. Fan power consumption. Fan mechanical efficiency. Motor drive type e.g., DIRECT DRIVE: Direct drive.	numeric numeric numeric numeric text	Fa m/s W N /			
	Operational Criteria Disscharge Pressure Loss Disscharge Vetocity Fan Power Rate. Fan Efficiency Motor Drive Type Nominal Power Rate	temperature. Fan discharge pressure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the fan heusing discharge opening. Fan power consumption. Fan mechanical efficiency. Motor drive type e.g., DIRECT DRIVE: Direct drive. Nominal fan power rate.	numeric numeric numeric numeric text numeric	Fa m/s W N / W			
	Operational Criteria Disscharge Pressure Loss Disscharge Velocity Fan Power Rate Fan Efficiency Motor Drive Type Nominal Power Rate Nominal Total Pressure	temperature: Fan discharge pressure loss associated with the discharge arrangement: The speed at which air discharges from the fan through the fan housing discharge opening. Fan gover consumption. Fan mechanical efficiency. Motor drive type e.g., DIRCET DRIVE: Direct drive. Nominal fan power rate. Nominal fan power rate.	numeric numeric numeric numeric text numeric numeric	Ра m/s W 15 / W Ра			
	Operational Criteria Disscharge Pressure Loss Disscharge Vetocity Fan Power Rate. Fan Efficiency Motor Drive Type Nominal Power Rate	Impersature. Fan discharge pressure loss associated with the discharge arrangement. This speed at which air discharges from the fan through the fan housing discharge opening. Fan power consumption. Fan mechanical efficiency. Motor drive type e.g., DIRECT DRIVE: Direct drive. Nominal Tata power rate. Sominal total pressure rise across the fan. Total efficiency of motor and fan.	numeric numeric numeric numeric text numeric	Fa m/s W N / W			
	Operational Criteria Disscharge Pressure Los Disscharge Velocity Fan Power Rate Fan Efficiency Motor Drive Type Nominal Power Rate Nominal Total Pressure Overall Efficiency	Impersive Fan discharge pressure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the fan housing discharge openine. Fan power consumption. Fan mechanical efficiency. Moor drive type e.g., DIRECT DRIVE: Direct drive. Neminal total pressure rise. Neminal total pressure rise across the fan. Total efficiency of motor and fan. Installation Data	numeric numeric numeric text numeric numeric numeric	Ра m/s W 15 / W Ра			
	Operational Criteria Disscharge Pressure Loss Disscharge Velocity Fan Power Rate Fan Efficiency Motor Drive Type Nominal Power Rate Nominal Total Pressure Overall Efficiency Installation date	Interpretations Fan discharge pressure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the fan housing discharge opening. Fan power consumption. Mater drive type e.g., DIRECT DRIVE: Direct drive. Nominal statistic efficiency. Total efficiency of motor and fan. Installation Data The date on which the installation was carried out.	numeric numeric numeric numeric text numeric numeric	Fa m/s W N Fa S Gote			
	Operational Criteria Disscharge Pressure Loss Diascharge Velocity Fan Power Rate Fan Efficiency Motor Drive Type Nominal Power Rate Nominal Power Rate Nominal Power Rate Overall Efficiency Installation date Subcontractor	Impersive Fan discharge pressure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the fan housing discharge openine. Fan power consumption. Fan mechanical efficiency. Moor drive type e.g., DIRECT DRIVE: Direct drive. Neminal total pressure rise. Neminal total pressure rise across the fan. Total efficiency of motor and fan. Installation Data	numeric numeric numeric text numeric numeric numeric date time	Fa m/s W S / W Fa S date /			
	Operational Criteria Disscharge Pressure Los Disscharge Velocity Fan Power Rate Fan Efficiency Motor Driter Type Nominal Power Rate Nominal Power Rate Notal Efficiency Installation Serial Number/Tag	emperature. Fan discharge pressure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the fan housing discharge opening. Fan power consumption. Fan mouter of the speed of th	numeric numeric numeric text numeric numeric numeric date time text numeric	γa m/s % / W Fa % date / / /			
	Operational Criteria Disscharge Pressure Loss Diascharge Velocity Fan Power Rate Fan Efficiency Motor Drive Type Nominal Power Rate Nominal Power Rate Nominal Power Rate Overall Efficiency Installation date Subcontractor	Impersature. Fan discharge parsoure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the fan housing discharge opening. Fan power consumption. Fan mechanical efficiency. Moorninal fan power rate. Noorninal fan power rate. Noorninal total pressure rise across the fan. Total efficiency of motor and fan. Installation Data The date on which the installation was carried out. The date on which the installation work. The identifier assigned to installation. A person responsible for assuring the quality and meeting the recuivements of the installed element.	numeric numeric numeric text numeric numeric numeric date time text	Fa m/s W S / W Fa S date /			
	Operational Criteria Disscharge Pressure Los Disscharge Velocity Fan Power Rate Fan Efficiency Motor Driter Type Nominal Power Rate Nominal Power Rate Notal Efficiency Installation Serial Number/Tag	emperature. Fan discharge pressure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the fan housing discharge opening. Fan power consumption. Fan mouter of the speed of th	numeric numeric numeric text numeric numeric numeric date time text numeric	γa m/s % / W Fa % date / / /			
	Operational Criteria Disscharge Pressure Los Disscharge Velocity Fan Power Rate Fan Efficiency Motor Drive Type Nominal Total Pressure Overall Efficiency Installetion date Subcontractor Installation Serial Namher/Tag Approved By	emperature. Fan discharge pressure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the fan housing discharge opening. Fan power consumption. Fan mechanical efficiency. Motor drive type e.g., DIRECT DRIVE: Direct drive. Nominal total efficiency. Motor drive type e.g., DIRECT DRIVE: Direct drive. Nominal total efficiency of motor and fan. Total efficiency of motor and fan. Total efficiency of motor and fan. The date on which the installation was carried out. A firm or person that carries out installation work. The ident fier assigned to installation. Product Data Naments of the installation. Product Data Na alphanumeric value representing the ground, item or	numeric numeric numeric numeric text numeric numeric text date time text numeric text	Ya m/s X Ya N Pa N date / / /			
	Operational Criteria Disscharge Pressure Los Disscharge Velocity Fan Power Rate Fan Efficiency Motor Driter Type Nominal Power Rate Nominal Power Rate Notal Efficiency Installation Serial Number/Tag	emperature Fan discharge pressure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the fan housing discharges pressure Fan power consumption. Fan mechanical efficiency. Nominal fan power rate. Nominal fan power rate. Nominal total pressure rite across the fan. Total efficiency of motor and fan. Installation Data The date on which the installation was carried out. The identifier axigned to installation. The identifier axigned to installation. Fan mechanical of the installation. The identifier axigned to installation.	numeric numeric numeric text numeric numeric numeric date time text numeric	γa m/s % / W Fa % date / / /			
	Operational Criteria Disscharge Pressure Loss Disscharge Velocity Fan Power Rate Fan Efficiency Motor Drive Type Nominal Total Pressure Overall Efficiency Unversil Efficiency Installation Serai Number/Tag Approved By ModelLabel	temperature. Fan discharge pressure loss associated with the discharge arrangement. This speed at which air discharges from the fan through the fan housing decharge opening. Fan power consumption. Fan mechanical efficiency. Nominal fan power rate. Sominal total pressure rise across the fan. Total efficiency of motor and fan. Installation Data Installation Data Installation Data Installation out. The identifier assigned to installation A person responsible for assumption. Product flar A person responsible for assumption. Fan discharger of the installation. Installation. Installation	numeric numeric numeric numeric numeric numeric numeric numeric text text text text	Fa m/s N Fa S Gate / / / /			
	Operational Criteria Disscharge Pressure Los Disscharge Velocity Fan Power Rate Fan Efficiency Motor Drive Type Nominal Total Pressure Overall Efficiency Installetion date Subcontractor Installation Serial Namher/Tag Approved By	emperature. Fan discharge pressure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the fan housing discharge opening. Fan power consumption. Fan mechanical efficiency. Motor drive type e.g., DIRECT DRIVE: Direct drive. Nominal total efficiency. Motor drive type e.g., DIRECT DRIVE: Direct drive. Nominal total efficiency of motor and fan. Total efficiency of motor and fan. Total efficiency of motor and fan. The date on which the installation was carried out. A firm or person that carries out installation work. The ident fier assigned to installation. Product Data Nametring the recuirements of the installation. Product Data	numeric numeric numeric numeric text numeric numeric text date time text numeric text	Ya m/s X Ya N Pa N date / / /			
	Operational Criteria Disscharge Pressure Loss Disscharge Velocity Fan Power Rate Fan Efficiency Motor Drive Type Nominal Total Pressure Overall Efficiency Unversil Efficiency Installation Serai Number/Tag Approved By ModelLabel	Impersature. Fan discharge parsoure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the fan housing discharge opening. Fan power consumption. Fan mechanical efficiency. Moorninal fan power rate. Neominal fan power rate. Neominal fan power rate. Neominal total pressure rise across the fan. Total efficiency of motor and fan. Installation Data The date on which the installation was carried out. The identifier assigned to installation. The identifier assigned to installation. Product Data Neoming the installation Product Data An aphanumeric value representing the groubuck, item of the product. An alphanumeric value representing the product, item of the product. An alphanumeric value for the name of the product.	numeric numeric numeric numeric numeric numeric numeric numeric text text text text	Fa m/s N Fa S Gate / / / /			
	Operational Criteria Disscharge Pressure Loss Disscharge Velocity Fan Power Rate Fan Efficiency Motor Drive Type Nominal Total Pressure Overall Efficiency Unversil Efficiency Installation Serai Number/Tag Approved By ModelLabel	Impersature. Fan discharge pressure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the fan housing discharge opening. Fan power consumption. Fan mochanical efficiency. Motor drive type e.g., DIRECT DRIVE: Direct drive. Nominal total efficiency. Installation power rate. Installation power rate. Installation Data The date on which the installation was carried out. A firm or person that carries out installation work. The identific asigned to installation. A person responsible for assuring the quality and meeting the reculierents of the installation. A aperson responsible for assuring the groduct, item or unit number asigned to the manufacture of the product. An alphanumeric value representing the product. Item or unit number asigned by the manufacture of the product. An alphanumeric value representing the numufacture discured item as used by the manufacturers. Cost Sum of all costs needed for installing.	numeric numeric numeric numeric numeric numeric numeric numeric text text text text	Fa m/s N Fa S Gate / / / /			
	Operational Criteria Disscharge Pressure Los Disscharge Velocity Fan Power Rate Fan Efficiency Moder Drive Type Rominal Total Pressure Overal Efficiency Installation date Subcontractor Installation Serial Number/Tag Approved By ModelLabel ModelRaference	emperature. Fan discharge pressure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the fan nover adjuster programmed on the discharge opening. Fan power consumption. Fan power consumption. Motor drive type e.g., DIRECT DRIVE: Direct drive. Nominal fan power rate. Nominal fan power rate. Nominal fan power rate. Total efficiency. It discharge opening opening the transmitted out. Total efficiency of motor and fan. It discharge opening the transmitted out. A firm or person that carries out installation work. The identifier axiggend to installation. A person responsible for assume the quality and meeting the recoursements of the installed element. Product Data An alphanumeric value for the name of the monufactured tem as used by the manufacturer. Cost of installing overling. Cost of installing overling.	numeric numeric numeric text numeric numeric numeric date time text text text text	Ya m/s N f W Pa % date / / / / /			
	Operational Criteria Disscharge Pressure Loss Disscharge Velocity Fan Prover Rate Fan Efficiency Motor Drive Type Nominal Total Pressure Overall Efficiency Installation date Subcontractor Installation Seral Number/Tag Approved By ModelRabel ModelReference Overall Cost Installation Cost Installation Cost	Interpretations: and discharge pressure loss associated with the discharge arrangement: The speed at which air discharges from the fan through the fan housing discharge opening. Fan power consumption. Fan mochanical efficiency. Mater drive type e.g., DIRECT DRIVE: Direct drive. Forminal fan power rate. Nominal total efficiency. Installation power rate. Installation power rate. Installation outs carried out. A firm or person that carries out installation work. The identific angigned to installation. A person responsible for assuring the quality and meeting the requirements of the installation. Product Data The alphanumeric value representing the product, item or unit number assigned by the manufacture of the product. Ro alphanumeric value representing the product, item or unit number assigned by the manufacture of the product. Sum of all costs needed for installing. Cost of installing one unit, including workforce and equipment.	numeric numeric numeric numeric numeric numeric numeric numeric date time text text text text text text	Fa m/s W N 7 W Pa % date 1 1 1 1 1 1 1 1 1 1 1 € €			
	Operational Criteria Disscharge Pressure Los Disscharge Velocity Fan Power Rate Fan Efficiency Motor Drive Type Nominal Total Pressure Overall Efficiency Installation date Subcortractor Installation Serai Number/Tag Approved By ModelRabel ModelRabel Overall Cost Overall Cost	emperature. Fan discharge pressure loss associated with the discharge arrangement. The speed at which air discharges from the fan through the fan nover adjuster programmed on the discharge opening. Fan power consumption. Fan power consumption. Motor drive type e.g., DIRECT DRIVE: Direct drive. Nominal fan power rate. Nominal fan power rate. Nominal fan power rate. Total efficiency. It discharge opening opening the transmitted out. Total efficiency of motor and fan. It discharge opening the transmitted out. A firm or person that carries out installation work. The identifier axiggend to installation. A person responsible for assume the quality and meeting the recoursements of the installed element. Product Data An alphanumeric value for the name of the monufactured tem as used by the manufacturer. Cost of installing overling. Cost of installing overling.	numeric numeric numeric text numeric numeric numeric date time text text text text text	Fa m/s W Fa % Fa % C C f f f f f f f f			
	Operational Criteria Disscharge Pressure Loss Disscharge Velocity Fan Prover Rate Fan Efficiency Motor Drive Type Nominal Total Pressure Overall Efficiency Installation date Subcontractor Installation Seral Number/Tag Approved By ModelRabel ModelReference Overall Cost Installation Cost Installation Cost	emperature: Fan discharge pressure loss associated with the discharge arrangemet. Fan gowed at which air discharges from the fan through the fan bousing docharge opening. Fan power consumption. Fan mochanical efficiency. Motor drive type e.g., DIRECT DRIVE: Direct drive. Mominal fan power rate. Norminal total efficiency. Introduction of the second fan. Introduction on the fan. Total efficiency of motor and fan. Introduction was carried out. A firm or person that carries out installation total The date on which the installation work. The identifier areigned to installation. Product Data Na alphanumeric value for the name of the manufactured them as used by the manufactured. Item as used by the manufactured. Cost Cost of installing one unit, including workforce and exujement. Cost of installing one unit.	numeric numeric numeric numeric numeric numeric numeric numeric date time text text text text text text	Fa m/s W N 7 W Pa % date 1 1 1 1 1 1 1 1 1 1 1 € €			

Information Delivery Milestone: Construction

nformation Delivery Mileston						
urpose:	Mechanical					
ictor:						
Ab in ste	"Fan" / IfcFan					
bject: ieometrical information:	ran / noran					
	Element modelled b	shane and environ Asherician and the state of the	wall executed	mante ma toto d		
etail:	Element modelled to accurate size, shape and spacing. Actual clearancess modelled. Actual floor and wall penetration elements modeled.					
imensionality:	3D Absolute					
ocation:						
ppearance:	Color fill to distinguish different ma Not requested	icenais				
arametric behaviour: Iphanumeric Information:	not requested					
Sentification:						
information content:	Property	Description	Data Type	Units		
		Identity Data				
	Name	Primary identifier of an object.	text	1		
	Type	Defines the object type, specific information about object.	text	1		
	Dud to day	Holds the entity specific enumeration of predefined types to		1960		
	Predefined Type	further classify the entity	text	1		
	Classification	Classification code according to chosen classification system.	test	1		
		Defines the system for the connectors that are located on air				
	System Classification	terminals, equipment and fixtures. For example, connectors	test	1		
		for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	1000	×		
	System Type	Type of system e.g., supply air.	text	1		
	System Name	A name that uniquely defines system. It may be user-defined	text	1		
		or automatically generated.	1112			
	System Abbreviation	A user-defined abbreviation for a system.	text	1		
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m		
	Level	Defines the reference level.	text	1		
	Q. 19/6	An alphanumeric value		140		
	Description	providing a concise description of the element.	text	1		
	Manufacturer	The organization that manufactured and / or assembled the	text	1		
	wanuacturer	item.	0241	J.		
	URL	A valid URL hyperlink to the manufacturer's website.	text	1		
		Material				
	Material	The primary material used to construct the object.	text	1		
		Dimensional Data				
	Length	The nominal length of the fan.	numeric	mm		
	Width	The nominal width of the fan.	numeric	mm		
	Height	The nominal height of the fan. Michanical Data	numeric	mm		
	Air Flow Rate Range	Possible range of airflow that can be delivered.	numeric	Liter/Mini		
	Air Flow Rate	The actual airflow rate as designed.	numeric	Liter/Min		
	Operation Temperature Range	Allowable operation ambient air temperature range.	numeric	°C		
	Operational Criteria	Time of operation at maximum operational ambient air	numeric	hour		
	operational criteria	temperature.	numere.	nour		
	Disscharge Pressure Loss	Fan discharge pressure loss associated with the discharge arrangement.	numeric	Pa		
	Disscharge Velocity	The speed at which air discharges from the fan through the	numeric	m/s		
		fan housing discharge opening.				
	Fan Power Rate Fan Efficiency	Fan power consumption. Fan mechanical efficiency.	numeric	W %		
	Motor Drive Type	Motor drive type e.g., DIRECT DRIVE: Direct drive.	text	* /		
	Nominal Power Rate	Nominal fan power rate.	numeric	W		
	Nominal Total Pressure	Nominal total pressure rise across the fan.	numeric	Pa		
	Overall Efficiency	Total efficiency of motor and fan.	numeric	%		
		Installation Data	1			
	Installation date	The date on which the installation was carried out.	date time	date		
	Subcontractor	A firm or person that carries out installation work.	text	1		
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1		
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1		
		Warranty Data				
	Warranty ID	The identifier assigned to a warranty.	text	1		
		An alphanumeric value				
	WarrantyDescription	providing a concise description of the warranty content and	text	1		
		any exclusions.	control.			
	Warranty Start Date	The date on which the warranty commences.	date time	date		
	Warranty End Date	The date on which the warranty expires.	date time	date		
	0.00000000	The physical status of the element at the time of the inventory or audit, based on the best judgment of those				
	Condition	persons familiar with the physical characteristics and	text	1		
		condition.				
	(Second state	Basic imperfection that implies any deformity in component of a building that is owing to blemished plan, inadequate or				
	Defects	flawed workmanship or deficient material and once in a	text	1		
		while any blend of these.		L		
		Product Data	1			
	ModelLabel	An alphanumeric value representing the product, item or	text	1		
		unit number assigned by the manufacturer of the product.	1770 y	2		
	ModelReference	An alphanumeric value for the name of the manufactured	text	1		
		item as used by the manufacturer.	73			
	Overall Cost	Sum of all costs needed for installing.	numeric	£		
	0.000	Cost of installing one unit, including workforce and	numeric			
	Installation Cost.					
	Installation Cost	equipment.	10011001			
	Installation Cost Material Cost	equipment. Cost of material for installing one unit.	numeric	e		
	Charles and Conference	equipment.	10011001	e /		

Erasmus Mundus Joint Master Degree Programme - ERASMUS+

European Master in Building Information Modelling BIM A+

Information Delivery Milestone:	Design						
Purpose:	Mechanical						
Actor:							
Object:	"Chiller" / IfcChiller						
Seometrical information:							
letail:	Element modelled as simplified vol	lume representation with approximate size and shape. Approximal	te clearances model	led.			
Dimensionality:	30						
ocation:	Absolute and relative to other building elements						
opearance:	Single color fill						
arametric behaviour:	Not requested						
Nohanumeric Information							
dentification:	1						
nformation content	Property	Description	Data Type	Units			
		Identity Data					
	Name	Primary identifier of an object.	text	1			
	Туре	Defines the object type, specific information about object.	text	1			
	Classification	Classification code according to chosen classification system.	text	1			
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	1			
	System Type	Type of system e.g., supply air.	text	1			
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1			
	System Abbreviation	A user-defined abbreviation for a system.	text	1			
	Level	Defines the reference level.	text	1			
		Material					
	Material	The primary material used to construct the object.	text	1			
		Dimensional Data					
	Length	The nominal length of the chiller.	numeric	mm			
	Width	The nominal width of the chiller.	numeric	mm			
	Height	The nominal height of the chiller.	numeric	mm			
	Mechanical Data						
		The product of the ideal capacity and the overall volumetric					
	Capacity	efficiency of the compressor.	numeric	w			
	Nominal Efficiency	Nominal chiller efficiency under nominal conditions.	numeríc	56			
	Nominal Capacity	Nominal cooling capacity of chiller at standardized conditions as defined by the agency having jurisdiction.	numeric	w			
	Cooling Water Pressure Drop	The pressure difference of the cooling water.	numeric	Pa			
	Cooling Water Flow	Nominal water flow.	numeric	L/s			
	Cooling Capacity	Cooling capacity measures the ability of a cooling system to remove heat.	numeric	w			
	Chilled Water Pressure Drop	The pressure difference of the chilled water.	numeric	Pa			
		Electrical Data					
	Apparent Load	Apparent power device is needed.	numeric	VA			
		Cost					
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material, lubor and equipment).	numeric	¢			
	Estimated Unit Cost	Estimated cost of element per m ² / m ³ . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/ m³			
		Phasing					
	Phase	Identifies the phase in which the object is created.	text.	1			
Documentation:				-			

Information Delivery Milestone:	Construction			
Purpose:	Mechanical			
Actor:				
Object:	"Chiller" / IfcChiller			
Geometrical information:				
Detail;	Element modelied to nominal size,	shape and spacing. Actual clearancess modelled. Nominal floor an	d wall penetration ele	ments modeled.
Dimensionality:	30			
Location:	Absolute			
Appearance:	Color fill to distinguish different ma	iterials		
Parametric behaviour:	Not requested			
Alphanumeric Information:				
Identification:		-		
information content:	Property	Description Identity Data	Data Type	Units
1	Name	Primary identifier of an object.	text	1
				E S
	Түре	Defines the object type, specific information about object.	test	1
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and futures. For example, connectors for air terminals could have a system classification of Supply	text	1
	System Type	Air, Return Air or Exhaust Air. Type of system e.g., supply air.	text	/
	System Name	A name that uniquely defines system. It may be user-defined	text	
		or automatically generated.	10000	£
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
	Level	Defines the reference level.	test	1
	Description	An alphanumeric value providing a concise description of the element.	text	1
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1
		Material		
	Material	The primary material used to construct the object. Dimensional Data	text	1
	Length	The nominal length of the chiller.	numeric	mm
1	Width	The nominal width of the chiller.	numeric	mm
1	Height	The nominal height of the chiller.	numeric	៣៣
		Mechanical Data		-
	Capacity	The product of the ideal capacity and the overall volumetric	numeric	w
		efficiency of the compressor.		
1	Nominal Efficiency	Nominal chiller efficiency under nominal conditions. Nominal cooling capacity of chiller at standardized conditions	numeric	%
	Nominal Capacity	as defined by the agency having jurisdiction.	numeric	w
	Cooling Water Pressure Drop	The pressure difference of the cooling water.	numeric	Pa
	Cooling Water Flow	Nominal water flow.	numeric	L/S
	Cooling Capacity	Cooling capacity measures the ability of a cooling system to	numeric	w
	Chilled Water Pressure Drop	remove heat. The pressure difference of the chilled water.	numeric	Pa
	and the restored bigs	Electrical Data	AND THE R.	
	Apparent Load	Apparent power device is needed.	numeric	VA
	Voltage	The voltage that a device is designed to handle.	numeric	V
	Number of Poles	The number of live lines that is intended to be handled by the device.	numeric	1
		the device. Installation Data		
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1
		Product Data		
	ModelLabel	An alphanumeric value representing the product, item or	text	1
		unit number assigned by the manufacturer of the product. An alphanumeric value for the name of the manufactured	2000	
	ModelReference	Item as used by the manufacturer.	text	1
		Cost		
	Overall Cost	Sum of all costs needed for installing.	numeric	C
	Installation Cost	Cost of Installing one unit, including workforce and equipment.	numeric	¢
	Material Cost	Cost of material for installing one unit.	numeric	c
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1
Documentation:				
Set of documents:				

nformation Delivery Milestone:	Operation			
urpose:	Mechanical			
Actor:				
	Det al. II for at the			
Object:	"Chiller" / IfcChiller			
Seometrical Information: Netail:	Element modelled to accurate size	shape and spacing. Actual size for all supports and clearancess m	odelled	
ietaii: Jimensionality:	Element modelled to accurate size, 3D	, wrope and specing, without size for all supports and clear aboess in	unite and an	
location:	Absolute			
Appearance:	Color fill to distinguish different ma	oterials		
Parametric behaviour:	Not requested			
Alphanumeric information:				
dentification:				11.11.
nformation content:	Property	Description Identity Data	Data Type	Units
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	Classification		text	1
	Classification	Classification code according to chosen classification system.	text	1
	In the rest of the rest of the	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors	200302	
	System Classification	for air terminals could have a system classification of Supply	text	1
		Air, Return Air or Exhaust Air.		
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
		Defines the reference level.	1000000000	Jacob.
	Level	An alphanumeric value	text	1
	Description	providing a concise description	text	1
		of the element.		200
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1
	URL	A valid URL hyperlink to the	text	1
	Uni	manufacturer's website.	10.11	1
	Advanced.	Material	text	
	Material	The primary material used to construct the object. Dimensional Data	text	1
	Length	The nominal length of the chiller.	numeric	mm
	Width	The nominal width of the chiller.	numeric	mm
	Height	The nominal height of the chiller.	numeric	mm
		Mechanical Data		
	Capacity	The product of the ideal capacity and the overall volumetric	numeric	w
	Nominal Efficiency	efficiency of the compressor. Nominal chiller efficiency under nominal conditions.	numeric	%
		Nominal cooling capacity of chiller at standardized		22.01
	Nominal Capacity	conditions as defined by the agency having jurisdiction.	numeric	w
	Cooling Water Pressure Drop	The pressure difference of the cooling water.	numeric	Pa
	Cooling Water Flow	Nominal water flow.	numeric	L/s
	Cooling Capacity	Cooling capacity measures the ability of a cooling system to remove heat.	numeric	w
	Chilled Water Pressure Drop	The pressure difference of the chilled water.	numeric	Pa
		Electrical Data		
	Apparent Load	Apparent power device is needed.	numeric	VA
	Voltage	The voltage that a device is designed to handle.	numeric	v
	Number of Poles	The number of live lines that is intended to be handled by the device.	numeric	1
		Installation Data		
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1
		Warranty Data		
	Warranty ID	The identifier assigned to a warranty.	text	1
		An alphanumeric value		
	WarrantyDescription	providing a concise description of the warranty content and	text	1
		any exclusions.		-9.
	Warranty Start Date	The date on which the warranty commences.	date time	date
	Warranty End Date	The date on which the warranty expires.	date time	date
	1012100-011	The physical status of the element at the time of the inventory or audit, based on the best judgment of those	1000	173
	Condition	persons familiar with the physical characteristics and	text	1
	-	condition. Basic imperfection that implies any deformity in component		
	Defects	of a building that is owing to blemished plan, inadequate or	101	
	Defects	flawed workmanship or deficient material and once in a	test	/
	-	while any blend of these. Product Data		
			1	
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
	ModelReference	An alphanumeric value for the name of the manufactured Item as used by the manufacturer.	text	1
		Cost		
	Overall Cost	Sum of all costs needed for installing.	numeric	¢
	Installation Cost	Cost of installing one unit, including workforce and	numeric	6
	Material Cost	equipment. Cost of material for installing one unit.	numeric	£
		Phasing		277.22
	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	Identifies the phase in which the object is created.	text	1
	Phase	identities the phase in which the object is created.	text	1

Information Delivery Mileston				
Purpose:	Mechanical			
Actor:				
	10 million (1997)			
Object:	"Boiler" / IfcBoiler			
Geometrical Information:				
Detail	Element modelled as simplified vol-	ume representation with approximate size and shape. Approxima	te clearances model	ied.
Dimensionality:	30		12-2-2010-0-1-1-2-2-2-2-2-2-2-2-2-2-2-2-	2222
ocition:	Absolute and relative to other built	find elements		
Appéarance:	Single color fill			
arametric behaviour:	Not requested			
Aphanumeric Information:				
dentification.				
nformation content:	Property	Description	Data Type	Units
	Property	Identity Data	Data Type	Chills
	Name		text	
	Name	Primary identifier of an object.	text	/
	Type	Defines the object type, specific information about object.	text	1
		and the second	100	
	Classification	Classification code according to chosen classification system.	text	1
		Defines the system for the connectors that are located on air		
	System Classification	terminals, equipment and fixtures. For example, connectors	text	1
	5 50 mm 20 753 10 m 20 75	for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	2612235	
	System Type	Type of system e.g., supply air.	text	1
	and and investigation	A name that uniquely defines system. It may be user-defined		
	System Name	or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Level	Defines the reference level.	text	1
		Material		
	Material	The primary material used to construct the object.	text	1
		Dimensional Data	14.03	<i></i>
	Length	The nominal length of the boiler.	numeric	men
	Width	The nominal width of the boiler.	numeric	mm
	Diametar of exhaust connection	The nominal diametar of the exhaust connection.	numeric	mm
	Height	The nominal height of the boiler.	numeric	mm
		Performance Data		
		This is used to identify if the boiler has storage capacity		
	Is Water Storage Heater	(TRUE). If FALSE, then there is no storage capacity built into	bolean	YES/ND
		the boiler, such as an instantaneous hot water heater.		
		Mechanical Data		
	Water Storage Capacity	Water storage capacity.	numeric	litres
		Total nominal heat output as listed by the Soller		and the second
	1000100000000	manufacturer.	10.0123345	2577.07442
	Heat Output	*For steam bollers, it is a function of inlet temperature	numeric	BTU/Hr
		versus steam pressure.		
		Enumeration defining the energy source or fuel cumbusted		
	Energy Source	to generate heat.	text	1
			10000	۴
		Allowable outlet temperature of either the water or the		
	Outlet Temperature Range	Allowable outlet temperature of either the water or the steam.	numeric	
	Outlet Temperature Range		numeric	
	Outlet Temperature Range	steam.	numeric	VA
		steam. Dectrical Data		
		steam. Electrical Data Apparent power device is needed.		
		steam. Electrical Data Apparent power device is needed. Cost Estimated cost for installing one unit. It is based on the average amount of needed resource (including material,		
	Apparent Load	Learn. Destrical Data Apparent power device is needed. Cost Estimated cost for installing one with. It is based on the average amount of needed resources (including material, laber and equipment).	numeric	¥A,
	Apparent Load Estimated Cost	team. Electrical Eata Apparent power device's needed. Cost Estimated cost for installing one unit. It is braud on the average amount of needed resources (including material, labor and equipment). Estimated cost of detement per m ² / m ² , It is based on the	numeric numeric	VA C
	Apparent Load	Letam. Electrical Data Apparent power device is needed. Cost Estimated cost for installing one unit. It is based on the average amount of needed resources, (including material, laber and equipment). Estimated cost of element per m ² /m ² , it is based on the verage amount of needed resources. (including material,	numeric	VA C
	Apparent Load Estimated Cost	team. Electrical Data Apparent power device is needed. Coit Estimated cast for installing one unit. It is taued on the average amount of needed resources (including material, labor and equipment). Estimated cost of dement per m ³ / m ³ , It is based on the average amount of needed resources (including material, labor and equipment).	numeric numeric	¥A.
	Apparent Load Estimated Cost	Letam. Electrical Data Apparent power device is needed. Cost Estimated cost for installing one unit. It is based on the average amount of needed resources, (including material, laber and equipment). Estimated cost of element per m ² /m ² , it is based on the verage amount of needed resources. (including material,	numeric numeric	VA C

Docu	ment	ation:	
Set of	docum	ants-	

Purpose: Actor:	Construction Mechanical			
manufaction and a second se	intechatinea)			
	1			
	HR-H-R / M-R-H-S			
bject:	"Boiler" / IfcBoiler			
eometrical information:	- Exception of the second s			
etaik:	Element modelled to nominal size, s	hape and spacing. Actual clearancess modelled. Nominal floor and	d wall penetration ele	ments modeled
Nmensionality:	3D			
ocation:	Absolute			
Appearance:	Color fill to distinguish different mat	torials		
Parametric behaviour:	Not requested			
Alphanumeric Information:				
dentification:				
nformation content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	£
	Type	Defines the object type, specific information about object.	text	1
	Bradelined Tune	Holds the entity specific enumeration of predefined types to	text	1
	Predefined Type	further classify the entity	sext	1
	Classification	Classification code according to chosen classification system,	text	1
		Defines the system for the connectors that are located on air		
	System Classification	terminals, equipment and fotures. For example, connectors	text	1
	aystern constituation	for air terminals could have a system classification of Supply	403	1
	Enders Free	Air, Return Air or Exhaust Air.	in the second se	7
	System Type	Type of system e.g., supply air. A name that uniquely defines system. It may be user-defined	text	-
	System Name	or automatically generated.	text	E.
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
			V 1000	
	Level	Defines the reference level.	text	1
	Description	An alphanumeric value providing a concise description	text	7
		of the element.		5
	Manufacturer	The organization that manufactured and / or assembled the	text	T
	THE WORLD	item.		1
		Material		-
	Material	The primary material used to construct the object.	text	t
	i possar	Dimensional Data	numeric	S 24400
	Length	The nominal length of the boiler.		mm
	Width Diameter of exhaust connection	The nominal width of the boiler. The nominal diametar of the exhaust connection.	numeric numeric	mm mm
	Height	The nominal diametar of the exhaust connection.	numeric	mm mm
	Height	Performance Data	in anneme	man
	1	I	1	
	is Water Storage Heater	This is used to identify if the boiler has storage capacity (TRUE). If FALSE, then there is no storage capacity built into	bolean	YES/NO
	is water storage meater.	(TRUE). If FALSE, then there is no storage capacity built into the boiler, such as an instantaneous hot water heater.	oolean	RESYNO
	Mare Press Course	Mechanical Sata	Burnady 1	
	Water Storage Capacity	Water storage capacity, Rominal fuel consumption rate required to produce the total	numeric	Rtres
	Nominal Energy Consumption	boiler heat output.	numeric	BTU
	Water Inlet Temperature Range	Allowable water inlet temperature range	numeric	۳ζ
	Working Pressure	Boiler working pressure.	numeric	Ra
	*#stown/Maximum Outlet Pressure	Masimum steam outlet pressure	numeric	Pa
	a new york new outer riesture		- Stilleric	14
		Total nominal heat output as listed by the Boiler manufacturer.		
	Heat Output	*For steam boilers, it is a function of inlet temperature versus	numeric	BTU/Hr
		steam pressure.		
	2	er setti filosopi -		
		The nominal efficiency of the bailer as defined by the		
	2007/10/2009/07	The nominal efficiency of the baller as defined by the manufacturer.	0001000	33
	Naminal Efficiency	The nominal efficiency of the baller as defined by the manufacturer. "For steam ballers, a function of inlet temperature versus steam pressure.	numeric	96
	Nominal Efficiency	The nominal efficiency of the baller as defined by the manufacturer. *For stars ballers, a function of inlet temperature versus steam pressure. * For water ballers, a function of inlet versus outlet.	numeric	s
	2000 D1000 D100	The nominal efficiency of the boller as defined by the manufacturer. Yes starm bollers, a function of lelet temperature versus steam pressure bollers, a function of inlet versus outlet temperature.		
	Nominal Efficiency Energy Source	The nominal efficiency of the baller as defined by the manufacturer. "For stam ballers, a function of inlet temperature versus stams pressure. "For writer ballers, a function of inlet versus outlet, temperature. Enumeration defining the energy source or fuel cambusted to	numeric text	*
	2000 D1000 D100	The nominal efficiency of the boller as defined by the manufacturer. Yes starm bollers, a function of lelet temperature versus steam pressure bollers, a function of inlet versus outlet temperature.		
	Energy Source Operating Mode	The nominal efficiency of the baller as defined by the manufactureer. "For steam ballers, a function of inlet temperature versus steam pressure. "For wither ballers, a function of inlet versus outlet. transpersture. Enumeration defining the energy source or fuel cumbunted to generate heat.	text text	1
	Energy Source	The nominal efficiency of the boiler as defined by the manufacturer. "For stam boilers, a function of inlet temperature versus steam pressure, function of inlet versus outlet temperature. Enumeration defining the energy source or fuel cambasited to generate hest.	text	t
	Energy Source Operating Mode Outlet Temperature Bange Combustion Efficiency	The nominal efficiency of the bolier as defined by the manufacturee. For stam boliers, a function of inlet temperature versus scenn pressure. For water boliers, a function of inlet versus outlet temperature. Enumeration defining the energy source or fuel cambousted to generate heat. Mentifies the operating mode of the bolier e.g., (DDD. Allowable outlet temperature of either the water or the steam.	text text numeric numeric	/ / *C
	Energy Source Operating Mode Outlet Temperature Range Combustion Efficiency Gass released	The nominal efficiency of the baller as defined by the manufactureer. "For strain ballers, a function of inlet temperature versus steam pressure. "For wither ballers, a function of inlet versus outlet. Thermoretarue. Ensumeration defining the energy source or fuel cumbusted to generate heat. Mentifies the operating mode of the boller e.g., FDED. Adamskie outlies theroparature of either the water or the steam. Combustion efficiency under nominal condition. Type of gass released.	text bext numeric numeric text	/ / *c *
	Energy Source Operating Mode Outlet Temperature Bange Combustion Efficiency	The nominal efficiency of the boller as defined by the manufacturer. Yer stam bollers, a function of lefet temperature versus steam pressure. Yer wrater bollers, a function of inlet versus outlet temperature. Enumeration defining the energy source or fuel cumbusted to generate heat. Mentifies the operating mode of the boller e.g., (TXID. Allowable outlet temporature of either the water or the team. Combustion efficiency under nominal condition. Type of gass refused.	text text numeric numeric	/ / *C
	Energy Source Operating Mode Outlet Temperature Range Combustion Efficiency Gass released Gass Flow Rate	The nominal efficiency of the baller as defined by the manufacturee. "For state hollers, a function of inlet temperature versus steam pressure. For water bollers, a function of inlet versus outlet transperature. Enumeration defining the energy source or fuel cambusted to generate heat. Mentlines the operating mode of the boller e.g., fDED. Allowable outlet temperature of laber the water or the steam. Combustion efficiency under nominal condition. Type of gass effected. Nominal gas flow. <u>Exectical Data</u>	bext bext numeric numeric text numeric	/ / * * * * * * *
	Energy Source Operating Mode Outlet Temperature Range Combustion Efficiency Gass released Gass Flow Rate Apparent Load	The nominal efficiency of the baller as defined by the manufactureer. "For steam ballers, a function of inlet temperature versus steam pressure. "For wither ballers, a function of inlet versus outlet. transpersture. Ensumeration defining the energy source or fuel cumbusted to generate heat. Mentifies the operating mode of the baller e.g., FDED. Allowable outlet temperature of either the water or the steam. Combustion efficiency under nominal condition. Type of gass released. Nominal gass flow. <u>Excitical Data</u> Apparent power device is needed.	text text numeric numeric text numeric numeric	/ *C % / VS
	Energy Source Operating Mode Outlet Temperature Range Combustion Efficiency Gass released Gass Flow Rate	The nominal efficiency of the boller as defined by the manufacturer. Ye or starm bollers, a function of inlet temperature versus steam pressure, and the second pressure bollers, a function of inlet versus outlet temperature. For watter bollers, a function of inlet versus outlet temperature. Enumeration defining the energy source or fuel cambasted to generate heat. Mentifies the operating mode of the boller e.g., FRID. Allowable outlet temperature of either the water or the team. Combustion efficiency under nominal condition. Type of gass released. Nominal gas flow. Excitical Data Apparent power fervice is needed. The voltage that a device is designed to handle.	bext bext numeric numeric text numeric	/ 1 1 1 1 VS
	Energy Source Operating Mode Outlet Temporature Range Combustion Efficiency Gass released Gass Flow Rate Apparent Load Voltage	The nominal efficiency of the baller as defined by the manufacturee. "For strain ballers, a function of inlet temperature versus steam pressure." For water bollers, a function of inlet versus outlet temperature. Enumeration defining the energy source or fuel cambusted to generate heat. Mentifies the operating mode of the boller e.g., fDXD. Allowable outlet temperature of the boller e.g., fDXD. Combustion efficiency under nominal condition. Type of gass released. Rominal gass flow. <u>Excisical Data</u> Appenent power fervice is needed. Interview that a device is designed to handle. Installation Data	text Sext numeric numeric numeric numeric numeric	/ // // //s VA VA
	Energy Source Operating Mode Outlet Temperature Range Combustion Efficiency Gass Flow Rate Apparent Load Voltage Installation date	The nominal efficiency of the baller as defined by the manufactureer. ¹⁴ For steam ballers, a function of inlet temperature versus steam pressure. ¹⁴ For wither ballers, a function of inlet versus outlet. transmitter ballers, a function of inlet versus outlet. ¹⁵ For wither ballers, a function of inlet versus outlet. ¹⁶ Allowable couldet temperature of either the water or the steam. ¹⁶ Combustion efficiency under nominal condition. ¹⁷ Pet of gass released. ¹⁶ Roomal State	text sext numeric numeric sext numeric numeric numeric numeric date time	/ / *C % / Vs VA V VA V VA
	Energy Source Operating Mode Outlet Temperature Range Combustion Efficiency Gass released Gass Flow Rate Apparent Load Voltage Installation date Solbcontractor	The nominal efficiency of the baller as defined by the manufacturee. For staten ballers, a function of inlet temperature versus scenn pressure. For water bollers, a function of inlet versus outlet trepperature. Enumeration defining the energy source or fuel cambasised to generate heat. Mentifies the operating mode of the boller e.g., (DKD. Allowable outlet temperature of either the water or the steam. Combustion efficiency under nominal condition. Type of gass released. Rominal gass flow: <u>Exclusion Data</u> <u>Exclusion Data</u> <u>Installation Data</u> The voltage that a device is designed to handle. <u>Installation Data</u> The date on which the installation work.	text Sext numeric text numeric numeric numeric numeric date time text	/ // // // // // // // // // // // // /
	Energy Source Opporting Mode Outet Temporature Range Combustion Efficiency Gass released Gass Flow Rate Apparent Load Voltage Installation date Subcontractor Installation Serial Number/Tag	The normal efficiency of the boller as defined by the manufacturee. "For strain bollers, a function of inlet temperature versus seein pressure. "For water bollers, a function of inlet versus outlet temperature. Enumeration defining the energy source or fuel cambusted to generate heat. Mentifies the operating mode of the boller e.g., fDED. Allowable outlet temporature of either the water or the seain. Combustion efficiency under nominal condition. Type of gass refusand. Nominal gass flow. <u>Exercical Data</u> Apparent power device is needed. The others the statisticon bata Installation Data The den on which the installation was carried out. A firm or person that carries out installation.	text sext numeric text numeric numeric numeric date sime text pumeric	/ / 'C % / % VA V date / /
	Energy Source Operating Mode Outlet Temperature Range Combustion Efficiency Gass released Gass Flow Rate Apparent Load Voltage Installation date Solbcontractor	Ibe nominal efficiency of the boller as defined by the manufacturer. Yer stam bollers, a function of inlet temperature versus steam pressure, a function of inlet versus outlet, temperature. Yer writter bollers, a function of inlet versus outlet, temperature, and the state of the loster erg, 1020. Allowable outlet temperature of either the water or the team. Combustion efficiency under nominal condition. Type of gass released. Nominal gass flow. Excitical Data Apparent power fervice is needed. The voltage that a device is designed to handle. Institution that carries out installation work. The date on which the installation work. The fore thersalited no stataliton. A person responsible for assiring the authy and meeting the	text Sext numeric text numeric numeric numeric numeric date time text	/ // 'C % // U/S VA V V // V // / /
	Energy Source Opporting Mode Outet Temporature Range Combustion Efficiency Gass released Gass Flow Rate Apparent Load Voltage Installation date Subcontractor Installation Serial Number/Tag	The normal efficiency of the boller as defined by the manufacturee. "For strain hollers, a function of inlet temperature versus seein pressure. "For water bollers, a function of inlet versus outlet temperature. Enumeration defining the energy source or fuel cambusted to generate heat. Meetifies the operating mode of the boller e.g., fDED. Allowable outlet temporature of either the water or the seain. Combustion efficiency under nominal condition. Type of gass refusand. Nominal gass flow. <u>Exercical Data</u> Apparent power device is needed. The others the statisticon bata Installation Data The den on which the installation was carried out. A firm or person that carries out installation.	text sext numeric text numeric numeric numeric date sime text pumeric	/ / 'C % / % VA V date / /
	Energy Source Operating Mode Outet Temperature Range Combustion Efficiency Gass released Gass Flow Rate Apparent Load Voltage Installation date Solitoon textor Installation Serial Number/Tag Approved By	The normal efficiency of the boller as defined by the manufacturee. "For strain bollers, o function of inlet temperature versus strain pressure. "For wrant bollers, a function of inlet versus outlet temperature. Enumeration defining the energy source or fuel cambusted to generate heat. Meetifies the operating mode of the boller eg., fDSDD. Allowals outlet temperature of either the water or the seam. Combustion efficiency under nominal condition. Type of gass refusiend. Nominal gass flow. Exercical Data Apparent power device is needed. The office on which the installation tars Installation. The form office assigned to installation. A firm or person that carries out installation. A person regionable for assing the quality and meeting the requirements of the installed dement. Product Data Product Data	text sext numeric numeric sext numeric numeric dete time text numeric text	/ / 'C % / V V V V date / / / / / /
	Energy Source Opporting Mode Outet Temporature Range Combustion Efficiency Gass released Gass Flow Rate Apparent Load Voltage Installation date Subcontractor Installation Serial Number/Tag	The normal efficiency of the boller as defined by the manufacturee. For stam bollers, a function of inlet temperature versus scenn pressure. For water bollers, a function of inlet versus outlet trepperature. Enumeration defining the energy source or fuel cambasted to generate heat. Meetings the operating mode of the boller e.g., (DKD. Allowable outlet temperature of either the water or the tacan. Combustion efficiency under nominal condition. Type of gass released. Bound efficiency under nominal condition. Type of gass released. Rominal gass flow: Exclusion flats Meetings that a device is designed to handle. Intervalues that a device is designed to handle. Exclusion flats The dater on which the installation work. The identifier a signed to lenstalitation. Apperon responsible for asciright the usel by all meeting the requirements of the installed element. Product Data An alphanemeric value representing the product, term or unit.	text sext numeric text numeric numeric numeric date sime text pumeric	/ / 'C % / % VA V date / /
	Energy Source Operating Mode Outet Temperature Range Combustion Efficiency Gass released Gass Flow Rate Apparent Load Voltage Installation date Solitoon textor Installation Serial Number/Tag Approved By	The normal efficiency of the boller as defined by the manufacturee. For stam bollers, a function of inlet temperature versus steam pressure. For water bollers, a function of inlet versus outlet transperature. Ensumeration defining the energy source or fuel cambusted to generate heat. Mentlines the operating mode of the boller e.g., fDSD. Allowable outlet temperature of laber the water or the trans. Combustion efficiency under nominal condition. Type of gass released. Nominal gass flow. <u>Excitical Data</u> Apparent power fervice is needed. The voltage that a device is designed to handle. Installation Data the date on which the installation work. The date on which the installation total. The date on which the installation work. The identifier assigned to testallation. A preson negonable for assiring the quality and meeting the product Data. An adphanemerk value roomersetting the product. The many the manufacturer of the product.	text sext numeric numeric sext numeric numeric dete time text numeric text	/ / 'C % / V V V V date / / / / / /
	Energy Source Operating Mode Outet Temperature Range Combustion Efficiency Gass released Gass Flow Rate Apparent Load Voltage Installation date Solitoon textor Installation Serial Number/Tag Approved By	The nonimal efficiency of the boller as defined by the manufactureer. ¹⁴ For stream bollers, a function of inlet temperature versus steam pressure. ¹⁴ For within the stream of the versus outlet. ¹⁴ The versus outlet temperature. Enumeration defining the energy source or fuel cumbusted to generate heat. Mentifies the operating mode of the boller edg., PDED. Allowakje outlet temperature of either the water or the steam. Combustion efficiency under nominal condition. ¹⁴ Type of gass released. Nominal gass flow. Electrical Data Apparent power device is needed. The othage that a device is designed to handle. Installation Bata The date on which the installation was Carried out. A firm or person that carries out installation. A person responsible for assuring the quality and meeting the recurrements of the installation. Apparent power value representing the product, item or unit number assigned by the manufactured of the product. An adphanameric value representing the product. Item or unit number assigned by the manufactured of the product. An adphanameric value representing the product. Item or unit number assigned by the manufactured of the product. An adphanameric value representing the product. An adphanameric	text sext numeric numeric sext numeric numeric dete time text numeric text	/ / 'C % / V V V V date / / / / / /
	Energy Source Operating Mode Dutiet Temperature Range Combustion Efficiency Gass released Gass Flow Rate Gass Flow Rate Apparent Load Voltage installation date Soboontrector Installation Serial Number/Tag Approved By ModelLabel	The normal efficiency of the boller as defined by the manufacturee. For stam bollers, a function of inlet temperature versus steam pressure. For water bollers, a function of inlet versus outlet transperature. Ensumeration defining the energy source or fuel cambusted to generate heat. Mentlines the operating mode of the boller e.g., fDSD. Allowable outlet temperature of laber the water or the trans. Combustion efficiency under nominal condition. Type of gass released. Nominal gass flow. <u>Excitical Data</u> Apparent power fervice is needed. The voltage that a device is designed to handle. Installation Data the date on which the installation work. The date on which the installation total. The date on which the installation work. The identifier assigned to testallation. A preson negonable for assiring the quality and meeting the product Data. An adphanemerk value roomersetting the product. The many the manufacturer of the product.	text hest numeric humeric humeric numeric numeric text hest hest hest hest	/ / / / / / / / / / / / / / / / / / /
	Energy Source Operating Mode Dutiet Temperature Range Combustion Efficiency Gass released Gass Flow Rate Gass Flow Rate Apparent Load Voltage installation date Soboontrector Installation Serial Number/Tag Approved By ModelLabel	The normal efficiency of the bolier as defined by the manufacturee. For stam hollers, a function of inlet temperature versus steam pressure. For water boliers, a function of inlet versus outlet trapperature. Enumeration defining the energy source or fuel cambusted to generate heat. Mentlifes the operating mode of the bolier e.g., fDED. Allowable outlet temperature of laber the water or the trans. Combustion efficiency under nominal condition. Type of gass released. Nominal gas fine. <u>Exciscial Data</u> Apparent power fervice is needed. The voltage that a device is designed to handle. In the voltage that a device is designed to handle. The date on which the installation was carried out. A firm or person that carries out installation work. The identifier a signed to installation. A person responsible for souring the quality and meeting the product Data An adphanemerk: value resonance in the manufactured ferm as used by the manufacturer.	text hest numeric humeric humeric numeric numeric text hest hest hest hest	/ / / / / / / / / / / / / / / / / / /
	Energy Source Operating Mode Outlet Temperature Range Combustion Efficiency Gass released Gass Flow Rate Apparent Load Voltage Installation date Subcontractor Installation Serial Number/Tag Approved By ModelRaference Overall Cost	The normal efficiency of the boller as defined by the reansfatturee. " For strain hollow, a function of inlet temperature versus seem pressure. The second state versus outlet temperature. The second state versus outlet programmers and the second state versus outlet preservate heat. The second state versus outlet temperature. The second state versus outlet preservate heat. The second state versus outlet temperature. The second state versus outlet temperature. The second state versus outlet temperate heat. The second state of the boller e.g., TRID. A Allowable outlet temperature of either the water or the second. The second state of the second state. The second. <u>Exercical Outland</u> . The other set second state of the temperate bour fields the inself out. A firm or person that carries out installation work. The fore the assigned to installed second. A firm or person that carries out installation. A previous messionable for assuring the quality and meeting the requirements of the installed second. A An alphanumeric value representing the product, item or unit number assigned by the manufacture of the mainufactured litem substate value for the name of the mainufactured litem substate version of the mainufacture Cost	text sext numeric numeric numeric numeric numeric date time text numeric text sext text text	/ / / / / / / / / / / / / / / / / / /
	Energy Source Operating Mode Dutiet Temperature Range Combustion Efficiency Gass released Gass Flow Rate Apparent Load Voltage Installation date Solitown textor Installation Serial Number/Tag Approved Dy ModelLabel ModelLabel Overall Cost Installation Cost	The normal efficiency of the bolier as defined by the manufacturee. For stam boliers, a function of inlet temperature versus scenn pressure. For water boliers, a function of inlet versus outlet trepperature. Enumeration defining the energy source or fuel cambasted to generate heat. Meetings the operating mode of the bolier e.g., (DKD. Allowable could's temporature of either the water or the steam. Combustion efficiency under normal condition. Type of gass released. Rominal gass flow: <u>Exclusion to the installation work.</u> The voltage that advice is designed to handle. <u>Installation flats</u> The dater on which the installation work. The factifier a signed to installation. Apparent power device is consisted out. A firm or person that carries out installation work. The ideation on the installation. Approvention the installation. Product Data An alphanameric value representing the product, item or unit number assigned to the installation. <u>Product Data</u> An alphanameric value representing the product. An alphanameric value representing the product. An alphanameric value representing the product. An alphanameric value representing the product. Cost Sum of all costs needed for installing. Cost of installing one unit, encluding workforce and equipment.	text text numeric numeric numeric numeric numeric date time text text text text numeric	/ / / / / / / / / / / / / / / / / / /
	Energy Source Operating Mode Outlet Temperature Range Combustion Efficiency Gass released Gass Flow Rate Apparent Load Voltage Installation date Subcontractor Installation Serial Number/Tag Approved By ModelRaference Overall Cost	The normal efficiency of the bolier as defined by the manufacturee. For strain boliers, a function of inlet temperature versus steam pressure. For water boliers, a function of inlet versus outlet trepperature. Enumeration defining the energy source or fuel cambusted to generate heat. Mentlines the operating mode of the bolier e.g., fDXD. Allowable outlet temperature of lefter the water or the tream officiency under normal condition. Type of gass reflected, under normal condition. Type of gass reflected. Excitical Data Appenent power firviers in needed. The voltage that a device is designed to bandle. Instructure, The date on which the installation mode. The voltage that a device is designed to bandle. Instructure, Appenent backet field to bandle. Instructure, Appenent the installed enterts. Product DBA: An adphanameric value for the name of the manufactured tem as using by the manufacturer. Cost Sam of all costs needed for installing. Cost Sam of all costs needed for installing.	text sext numeric numeric numeric numeric numeric date time text numeric text sext text text	/ / / / / / / / / / / / / / / / / / /
	Energy Source Operating Mode Dutiet Temperature Range Combustion Efficiency Gass released Gass Flow Rate Apparent Load Voltage Installation date Solitown textor Installation Serial Number/Tag Approved Dy ModelLabel ModelLabel Overall Cost Installation Cost	The normal efficiency of the bolier as defined by the manufacturee. For stam boliers, a function of inlet temperature versus scenn pressure. For water boliers, a function of inlet versus outlet trepperature. Enumeration defining the energy source or fuel cambasted to generate heat. Meetings the operating mode of the bolier e.g., (DKD. Allowable could's temporature of either the water or the steam. Combustion efficiency under normal condition. Type of gass released. Rominal gass flow: <u>Exclusion to the installation work.</u> The voltage that advice is designed to handle. <u>Installation flats</u> The dater on which the installation work. The factifier a signed to installation. Apparent power device is consisted out. A firm or person that carries out installation. The dater on which the installation. A person responsible for ascript the quality and meeting the requirements of the installation. An alphanameric value representing the product. Rem or unit number assigned by the manufacturer of tema sude by the manufacturers. Cost Sum of all costs needed for installing. Cost of installing one unit, including workforce and equipment.	text text numeric numeric numeric numeric numeric date time text text text text numeric	/ / / / / / / / / / / / / / / / / / /

ivery Milestone: Opera Mech				
Wech	Inical			
"Boile	r" / IfcBoiler			
mation:			1000000	
	modelled to accurate size,	shape and spacing. Actual size for all supports and clearancess m	nodelled.	
3D Absolut				
	r to distinguish different mat	torjals		
Not req				
ormation:	54.00 million			
		g to a the state of the state o		
	Property	Description identity Data	Data Type	Units
-	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	test	1
		Holds the entity specific enumeration of predefined types to	CONT.	-
	Predefined Type	further classify the entity	test	1
	Classification	Classification code according to chosen classification system.	test	1
		Defines the system for the connectors that are located on air	-	-
	system Classification	terminals, equipment and fixtures. For example, connectors	Lext.	1
		for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.		
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1
	stem Abbreviation	A user-defined abbreviation for a system.	text	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
-	Level	Defines the reference level.	text	1
		An alphanumeric value		T (
	Description	providing a concise description of the element.	text	/
	Manufacturer	The organization that manufactured and / or assembled the	text	1
	A.C. 2010/01/01/01	item. A valid URL hyperlink to the	2010	
	URL	manufacturer's website.	text	1
		Material		-
	Material	The primary material used to construct the object. Dimensional Data	text	1
	Length	The nominal length of the boiler.	numeric	mm
	Width	The nominal width of the boiler.	numeric	mm
Diame	tar of exhaust connection	The nominal diametar of the exhaust connection.	numeric	mm
	Height	The nominal height of the boiler.	numeric	mm
		Performance Data		1
2	Alana francis United	This is used to identify if the boiler has storage capacity	bolean	YES/NO
0	Water Storage Heater	(TRUE). If FALSE, then there is no storage capacity built into the boiler, such as an instantaneous hot water heater.	Dolean	1ES/NU
		Performance Data		
W	ater Storage Capacity	Water storage capacity.	numeric	litres
	nal Energy Consumption	Nominal fuel consumption rate required to produce the total	numeric	BTU
	Inlet Temperature Range	boller heat output. Allowable water iniet temperature range.	numeric	°C
wate	Working Pressure	Boiler working pressure.	numeric	Pa
*d stand		Maximum steam outlet pretsure.	numeric	Pa
	in concernessore	Total nominal heat output as listed by the Boller		
		manufacturer.		
	Heat Output	*For steam boilers, it is a function of inlet temperature versus steam pressure.	numeric	BTU/Hr
			2	
		The nominal efficiency of the boiler as defined by the manufacturer.		
	Nominal Efficiency	*For steam boilers, a function of inlet temperature versus	numeric	%
	Nominal Enciency	steam pressure.	numeric	<u> </u>
		*For water boilers, a function of inlet versus outlet temperature.		
	Energy Source	Enumeration defining the energy source or fuel cumbusted	text	1
<u> </u>		to generate heat. Identifies the operation mode of the holler e.g. EXED.	Cext	1
0.00	Operating Mode	Identifies the operating mode of the boiler e.g., FIXED. Allowable outlet temperature of either the water or the		1 (
	iet Temperature Range	steam.	numeric	2°
	ombustion Efficiency	Combustion efficiency under nominal condition.	numeric	*
	Gass released Gass Flow Rate	Type of gass released. Nominal gass flow.	text	/ /
-	Sea now Nate	Nominal gass flow. Electrical Data	aumenc	US US
	Apparent Load	Apparent power device is needed.	numeric	VA
	Voltage	The voltage that a device is designed to handle.	numeric	v
	Installation day.	Installation Data		1
	Installation date Subcontractor	The date on which the installation was carried out. A firm or person that carries out installation work.	date time text	date /
jesta	ation Serial Number/Tag	A tirm or person that carries out installation work. The identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the	text	1
	the even of	requirements of the installed element. Warranty Data	1044	1 1
	Warranty ID	The identifier assigned to a warranty.	text	1
		An alphanumeric value		<u> </u>
	VarrantyDescription	providing a concise description of the warranty content and	text	1
		of the warranty content and any exclusions.		
	Warranty Start Date	The date on which the warranty commences.	date time	date
	Warranty End Date	The date on which the warranty expires.	date time	date
	Condition	The physical status of the element at the time of the inventory or audit, based on the best judgment of those	2015	
	Condition	persons familiar with the physical characteristics and	TEXT	/
		condition. Basic imperfection that implies any deformity in component		-
	Defects	of a building that is owing to blemished plan, inadequate or	text	1
		flawed workmanship or deficient material and once in a while any blend of these.	35.05	· *
		Product Data		
	THE REAL PROPERTY.	An alphanumeric value representing the product, item or unit		-
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
	MadalBal	An alphanumeric value for the name of the manufactured		0
-	mouenvelerence	item as used by the manufacturer.	text	1
	Ownations		partner in	E
-				-
		equipment.		
	Material Cost		numeric	6
	Phase		test	1 7
	ModelReference Overall Cost Installation Cost Material Cost Phase	item as used by the manufacturer. Cost Sum of all costs needed for installing. Cost of installing one unit, including workforce and	text numeric numeric text	

Information Delivery Milestone:	Design					
Purpose:	Mechanical					
Actor:						
Object:	"Air Conditioning" / Ifcl	InitaryEquipment				
Geometrical information:						
Detail:	Element modelled as simplified u	volume representation with approximate size and shape. Approximat	te clearances mode	led.		
Dimensionality:	3D					
Location:	Absolute and relative to other b	uilding elements				
Appearance	Single color fill					
Parametric behaviour:	Not requested					
Alphanumeric Information:						
Identification:						
Information content:	Property	Description	Data Type	Units		
		Identity Data		22		
	Name	Primary identifier of an object.	text	1		
	Туре	Defines the object type, specific information about object.	text	1		
	Classification	Classification code according to chosen classification system.	text	1		
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and futures. For example, connectors for air terminals could have a system classification of Supply Air, Reburn Air or Exhaust Air.	text	1		
	System Type	Type of system e.g., supply air.	text	1		
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	F		
	System Abbreviation	A user-defined abbreviation for a system.	text	1		
	Level	Defines the reference level.	text	1		
	Material					
	Material	The primary material used to construct the object.	text	12		
	Dimensional Liata					
	Length	The nominal length of the air conditioning unit.	numeric	mm		
	Width	The nominal width of the air conditioning unit.	numeric	mm		
	Height	The nominal height of the air conditioning unit.	numeric	mm		
		Mechanical Data		2		
	Heating Capacity	Heating capacity.	numeric	BTU/Hr		
	Cooling Capacity	Cooling capacity.	numeric	BTU/Hr		
	Condenser Flowrate	Flow rate of fluid through the condenser.	numeric	liter/min		
	Outside Air Flowrate	Flow rate of outside air entering the unit.	numeric	liter/min		
	Heating Efficiency	Heating efficiency under full load heating conditions.	numeric	1		
	Cooling Efficiency	Coefficient of Performance: Ratio of cooling energy output to energy input under full load operating conditions.	numeríc	1		
	Electrical Data					
	Apparent Load	Apparent sower device is needed.	numeric	VA		
		Cost				
	Estimated Cost	Estimated cost for installing one unit, it is based on the average amount of needed resources [including material, labor and equipment].	numeric	¢		
	Estimated Unit Cost	Estimated cost of element per m ² / m ³ . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/ m		
		Phasing		90		
	Phase	Identifies the phase in which the object is created.	text	1		
Documentation:						

nformation Delivery Milestone:	Construction Mechanical			
urpose:	iviechanical			
ctor:				
	Hall Condition in Hillson			
bject:	"Air Conditioning" / IfcUn	itaryEquipment		
eometrical information:	1			
stail:	Element modelled to nominal size,	shape and spacing. Actual clearancess modelled. Nominal floor and	wall penetration eler	nents modeled.
imensionality:	30			
ocation:	Absolute			
ppearance:	Color fill to distinguish different ma	terials		
arametric behaviour.	Not requested			
Iphanumeric Information:				
entification:	i i i i i i i i i i i i i i i i i i i			10000
formation content:	Property	Description Identity Data	Data Type	Units
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply the flowment the	text	Ţ
	System Type	Air, Return Air or Exhaust Air. Type of system e.g., supply air.	text	1
		A name that uniquely defines system. It may be user-defined		
	System Name	or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
	Leve!	Defines the reference level.	text	1
	Description	An alphanumeric value providing a concise description	text	1
	Manufacturer	of the element. The organization that manufactured and / or assembled the	text	1
		item. Material	62.6	10
	Material	The primary material used to construct the object.	text	1
		Dimensional Data		
	Length	The nominal length of the air conditioning unit.	numeric	00/05
	Width	The nominal width of the air conditioning unit.	numeric	men
	Height	The nominal height of the air conditioning unit.	numeric	mm
		Mechanical Data		
	Heating Capacity	Heating capacity.	numeric	BTU/Hr
	0.0	Cooling capacity.	aumeric	BTU/Hr
	Cooling Capacity			
	Condenser Flowrate	Flow rate of fluid through the condenser.	numeric	liter/min
	Condenser Flowrate Outside Air Flowrate	Flow rate of fluid through the condenser. Flow rate of outside air entering the unit.	numeric	liter/min
	Condenser Flowrate	Flow rate of fluid through the condenser.		
	Condenser Flowrate Outside Air Flowrate	Flow rate of fluid through the condenser. Flow rate of outside air entering the unit.	numeric	liter/min
	Condenser Flowrate Outside Air Flowrate Heating Efficiency	Flow rate of fluid through the condenser. Flow rate of outside air metring the unit. Heating efficiency under full load heating conditions. Coefficient of Performance: Ratio of noiling energy output to energy input under full load operating conditions.	numeric numeric	liter/min /
	Condenser Flowrate Outside Air Flowrate Heating Efficiency Cooling Efficiency	Flow rate of fluid through the condenser. Flow rate of outside air entering the unit. Heating efficiency under full load heating conditions. Coefficient of Performance: Ratio of cooling energy output to energy input under full load operating conditions. Electrical Data	numeric numeric numeric	liter/min /
	Condenser Flowrate Outside Air Flowrate Heating Efficiency	Flow rate of fluid through the condenser. Flow rate of outside air entering the unit. Heating efficiency under full load heating conditions. Coefficient of Performance: Ratio of cooling energy output to energy input under full load operating conditions. Electrical Data Apparent power device is needed.	numeric numeric	iter/min / / VA
	Condenser Flowrate Outside Air Flowrate Heating Efficiency Cooling Efficiency Apparent Load	Flow rate of fluid through the condenser. Flow rate of outside air entering the unit. Heating efficiency under full load heating conditions. Coefficient of Performance: Ratio of cooling energy output to energy input under full load operating conditions. Electrical Data	numeric numeric numeric numeric	liter/min /
	Condenser Flowrate Outside Air Flowrate Heating Efficiency Cooling Efficiency Apparent Load	Flow rate of fluid through the condenser. Flow rate of outside air entering the unit. Heating efficiency under full load heating conditions. Coefficient of Performance: Ratio of noiling energy output to energy input under full load operating conditions. <u>Electrical Data</u> Apparent power dervice is needed. The voltage that a device is designed to handle.	numeric numeric numeric numeric	iter/min / / VA
	Condenser Flowrate Outside Air Flowrate Heating Efficiency Cooling Efficiency Apparent Load Voltage	Flow rate of fluid through the condenser. Flow rate of outside air entering the unit. Flow rate of outside air entering the unit. Coefficient of Performance: Ratio of cooling energy output to energy input under full load operating conditions. Flectrical Data Apparent power device is needed. The voltage that a device is designed to handle. Installation Data The date on which the installation was carried out.	numeric numeric numeric numeric numeric	ister/min / / VA V
	Condenser Flowrate Outside Air Flowrate Heating Efficiency Cooling Efficiency Apparent Load Voltage Installation date	Flow rate of fluid through the condenser. Flow rate of outside air entering the unit. Heating efficiency under full load heating conditions. Coefficient of Performance: Ratio of nooling energy output to energy input under full load operating conditions. Electrical Data Apparent power device is needed. The voltage that a device is degreed to handle. Installation Data The date on which the installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation.	numeric numeric numeric numeric numeric date time	liter/min / / VA V date
	Condenser Flowrate Outside Air Flowrate Heating Efficiency Cooling Efficiency Apparent Load Voltage Installation date Subcontractor	Flow rate of fluid through the condenser. Flow rate of outside air entering the unit. Heating efficiency under full load heating conditions. Coefficient of Performance: Ratio of noiling energy output to energy input under full load operating conditions. Electrical Data Apparent power device is designed to handle. Intervitage that a divice is designed to handle. Installation Data The date on which the installation work. The ident lifer assigned to installation. The ident lifer assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installed energy.	numeric numeric numeric numeric numeric date time text	Itter/min / / VA V date /
	Condenser Flowrate Outside Air Flowrate Heating Efficiency Cooling Efficiency Apporent Load Voltage Installation date Subcontractor Installation Serial Number/Tag	Flow rate of fluid through the condenser. Flow rate of outside air entering the unit. Heating efficiency under full load heating conditions. Coefficient of Performance: Ratio of noiling energy output to energy input under full load operating conditions. Electrical Data Apparent power device is designed to handle. Intervisited that evice is designed to handle. Installation Data The date on which the installation work. The ident fleer assigned to installation. A present responsible for assuring the quality and meeting the requirements of the installed energy.	numeric numeric numeric numeric numeric date time text numeric	Itter/min / / VA V date / /
	Condenser Flowrate Outside Air Flowrate Heating Efficiency Cooling Efficiency Apporent Load Voltage Installation date Subcontractor Installation Serial Number/Tag	Flow rate of fluid through the condenser. Flow rate of outside air entering the unit. Flow rate of outside air entering the unit. Coefficient of Performance: Natio of cooling energy output to energy input under full load operating conditions. Electrical Data Apparent power device is designed to handle. Installation Data The date on which the installation was carried out. A firm or perion that carries out installation work. The ident firer assigned to installation. A person responsible for assume the quality and meeting the requirements of the installation Data An alphanumeric value representing the product, teem or unit number assigned by the manufacturer of the product.	numeric numeric numeric numeric numeric date time text numeric	Itter/min / / VA V date / /
	Condenser Flowrate Outside Air Flowrate Heating Efficiency Cooling Efficiency Apparent Load Voltage Installation date Subcontractor Installation Serial Number/Tag Approved By	Flow rate of fluid through the condenser. Flow rate of outside air entering the unit. Flow rate of outside air entering the unit. Coefficient of Performance: Ratio of cooling energy output to energy input under full load operating conditions. Electrical Dara Apparent power device is designed to handle. Intervitage that a device is designed to handle. Intervitage the installation was carried out. A firm or person that carries out installation work. The ident fier assigned to installetion. A person responsible for assuring the quality and meeting the requirements of the installation. An alphanumeric value representing the product. Rem or unit number assigned by the manufacturer of the product. An alphanumeric value for the name of the manufactured ficen as used by the manufacturer.	numeric numeric numeric numeric numeric diste time text numeric text	liter/min / / VA V date / / /
	Condenser Flowrate Outside Air Flowrate Heating Efficiency Cooling Efficiency Apparent Load Voltage Installation date Subcontractor Installation Serial Number/Tag Approved By ModelRaference ModelRaference	Flow rate of fluid through the condenser. Flow rate of outside air entering the unit. Flow rate of outside air entering the unit. Coefficient of Performance: Ratio of cooling energy output to energy input under full load operating conditions. Electrical Data Electrical Data Electrical Data Electrical Data Electrical Data Electrical Data The voltage that a device is designed to handle. Intervoltage that a device is designed to handle. Product Data An alphanumeric value representing the product, item or unit An alphanumeric value for the name of the manufactured Item as used by the manufacture. Cost	numeric numeric numeric numeric numeric text text text text	lter/min
	Condenser Flowrate Outside Air Flowrate Heating Efficiency Cooling Efficiency Apparent Load Voltage Installation date Subcontractor Installation Serial Number/Tag Approved By ModelLabel	Flow rate of fluid through the condenser. Flow rate of outside air entering the unit. Flow rate of outside air entering the unit. Coefficient of Performance: Ratio of cooling energy output to energy input under full load operating conditions. Coefficient of Performance: Ratio of cooling energy output to energy input under full load operating conditions. The date of the statistic of the statistic output to Installation was carried out. A firm or person that carries out installation work. The ident file assigned to handle. Product Oata A person responsible for assoring the quality and meeting the requirements of the installation. An alphanumeric value representing the product, item or unit namber assigned by the manufacture? Cost Sum of all costs needed for installing.	numeric numeric numeric numeric date time test test test test	ter/min / / / / / / /
	Condenser Flowrate Outside Air Flowrate Heating Efficiency Cooling Efficiency Apparent Load Voltage Installation date Subcontractor Installation Serial Number/Tag Approved By ModelRaference ModelRaference	Flow rate of fluid through the condenser. Flow rate of outside air entering the unit. Flow rate of outside air entering the unit. Coefficient of Performance: Ratio of cooling energy output to energy input under full load operating conditions. Electrical Dam Apparent power device is designed to handle. Installation Data The date on which the installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installation was carried out. An alphanumeric value for the name of the manufactured frame assigned by the manufacturer. Cost Sum of all costs needed for installing.	numeric numeric numeric numeric numeric text text text text	lter/min
	Condenser Flowrate Outside Air Flowrate Heating Efficiency Cooling Efficiency Apport Load Voltage Installation date Subcontractor Installation Serial Number/Tag Approved By ModelRaference Overall Cost Overall Cost	Flow rate of fluid through the condenser. Flow rate of outside air entering the unit. Flow rate of outside air entering the unit. Flow rate of outside air entering the lang conditions. Coefficient of Performance: Ratio of cooling energy output to energy input under full load operating conditions. Electrical Data Apportnt power device is needed. The voltage that a divisio is designed to handle. Installation Data The date on which the installation war, carried out. A firm or person that carries out installation work. The identifiers assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installation. Product Data An alghanumeric value representing the product. Rem or unit number assigned by the manufacturer Icos of installing one unit, including workforce and equipament.	numeric numeric numeric numeric numeric text text text text text	Uter/min / / / / / v v date / / / / / / / / / / / / /
	Condenser Flowrate Outside Air Flowrate Heating Efficiency Cooling Efficiency Apporent Load Voltage Installation date Subcontractor Installation Serial Number/Tag Approved By ModelRoference Overall Cost Installation Cost	Flow rate of fluid through the condenser. Flow rate of outside air entering the unit. Flow rate of outside air entering the unit. Coefficient of Performance: Ratio of cooling energy output to energy input under full load operating conditions. Electrical Dam Apparent power device is designed to handle. Installation Data The date on which the installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installation was carried out. An alphanumeric value for the name of the manufactured frame assigned by the manufacturer. Cost Sum of all costs needed for installing.	numeric numeric numeric numeric numeric text text text text text numeric numeric	iter/min I I I VA V date I I I I I I I I I I I I I I I I I I I I I I I

Information Delivery Milestone:	Operation			
Purpose:	Mechanical			
Actor:				
222 A 473		2010 - 20		
Object:	"Air Conditioning" / IfcUn	itaryEquipment		
Geometrical information:	Planna and dia ta	descent and the second s		
Detail:		shape and spacing. Actual size for all supports and clearancess m	odelled.	
Dimensionality:	3D Absolute			
Location:	Color fill to distinguish different mat	torisk		
Appearance: Parametric behaviour:	Not requested			
Alphanumeric Information:				
Identification:	1			
Information content:	Property	Description	Data Type	Uni
		Identity Data	si	2
	Name	Primary identifier of an object	text	1
	Type	Defines the object type, specific information about object.	test	1
	121102000	Holds the entity specific enumeration of predefined types to	Carden Carden	
	Predefined Type	further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	12082230227	Defines the system for the connectors that are located on air	102350	
		terminals, equipment and fixtures. For example, connectors		
	System Classification	for air terminals could have a system classification of Supply	text	1
		Air, Return Air or Exhaust Air.		
	System Type	Type of system e.g., supply air. A name that uniquely defines system. It may be user-defined	text	/
	System Name	or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
	Level	Defines the reference level.	text	1
	ravai	An alphanumeric value	text	1
	Description	providing a concise description	text	1
		of the element.		2
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1
	1.81	A valid URL hyperlink to the		
	URL	manufacturer's website.	text	1
		Material		
	Material	The primary material used to construct the object.	text	1
	Tarak	Dimensional Data	a maile	-
	Length Width	The nominal length of the air conditioning unit. The nominal width of the air conditioning unit.	numeric	mn
	Height	The nominal height of the air conditioning unit.	numeric	110
	Trager.	Mechanical Data		
	Heating Capacity	Heating capacity.	numeric	BTU/
	Cooling Capacity	Cooling capacity.	numeric	BTU
	Condenser Flowrate	Flow rate of fluid through the condenser.	numerk	liter/
	Outside Air Flowrate	Flow rate of outside air entering the unit.	numeric	liter/
	Heating Efficiency	Heating efficiency under full load heating conditions.	numeric	1
	Cooling Efficiency	Coefficient of Performance: Ratio of cooling energy output to	numeric	1
	cooming enterinery	energy input under full load operating conditions.	mannerite	
		Electrical Data		
	Apparent Load	Apparent power device is needed.	numeric	V/
	Voltage	The voltage that a device is designed to handle.	numeric	v
		Installation Data		
	Installation date	The date on which the installation was carried out.	date time	dat
	Subcontractor	A firm or person that carries out installation work.	text	/
	Installation Serial Number/Tag	The Identifier assigned to installation. A nervea recoverible for provident the quality and meating the	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1
		Warranty Data		
	Warranty ID	The identifier assigned to a warranty.	text	1
		An alphanumeric value		
	WarrantyDescription	providing a concise description	text	1
		of the warranty content and any exclusions.		
	Warranty Start Date	The date on which the warranty commences.	date time	dat
	Warranty End Date	The date on which the warranty expires.	date time	dat
		The physical status of the element at the time of the		
	Condition	inventory or audit, based on the best judgment of those persons familiar with the physical characteristics and	text	1
		condition.		
	Aug. 10	Basic imperfection that implies any deformity in component		
	Defects	of a building that is owing to blemished plan, inadequate or flawed workmanship or deficient material and once in a while	text	1
		any blend of these.		
		Product Data	s	5
	-		22555	10
	1. And the second s	An alphanumeric value representing the product, item or unit		1
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	
		number assigned by the manufacturer of the product. An alphanumeric value for the name of the manufactured		
	ModelLabel ModelReference	number assigned by the manufacturer of the product. An alphanumeric value for the name of the manufactured item as used by the manufacturer:	text	1
	ModelReference	number assigned by the manufacturer of the product. An alphanumeric value for the name of the manufactured item as used by the manufacturer. Cost	text	1
		number assigned by the manufacturer of the product. An alphanumeric value for the name of the manufacturer item as used by the manufacturer: <u>Cost</u> Sum of all costs needed for installing.		1
	ModelReference	number assigned by the manufacturer of the product. An alphanumeric value for the name of the manufactured item as used by the manufacturer: Cost Sam of all costs needed for installing. Cost of installing one unit, including workforce and	text	e
	ModelReference Overall Cost Installation Cost	number assigned by the manufacturer of the product. An alphanumeric value for the name of the manufactured item as used by the manufacturer: <u>Cost</u> Sum of all costs needed for installing. Cost of installing one unit, including workforce and equipment.	text numeric numeric	
	ModelReference Overall Cost	number assigned by the manufacturer of the product. An alphanumeric value for the name of the manufactured item as used by the manufacturer: Cost Sam of all costs needed for installing. Cost of installing one unit, including workforce and	text numeric	¢
	ModelReference Overall Cost Installation Cost	number assigned by the manufacturer of the product. An alphanumeric value for the name of the manufactured tem as used by the manufacturer; Cost Sam of all costs needed for installing. Cost of installing one unit, including workforce and exuprement. Cost of material for installing one unit.	text numeric numeric	¢

Actor: "Pi Geometrical Information: Detail: Elen Dimersionality: 3D Location: Ansi: Sing Parametric behaviour: Not Alphanumeric Information: detarification: Details	imbing iping" / IfcPipeSegme ment modelled in schematic i olute and relative to other bi de color fill Property Name Type Classification System Classification	ayout with approximate size and shape. Approximate clearances mo alding elements	Data Type text text text	Units f 1
Geometrical Information: Detail: Elem Dimensionality: 30 Location: Abs: Appearance: Singl	nent modelled in schematic i olute and relative to other b de color fill requested Property Name Type Classification	ayout with approximate size and shape. Approximate clearances mo alding elements	Data Type text text	<i>t</i> <i>t</i>
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Geometrical information: Elem Detali: Elem Dimensionality: 30 Location: Apsic Appearance: Singl Farametric behaviour: Not Aphanumeric Information: Elemente and apping and apping	nent modelled in schematic i olute and relative to other b de color fill requested Property Name Type Classification	ayout with approximate size and shape. Approximate clearances mo alding elements	Data Type text text	<i>t</i> <i>t</i>
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	Name Type Classification	Identity Data Primary identifier of an object. Defines the object type, specific information about object. Classification code according to chosen classification system. Defines the system for the connectors that are located on air terminals, explorement of skurzes. For example, connectors	text text	<i>t</i> <i>1</i>
	Name Type Classification	Identity Data Primary identifier of an object. Defines the object type, specific information about object. Classification code according to chosen classification system. Defines the system for the connectors that are located on air terminals, explorement of skurzes. For example, connectors	text text	<i>t</i> <i>1</i>
	Type Classification	Primary identifier of an object. Defines the object type, specific information about object. Classification code according to chosen classification system. Defines the system for the connectors that are located on air terminals, explorement of the stures. For example, connectors	text	1
	Type Classification	Defines the object type, specific information about object. Classification code according to chosen classification system. Defines the system for the connectors that are located on air terminals, explorent and fistures. For example, connectors	text	1
	Classification	Classification code according to chosen classification system. Defines the system for the connectors that are located on air terminale, equipment and fixtures. For example, connectors	1000	-
	195058694879421)	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors	text	1
	System Classification	terminals, equipment and fixtures. For example, connectors		1.000
		for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	1
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Level	Defines the reference level.	text	1
		Material		
	Material	The primary material used to construct the object.	text	1
		Dimensional Data	X	-
	Length	Length of the segment, calculated at midpoint of cross- section, equal to the distance between inlet and outlet ports.	numeric	mm
	Diameter	The nominal diameter of the pipe segment.	numeric	mm
	Slope	Angle of the pipe.	numeric	degrees
		Performance Data		
	Has Insulation	IF TRUE, the pipe has thermal insulation.	boolean	YES/NO
		Mechanical Data		2
	Working Pressure	Working pressure.	numeric	Pa
	Pressure Range	Allowable maximum and minimum working pressure (relative to ambient pressure).	numeric	Pa
-	Temperature Range	Allowable maximum and minimum temperature.	numeric	°C
	Flow	Flow rate for the pipe.	numeric	1/min
		Cost	concertainty	
	Estimated Cost	Estimated cost for installing one unit. It is based on the	numeric	¢
	Estimated Cost	average amount of needed resources (including material, [abor and equipment).	numeric	
	Estimated Unit Cost	Estimated cost of element per m ² / m ³ . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/ m³
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1

Seometrical information:	se:				
Delect: "Piping" / KCPipeSegment isometrical information: Itemeter modelled to nominal size, shape and spacing. Actual dearancess modelled. Nominal floor and internationality: 30 O control: Abolula oppart mick Single role fill assentit behaviour: Not requested Vplanumeric Information: Preperty Description information content: Preperty Description information code according to choose dualification structure Information approximate. information freesth system for the contents to the contents to the contents of the c		T to The to T			
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number assigned by the manufacturer of the product.			Product Data		
number assigned by the manufacturer of the product.		Madelland	An alphanumeric value representing the product, item or unit	text	E
		ModelLaber		text	I.
An alphanumeric value for the name of the manufactured			An alphanumeric value for the name of the manufactured	1001	
ModelReference Reference R		ModelReference	Item as used by the manufacturer.	text	1
Cost					
Overall Cost Sum of all costs needed for installing.		Overall Cost	Sum of all costs needed for installing.	numeric	6
Installation Cost of installing one unit, including workforce and		2		numeric	
equipment.			equipment.		
Material Cost Cost of material for installing one unit.		Material Cost		numeric	e
Phasing			1		
Phase Identifies the phase in which the object is created.			It dentifies the physics in which the philot is created	text	1

Information Delivery Milestone:	Operation
Purpose:	Plumbing
Actor:	
	Holata B L I -
Object: Geometrical information:	"Piping" / IfcP
Detail:	Element modelled t
	3D
Dimensionality: Location:	Absolute
Appearance:	Single color fill
Parametric behaviour:	Not requested
Alphanumeric Information:	
dentification: information content:	Prope
	Nan
	Тур
	Predefine
	Classific
	System Clas
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Documentation:	
iet of documents:	1

ipeSegment			
o accurate size,	shape and spacing. Actual clearancess modelied. Actual floor and v	wall penetration eien	ients modefed.
irty	Description	Data Type	Units
	Identity Data		
e	Primary identifier of an object	text	1
•	Defines the object type, specific information about object. Holds the entity specific enumeration of predefined types to	text	1
d Type	further classify the entity	text	1
ation	Classification code according to chosen classification system.	text	1
	Defines the system for the connectors that are located on air		
sification	terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply	text	1
	Air, Return Air or Exhaust Air.		27
Type	Type of system e.g., supply air. A name that uniquely defines system. It may be user-defined.	text	1
lame	or automatically generated.	text	t
eviation	A user-defined abbreviation for a systen.	text	1
n Level	Specifies the elevation of the element relative to its level.	numeric	m
	Defines the reference level.	text	1
tion	providing a concise description	text	1
ternin.	of the element. The organization that manufactured and / or assembled the	1000	127
turer	item.	text	1
	A valid URL hyperlink to the manufacturer's website.	text	1
	Material		
al	The primary material used to construct the object.	text	1
	Dimensional Data		1
ħ	Length of the segment, calculated at midpoint of cross- section, equal to the distance between inlet and outlet ports.	numeric	mm
ter	The nominal diameter of the pipe segment.	numeric	mm
9	Angle of the pipe.	numeric	degrees
(a) () ()	Performance Data		tion from
ation	If TRUE, the pipe has thermal insulation. Mechanical Data	boolean	VES/NO
ressure	Working pressure.	numeric	Pa
	Working pressure. Allowable maximum and minimum working pressure (relative	numeric numeric	Pa Pa
Range	Working pressure.	2002/12/07	
Range e Range	Working pressure. Allowable maximum and minimum working pressure (relative to ambient pressure). Allowable maximum and minimum temperature. Row rate for the pipe.	numeric	Pa
lange e Range	Working pressure: Allowable maximum and minimum working pressure (relative to ambient pressure). Allowable maximum and minimum temperature: Row rate for the pipe. Installation Data	numeric numeric numeric	Pa 'C I/min
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tange Range n date ector Number/Tag d By y ID scription art Date nd Date	Working pressure. Allowable maximum and minimum working pressure (relative to ambient pressure). Allowable maximum and minimum temperature. Flow rate for the pipe. Installation Data The date on which the installation was carried out. A firm or person that carries out installation work. The identifier assigned to a warranty. A approximate to a warranty. A approximate outer and a provide a start of the warranty Data The identifier assigned to a warranty. The date on which the warranty commences. The date on which the warranty commences. The date on which the warranty expires. The date on which the warranty commences.	numeric numeric numeric date time text text text text text date time date time	Pa *C Vmin date 1 1 1 1 1 1 1 1 1 date date date
tange c Range in diate ector Number/Tag d By y ID y ID scription art Date ind Date	Working pressure. Allowable maximum and minimum working pressure (relative to ambient pressure). Allowable maximum and minimum temperature. Flow rate for the pipe. Installation Data The date on which the installation was carried out. A firm or person that carries out installation work. The identifier assigned to a warranty OSta The identifier assigned to a warranty. An alphanumeric value providing a concise discription of the warranty content and any exclusions. The date on which the warranty commences. The physical status of the element at the time of the imentory or audit, based on the best judgment of those person familier with the physical characteristics and condition. Basic Imperfection that inplies any deformity in component of a building that is owing to Bernent	numeric numeric numeric date time text text text text text date time date time	Pa *C Vmin date / / / / date / / date date / / / / / / / / / / / / / / / / / / /
ange Range in date istor Number/Tag d By YID scription art Date ind Date	Working pressure. Allowable maximum and minimum working pressure (relative ta maibing register). Allowable maximum and minimum temperature. Fiow rate for the pipe. Installation Data The date on which the installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation A person responsible for assuring the quality and meeting the requirements of the installed tement. Warranty Data The iden on which the warranty. An alphanumeric value providing a concise description of the warranty commences. The date on which the warranty expires. The date on which the warranty commences. The physical status of the element at the time of the iventory or audit, based on the best judgment of those persons families with the physical varianty component assi: Imperfection that implies any deformity in component	numeric numeric numeric date time text text text date time date time text	Pa *C Vmin date I I I date date date
ange Range in date istor Number/Tag d By YID scription art Date ind Date	Working pressure. Allowable maximum and minimum working pressure (relative ta mibinit pressure). Allowable maximum and minimum temperature: Frow rate for the pipe. Installation Data The date on which the installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installed element. Warranty Data The date on which the warranty. An alphanumeric value providing a concise description of the warranty content and any exclusions. The date on which the warranty expires. The bask is upperfection that inplies any deformity in component of a building that is owing to blemished plan, inadequate or flawed warkinship or deficient material and next in a while	numeric numeric numeric date time text text text date time date time text	Pa *C Vmin date / / / / / date date / / / / date date /
tange e Range in date ector Number/Tag d By y ID scription art Date ind Date on	Working pressure. Allowable maximum and minimum working pressure (relative anabient pressure). Allowable maximum and minimum temperature. Fiow rate for the pipe. Installation Duta The date on which the installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation A person responsible for assuring the quality and meeting the requirements of the installate dement. Warranty Data The date on which the warranty commences. The date on which the physical characteristics and condition. Basil imperfection that implies any deformitly in component of a building that is owing to beminded these wareanty of the warranty are observed. An alphanumeric value representing the product, item or unit. An alphanumeric value representing the product, item or unit.	numeric numeric numeric date time text text text date time date time text	Pa *C Umin date f f f f f date date f f
ange Range i date ector Number/Tag d By y ID cription urt Date id Date on	Working pressure. Allowable maximum and minimum working pressure (relative Allowable maximum and minimum temperature. Flow rate for the pipe. Installation Data The date on which the installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation A person responsible for assuring the quality and meeting the requirements of the installed tement. Warranty Data The ident on which the warranty. An alphanumeric value providing a concise description of the warranty commences. The date on which the warranty commences. The physical status of the element at the time of the iventific or a subit, based on the best judgment of those person is mains with the physical characteristics and condition. Basic imperfection that implies any deformitly in component of a building that is owing to blemished plan, inadequate or fawed workmantip or celletent material and once in a while any blend of these. Product Data An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	numeric numeric date time text numeric text text text date time date time date time text text	Pa *C Umin date / / / / date date date /
tange c Range n date ctor tor yID yID ort Date on scription art Date on ss bel	Working pressure. Allowable maximum and minimum working pressure (relative to ambient pressure). Allowable maximum and minimum temperature. Flow rate for the pipe. Installation Data The date on which the installation was carried out. The identifier assigned to installation work. The identifier assigned to a warranty. A a physion responsible for assuring the quality and meeting the requirement. Of the installation work. The identifier assigned to a warranty. The identifier assigned to a warranty. The identifier assigned to a warranty. The date on which the warranty commences. The date on which the warranty commences. The date on which the warranty commences. The date on which the physical characteristics and condition. Basic imperfection that inglies any deformity in component of a building that is owing to before a maximal and once in a while any been of these. Product Data An alphanumeric value representing the product, item or unit An alphanumeric value for the name of the marranty An alphanumeric value for the name of the marranty An alphanumeric value for the name of the marranty An alphanumeric value for the name of the marranty An alphanumeric value for the name of the marranty An alphanumeric value for the name of the marranty An alphanumeric value for the name of the marranty An alphanumeric value for the name of the marranty An alphanumeric value for the name of the marranty An alphanumeric value for the name of the marranty An alphanumeric value for the name of the marranty An alphanumeric value for the name of the marranty An alphanumeric value for the name of the marranty An alphanumeric value for the name of the marranty An alphanumeric value for the name of the marranty An alphanumeric value for the name of the marranty An alphanumeric value for the name of the marranty An alphanumeric value for the name of the marranty An alphanumeric value for the name of the	numeric numeric date time text numeric text text text date time date time date time text text	Pa *C Umin date f f f f f date date f f
tange e Range in date e Range in date ector Number/Tag d By yID scription art Date on is seter con	Working pressure. Allowable maximum and minimum working pressure (relative to ambient pressure). Allowable maximum and minimum temperature. Fow rate for the pipe. Installation Data The date on which the installation was carried out. A firm or personable for installation work. The identifier assigned to a warranty Osta The identifier assigned to a warranty. An alphanumeric value providing a concise discription of the warranty content and any exolusion. The date on which the warranty commences. The date on which the warranty commences. An alphanumeric value express find plan, inadequate or flawed workmannahie or deficient material and once in a while workmannahie or deficient material and once in a while where any blem of these. Product Data An alphanumeric value representing the product, item or unit number assigned by the mandacture of the product. An alphanumeric value for the name of the manufactured Item as used by the manufacture of the product.	numeric numeric date time text numeric text text text date time date time date time text text text text text text text te	Pa *C Umin dute / / / dute / / / / / / / / / / / / /
tange e Range e Range e Range i n date extor v number/Tag d By y ID scription art Date on ts serece cost	Working pressure. Allowable maximum and minimum working pressure (relative to ambient pressure). Allowable maximum and minimum temperature. Fiow rate for the pipe. Installation Data The date on which the installated end of the second of the	numeric numeric numeric date time text text text text date time date time text text text	Pa *C Umin dute / / / / dute dute dute dute / / / / / / / / / / / / /
tange e Range e Range / / / n date ector / / / / / / / / / / / / / / / / / / /	Working pressure. Allowable maximum and minimum working pressure (relative to ambient pressure). Allowable maximum and minimum temperature. Flow rate for the pipe. Installation Data The date on which the installation was carried out. The identifier assigned to installation work. The identifier assigned to a warranty. A a physion responsible for assuring the quality and meeting the requirement. Of the installed dement. Warranty Osta The identifier assigned to a warranty. The identifier assigned to a warranty. The date on which the warranty commences. The date on which the warranty commences. The date on which the warranty commences. The date on which the physical characteristics and condition. Basic imperfection that inglies any deformity in component of a building that is ought to blemted plan, inadequate or flawed workmantup or deficient material and once in a while any blem dor these. Product Data An alphanumeric value representing the product, item or unit mumber assigned by the manufacturer of the product. An alphanumeric values for the arare of the manufacturer Cost Sum of all costs needed for installing. Cost of installing.	numeric numeric numeric date time text text text text text text text te	Pa *C Umin date / / / date date date / / / / / / / / / / / / /
tange e Range e Range e Range i n date extor v number/Tag d By y ID scription art Date on ts serece cost	Working pressure. Allowable maximum and minimum working pressure (relative ta mainet pressure). Allowable maximum and minimum temperature. Fow rate for the pipe. Installation Dura The date on which the installation was carried out. Allowable the installation was carried out. The identifier assigned to installation A peson responsible for assuring the quality and meeting the resurrement of the installed element. Warranty Osta The identifier assigned to installation An alphanumeric value The identifier assigned to a warranty. An alphanumeric value any exclusion: The ident the warranty commences. The ident the warranty commences. The date on which the warranty commences. An alphanumeric value of the benefits of a building that is ouing to benished plan, inadequate or flawed warranty or deficient material and once in a while water press. Product Dats Product Dats Cost Sum of al costs needed for installing. Cost Sum of al costs needed for installing. Cost Sum of all costs needed for installing. Cost	numeric numeric numeric date time text numeric text text text date time date time date time text text text text text text text te	Pa 'C U/min date / / / / / / date / / / / / / / / / / / / / / / / / / /

Information Delivery Milestone:	Design			
Purpose:	Plumbing			
Actor:				
Object:	"Valve" / IfcValve			
Seometrical information:				
etail:	Element modelled in schematic la	eyout with approximate size and shape. Approximate clearances mo	delled.	
limensionality:	3D			
ocation:	Absolute and relative to other but	aiding elements		
Appearance:	Single color fill			
arametric behaviour:	Nat requested			
Vphanumeric Information:				
dentification:				
nformation content:	Property	Description	Data Type	Units
		Identity Data		69
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	, K
	Classification	Classification code according to chosen classification system.	text	1
	System Classification	Defines the system for the correctors that are located on air terminals, equipment and fatures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	1
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system, it may be user-defined or automatically generated.	text	7
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Level	Defines the reference level	text	1
		Material		
	Valve Material	Material from which the body of the valve is constructed.	text	1
	Pipe Material	Material from which the pipe is constructed.	text	1
		Dimensional Data		0
	Length	The nominal length of the valva.	numeric	mm
	Diametar	The nominal diameter of valve.	numeric	mn
	Size	The size of the connection to the value (or to each connection for faucets, mixing values, etc.).	numeric	mm
		Performance Data		2
	Has Insulation	If TRUE, the valve has thermal insulation.	boolean	VES/NO
		Mechanical Data		
	Valve Mechanism	The mechanism by which the valve function is achieved e.g., BALL	text	Ĩ
	How Coefficient	Flow coefficient (the quantity of fluid that passes through a fully open valve at unit pressure drop), typically expressed as the Kv or Cv value for the valve.	numeric	KujCu
	Working Pressure	The normally expected maximum working pressure of the valve.	numeric	Pa
	Measured Flow Rate	The rate of flow of a fluid measured across the valve.	numeric	V∕min
	Measured Pressure Drop	The actual pressure drop in the fluid measured across the valve.	numeric	Pa
		Cost		
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material, labor and equipment).	numeric	¢
	Estimated Unit Cost	Estimated cost of element per m ² / m ³ . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/ m²
		Phasing		S
	Phase	Identifies the phase in which the object is created.	text	10

formation Delivery Milestone:	Construction			
urpose:	Plumbing			
ttor:				
bject:	"Valve" / IfcValve			
eometrical information:				
tail:		shape and spacing. Actual clearancess modelled.		
nensionality:	30			
ation:	Absolute Circle color (2)			
pearance. ametric behaviour:	Single color fill Not requested			
phanumeric Information:	notrequested			
ntification:				
mation content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
	Type	Defines the object type, specific information about object.	text	T.
		Holds the entity specific enumeration of predefined types to		
	Predefined Type	further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
		Defines the system for the connectors that are located on air		
	System Classification	terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	1
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined	text	1
	P BOUELOW CHICK	or automatically generated.	1239	
	System Abbreviation	A user-defined abbreviation for a system.	text.	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
	Level	Defines the reference level.	text	1
	Description	An alphanumeric value providing a concise description of the element.	text	t
	Manufacturer	The organization that manufactured and / or assembled the	text	1
	Manufacturer	item.	text	1
		Material		
	Valve Material	Material from which the body of the valve is constructed.	text	1
	Pipe Material	Material from which the pipe is constructed. Dimensional Data	text	1
	(south		numeric	mm
	Length Diametar	The nominal length of the valve. The nominal diameter of valve.	numeric	mm
		The size of the connection to the value (or to each		
	Size	connection for faucets, mixing valves, etc.).	numeric	mm
		Performance Data		
	Has Insulation	If TRUE, the value has thermal insulation.	boolean	YES/NO
		Mechanical Data		
	Valve Mechanism	The mechanism by which the valve function is achieved e.g., BAU.	text	1
	Flow Coefficient	Flow coefficient (the quantity of fluid that passes through a fully open valve at unit pressure drop), typically expressed as	numeric	Kv/Cv
		the Ky or Cy value for the value.		
	Working Pressure	The normally expected maximum working pressure of the valve.	numeric	Pa
	Measured Flow Rate	The rate of flow of a fluid measured across the valve.	numeric	1/min
	Measured Pressure Drop	The actual pressure drop in the fluid measured across the	numeric	Pa
		valve.	1000000	
	Installation date	Installation Data The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	date time text	1
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1
	ModelLabel	Product Data An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	t
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1
		Cost		
	Overall Cost	Sum of all costs needed for installing.	numeric	6
	Installation Cost	Cost of installing one unit, including workforce and	numeric	£
	installation Cost			(I I I I I I I I I I I I I I I I I I I
		equipment. Cost of material for installing one unit	Dumeric	6
	Material Cost	Cost of material for installing one unit. Physing	numeric	•
		Cost of material for installing one unit.	numeric	<u>د</u> /

nformation Delivery Milesto				
Purpose:	Plumbing			
Actor:				
bject:	"Valve" / IfcValve			
eometrical information:				
etail:	Element modelled to accurate size	e, shape and spacing. Actual clearancess modelled. Actual floor an	d wall penetration ele	ments modeled
			10	
mensionality:	3D			
cation:	Absolute			
opearance:	Single color fill			
rametric behaviour:	Not requested			
phanumeric Information:				
entification:	1		-	
ormation content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Rendefined Turns	Holds the entity specific enumeration of predefined types to	text	24.2
	Predefined Type	further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
		Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors	20025	
	System Classification	for air terminals could have a system classification of Supply	text	1
		Air, Return Air or Exhaust Air.		
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined	text	1
		or automatically generated.	text	
	System Abbreviation	A user-defined abbreviation for a system.	1000000000000	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
	Level	Defines the reference level.	text	1
	1	An alphanumeric value		office.
	Description	providing a concise description	text	1
		of the element.		
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1
		A valid URL hyperlink to the	2000 J.	(C.M.
	URL	manufacturer's website.	text	1
		Material		
	Valve Material	Material from which the body of the valve is constructed.	text	1
	Pipe Material	Material from which the pipe is constructed.	text	1
		Dimensional Data		
	Length	The nominal length of the valve.	numeric	mm
	Diametar	The nominal diameter of value.	numeric	ເກເຕ
	Size	The size of the connection to the valve (or to each	numeric	mm
		connection for faucets, mixing valves, etc.).	THE REAL PROPERTY IN	
	2 2220-2220-2220-2220-2220-2220-2220-22	Performance Data	1300000	1012/14/14
	Has Insulation	If TRUE, the value has thermal insulation.	boolean	YES/NO
		Mechanical Data		
	Valve Mechanism	The mechanism by which the valve function is achieved e.g., BALL	text	1
		Flow coefficient (the quantity of fluid that passes through a	Xinitis (
	Flow Coefficient	fully open value at unit pressure drop), typically expressed as	numeric	Ky/Cv
		the Kv or Cv value for the valve.		
	Working Pressure	The normally expected maximum working pressure of the	numeric	Pa
	1 CERTIFICATION AND CONTRACTOR	value.	and a second sec	elle s
	Measured Flow Rate	The rate of flow of a fluid measured across the value.	numeric	l/min
	Measured Pressure Drop	The actual pressure drop in the fluid measured across the valve.	numeric	Pa
		Installation Data		
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	/
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1
	Contraction in the second second	A person responsible for assuring the quality and meeting		2002
	Approved By	the requirements of the installed element.	text	/
		Warranty Data		
	Warranty ID	The identifier assigned to a warranty.	text	1
		An alphanumeric value		
	WarrantyDescription	providing a concise description	text	1
		of the warranty content and any exclusions.	101705	
	Warranty Start Date	The date on which the warranty commences.	date time	date
	Warranty End Date	The date on which the warranty expires.	date time	date
		The physical status of the element at the time of the		
	Condition	inventory or audit, based on the best judgment of those	text	1
	condition	persons familiar with the physical characteristics and	4CAL	1
		condition. Prote imperfection that implies any deformity is component.		
	5252	Basic imperfection that implies any deformity in component of a building that is owing to blemished plan, inadequate or		157
	Defects	flawed workmanship or deficient material and once in a	text	1
		while any blend of these.		
		Product Data		
		An alphanumeric value representing the product, item or	122	10
	ModelLabel	unit number assigned by the manufacturer of the product.	text	1
	Construction of the	An alphanumeric value for the name of the manufactured	2024	1521
	MadelReference	item as used by the manufacturer.	text	1
		Cost		
	Overall Cost	Sum of all costs needed for installing.	numeric	¢
	Installation Cost	Cest of installing one unit, including workforce and	numeric	£
		equipment.		
	Material Cost	Cost of material for installing one unit.	numeric	ŧ
		Phasing		
ocumentation:	Phase	Identifies the phase in which the object is created.	text	1

Information Delivery Milestone:	Design					
Purpose:	Plumbing					
Actor:						
Object:	"BathTub" / IfcSanitary"	Terminal				
Geometrical information:	bounds / nesennary					
Detail:	Simplified volume correspondation	n. Modelled accurately in terms of the overall geometry and thickne	10			
Dimensionality:	30	a needed and a service service Benned and a service				
Location:	Absolute and relative to other b	ultime alsonants				
Appearance:	Single color fill	and its shortened				
Parametric behaviour:	Not requested					
Alphanumeric Information:	Notrequestes					
dentification:						
nformation content:	Deservation	Description	Data Dura	Units		
indermation contests.	Property		Data Type	Units		
	Norma	Identity Data				
	Name	Primary identifier of an object.	text	1		
	Туре	Defines the object type, specific information about object.	text	1		
	Classification	Classification code according to chosen classification system.	text	1		
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fetures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air of Exhaust Air.	text	ž		
	System Type	Type of system e.g., supply air.	text	1		
	and a second	A name that uniquely defines system. It may be user-defined				
	System Name	or automatically generated.	text	1		
	System Abbreviation	A user-defined abbreviation for a system.	text	1		
	Room Name	Room name where component to be/is installed.	text	1		
	Room Number	Room number where component to be/is installed.	text	1		
	Level	Defines the reference level.	text	1		
	Material					
	Calor	Principal color of the object.	text	1		
	Material	The primary material used to construct the object.	text	1		
	Dimensional Data					
	Length	Nominal or quoted length of the object.	numeric	mm		
	Depth	Nominal or quoted depth of the object.	numeric	mm		
		Performance Data				
	Has Grab Handles	Indicates whether the bath is fitted with handles that provide assistance to a bather in entering or leaving the bath.	boolean	YES/NO		
		Cost				
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material, labor and equipment).	numerk	٤		
	Estimated Unit Cost	Estimated cost of element per m ² / m ³ . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/ m²		
		Phasing				
	Phase	Identifies the phase in which the object is created.	text	1		
Documentation:						

formation Delivery Milestone: urpose:	Plumbing			
Actor:				
Actor.	1			
Objects	"BathTub" / IfcSanitaryTe	minal		
Object:	bathiub / ncsanitaryre	(mind)		
Geometrical information: Detail:		and the state of t		
	30	nsions and geometry. Actual clearances modelled.		
Dimensionality:	Absolute and relative to other build	land of exercise to		
Location:	Color fill to distinguish different mar			
Appearance:	Not requested	(erriers		
Parametric behaviour:	Nocrequested			
Alphanumeric Information: destitication:				
information content:		Description		Units
	Property	Identity Data	Data Type	Units
	Name	Primary identifier of an object.	text	1
	Name	Primary identifier of an object.	text	
	Туре	Defines the object type, specific information about object. Holds the entity specific enumeration of predefined types to	text	1
	Predefined Type	Holds the entity specific enumeration of predenined types to further classify the entity	text	7
	Classification	Classification code according to chosen classification system,	text	1
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	1
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.		
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be/is installed.	test	9
	Level	Defines the reference level.	text	1
	Description	An alphanumeric value providing a concise description of the element.	text	1
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1
		Material		
	Color	Principal color of the object.	text	1
	Material	The primary material used to construct the object.	text	1
	4	Dimensional Data		
	Length	Nominal or quoted length of the object.	numeric	inm.
	Width	Nominal or sucted width of the object.	numeric	B.W.
	Depth	Nominal or quoted depth of the object.	numeric	mm
	Drain Size	The size of the drain outlet connection from the object.	numeric	mm
	-	Performance Data		
	Has Grab Handles	Indicates whether the bath is fitted with handles that provide assistance to a bather in entering or leaving the bath.	boolean	YES/NO
	â	Installation Data		(
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work:	test	1
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric -	1
	Approved By	A person responsible for assuring the quaity and meeting the requirements of the installed element.	text	1
	<u>i</u>	Product Data		
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1
	8	Cost		
	Overall Cost	Sum of all costs needed for installing.	numeric	٤
	Installation Cost	Cost of installing one unit, including workforce and equipment.	numeric	¢
	Material Cost	Cost of material for installing one unit.	numeric	£
		Phasing		

nformation Delivery Milestone:	Operation			
urpose:	Plumbing			
ctor:				
Object:	"BathTub" / IfcSanitaryTe	erminal		
Seometrical information:				
letail:	Element modelled to actual dimen-	sions and geometry. Actual clearances and supports modelled.		
)imensionality:	30			
Location:	Absolute and relative to other built	ding elements		
Appearance:	Color fill to distinguish different ma			
Parametric behaviour:	Not requested			
Alphanumeric Information:				
dentification:				
nformation content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1
		further classify the entity		
	Classification	Classification code according to chosen classification system.	text	t
		Defines the system for the connectors that are located on air		
	System Classification	terminals, equipment and fixtures. For example, connectors	text	1
	appress of a state of a	for air terminals could have a system classification of Supply		5
	P	Air, Return Air or Exhaust Air.	107	
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Room Name	Room name where component to be/is installed.	text	1
	Boom Number	Room name where component to be/is installed. Room number where component to be/is installed.	text	
				1
	Level	Defines the reference level. An alphanumeric value	text	1
	Description	An alphanumeric value providing a concise description	text	1
		of the element.		5
	Manufacturer	The organization that manufactured and / or assembled the	text	1
	Manufacturer	item.	uest.	/>/
	URL	A valid URL hyperlink to the	text	1
	1 Miles	manufacturer's website. Material		
	Print.		and I	-
	Eblor	Principal color of the object.	text	1
	Material	The primary material used to construct the object.	text	1
	1270.02*	Dimensional Data	Successor 1	and the set
	Length	Nominal or quoted length of the object.	numeric	mm
	Width	Nominal or quoted width of the object.	numeric	mm
	Depth	Nominal or quoted depth of the object.	numeric	mm
	Drain Size	The size of the drain outlet connection from the object.	numeric	mm
		Performance Data		
	Hard Sectors 10	Indicates whether the bath is fitted with handles that provide	Acres 1	Men min
	Has Grab Handles	assistance to a bather in entering or leaving the bath.	boolean	YES/NO
		installation Data		
	Installation date		date time	date
		The date on which the installation was carried out.		
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1
	5275 - 55	Warranty Data		
	Warranty ID		text	1
	workdray to	The identifier assigned to a warranty. An alphanumeric value	UCA4	1
		providing a concise description		
	WarrantyDescription	of the warranty content and	text	1
		any exclusions.		
	Warranty Start Date	The date on which the warranty commences.	date time	date
	Warranty End Date	The date on which the warranty expires.	date time	date
		The physical status of the element at the time of the		
	Condition	inventory or audit, based on the best judgment of those	text	1
	0.048/00/(6800)	persons familiar with the physical characteristics and condition.		
		Basic imperfection that implies any deformity in component		
	Deleter	of a building that is owing to blemished plan, inadequate or	Tout .	2
	Defects	flawed workmanship or deficient material and once in a	text	1
		while any blend of these.		
		Product Data		
	ModelLabel	An alphanumeric value representing the product, item or unit	test	2
	ModelLaber	number assigned by the manufacturer of the product.	text	1
		An alphanumeric value for the name of the manufactured		
	ModelReference	item as used by the manufacturer.	text	1
		Cost		
	Overall Cost	Sum of all costs needed for installing.	numeric	c
	the statement mean for	Cost of installing one unit, including workforce and	and the second	
	Installation Cost	equipment.	numeric	¢
	Material Cost	Cost of material for installing one unit.	numeric	¢
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1
Documentation:	Phase		text	7

Information Delivery Milestone:	Design					
Purpose:	Plumbing					
Actor:						
Object:	"Shower" / IfcSanitaryT	erminal				
Geometrical information:						
Detail:	Simplified volume representation	n. Modelled accurately in terms of the overall geometry and thicknes	15.			
Dimensionality:	30					
Location:	Absolute and relative to other b	uilding elements				
Appearance:	Single color fill					
Parametric behaviour:	Not requested					
Alphanumeric Information:						
dentification:		N:				
Information content:	Property	Description	Data Type	Units		
		Identity Data				
	Name	Primary identifier of an object.	text	1		
	Туре	Defines the object type, specific information about object.	text	7		
	Classification	Classification code according to chosen classification system.	text	7		
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors, for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	test	7		
	System Type	Type of system e.g., supply air.	text	1		
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1		
	System Abbreviation	A user-defined abbreviation for a system.	text	1		
	Room Name	Room name where component to be/is installed.	text	J.		
	Room Number	Room number where component to be/is installed.	text	1		
	Level	Defines the reference level.	text	1		
		Material				
	Shower Stall Material	Material from which the body of the stall is constructed.	text	Ŧ		
	Boor Material	Material from which the door is constructed.	text	1		
	Dimensional Data					
	Length	Nominal or quoted length of the object.	numeric	กระกร		
	Width	Nominal or quoted width of the object.	numeric	mera		
	Dear Width	Width of the shower door.	numeric	mm		
		Performance Data				
	Has Tray	Indicates whether the shower has a separate receptacle that catches the water in a shower and directs it to a waste outlet.	boolean	YES/NO		
		Cost				
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material, labor and equipment).	numeric	¢		
	Estimated Unit Cost	Estimated cost of element per m^2 / m^4 . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/m²		
		Phasing		(
	Phase	Identifies the phase in which the object is created.	text	7		
Documentation:						

ormation Delivery Milestone: pose:	Construction Plumbing			
	i minong			
tor:				
	Inet and for a state			
oject:	"Shower" / IfcSanitaryTer	minal		
ometrical information:				
tail:		nsions and geometry. Actual clearances modelled.		
nensionality	30			
ation:	Absolute and relative to other build	ling elements		
pearance:	Color fill to distinguish different ma	terials		
ametric behaviour.	Not requested			
phanumeric Information:				
ntification:				
rmation content:	Property	Description	Data Type	Units
		identity Data		
	Name	Primary identifier of an object.	text	/
			70203	
	Туре	Defines the object type, specific information about object.	text	1
	Deside and Trees	Holds the entity specific enumeration of predefined types to	1000	1
	Predefined Type	further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	Contractions.	Defines the system for the connectors that are located on air	CASA NO	1
		terminals, equipment and fixtures. For example, connectors		- 10
	System Classification	for air terminals could have a system classification of Supply	text	1
		Air, Return Air or Exhaust Air.		
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined	text	1
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	or automatically generated.		-
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be/s installed.	text	1
	Leve!	Defines the reference level,	text	1
	- 20	An alphanumeric value		20
	Description	providing a concise description	text	1
		of the element.		
	Manufacturer	The organization that manufactured and / or assembled the	text	1
	100000000000000000000000000000000000000	Item. Mareria	122.027	1.000
		troutes (a)		
	Shower Stall Material	Material from which the body of the stall is constructed.	text	1
	Door Material	Material from which the door is constructed.	text	1
	Door Handle Material	Material from which the door handle t is constructed.	text	1
		Dimensional Data		
	Drain Size	The size of the drain outlet connection from the object.	numeric.	mm
	Height	Naminal or quoted height of the object.	numeric	mm
	Length	Nominal or quoted length of the object.	numeric	mm
	Width	Nominal or quoted width of the object.	numeric	mm
	Door Width	Width of the shower door.	numeric	mm
	User widen	Width of the shower door. Ferformance Data	manenc	
	-	Performance Laata		
	Has Tray	Indicates whether the shower has a separate receptacle that	boolean	YES/NO
	nas iray	catches the water in a shower and directs it to a waste outlet.	boolean	125/100
		Installation Data		
	Installation date	The second se	date time	date
		The date on which the installation was carried out.	date time	
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the	text	1
		requirements of the installed element. Product Data	1965	C. C. B.K.
	1	Product Lists		r
	ModelLabel	An alphanumeric value representing the product, item or unit.	text	1
	Wodeltaber	number assigned by the manufacturer of the product.	test	1
	22266	An alphanumeric value for the name of the manufactured		
	ModelReference	item as used by the manufacturer.	text	1
		Cost		
	Overall Cost	Sum of all costs needed for installing.	numeric	E
	2 Alexandra and a second	Cost of installing one unit, including workforce and	574870-557	-
	Installation Cost	equipment.	numeric	e
	Material Cost	Cost of material for installing one unit.	numeric	c
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	T

Information Delivery Milesto				
Purpose:	Plumbing			
Actor:				
		2014-11-14		
Object:	"Shower" / IfcSanitaryTer	minal		
Geometrical Information:				
Detail:		sions and geometry. Actual clearances and supports modelled.		
Dimensionality:	30			
ocation:	Absolute and relative to other build			
Appearance:	Color fill to distinguish different ma	sterials		
arametric behaviour:	Not requested			
Alphanumeric Information:				
dentification: nformation content:		Description		Units
	Property	identity Data	Data Type	Units
	Name	Primary identifier of an object.	text	1
	- 10 20 20	Settlements in the settlement of the section of the section of the section of the	-00100	
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1
		further classify the entity		0.0
	Classification	Classification code according to chosen classification system.	test	1
		Defines the system for the connectors that are located on air		
	System Classification	terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply	text	1
	System Type	Air, Return Air or Exhaust Air. Type of system e.g., supply air.	text	/
		A name that uniquely defines system. It may be user-defined		
	System Name	or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be/is installed.	text	1
	Level	Defines the reference level.	text	1
	Description	An alphanumeric value providing a concise description	text	1
	Manufacturer	of the element. The organization that manufactured and / or assembled the item.	text	1
	URL	A valid URL hyperlink to the	text	1
	UNL	manufacturer's website. Material	text.	5
	Shower Stall Material	Material from which the body of the stall is constructed.	text	L.
	Door Material	Material from which the door is constructed.	test	1
	Door Handle Material	Material from which the door handle t is constructed. Dimensional Data	text	1
	Drain Size	The size of the drain outlet connection from the object.	numeric	mm
	Height	Nominal or quoted height of the object.	numeric	mm
	Length	Nominal or quoted length of the object.	numeric	mm
	Width	Nominal or quoted width of the object.	numeric	mm
	Door Width	Width of the shower door.	numeric	mm
		Performance Data		
	Has Tray	Indicates whether the shower has a separate receptacle that catches the water in a shower and directs it to a waste outlet.	boolean	YES/NO
	-	Installation Data		
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	test	/
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1
	200450702202	A person responsible for assuring the quality and meeting the	3223203	
	Approved By	requirements of the installed element.	text	/
		Werranty Data		
	Warranty ID	The identifier assigned to a warranty.	text	1
	WarrantyDescription	An alphanumeric value providing a concise description of the warranty content and	text	1
		any exclusions.		
	Warranty Start Date	The date on which the warranty commences.	date time	date
	Warranty End Date	The date on which the warranty expires.	date time	date
	Condition	The physical status of the element at the time of the inventory or audit, based on the best judgment of those persons familiar with the physical characteristics and	text	1
		condition. Basic imperfection that implies any deformity in component		
	Defects	of a building that is owing to blemished plan, inadequate or flawed workmanship or deficient material and once in a while any blend of these. Product Data	text	1
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	/
	Overall Cost	Cost Sum of all costs needed for installing.	numeric	e
		Cost of installing one unit, including workforce and		
	installation Cost	equipment.	numeric	¢
	Material Cost	Cost of material for installing one unit. Phasing	numeric	£
	-		huit	1
	Phase	Identifies the phase in which the object is created.	text	

IfcSanitaryTermin	al		
led to actual dimensions	and geometry. Actual clearances and supports mo	odelled.	
elative to other building e	lements		
inguish different materia	ls -		
roperty	Description	Data Type	Units
	Liferation Theory		

Information Delivery Milestone:	Design			
Purpose:	Plumbing			
Actor:				
Object:	"Bidet" / IfcSanitaryTerr	minal		
Geometrical information:				
Detail:	Simplified volume representatio	n. Modelled accurately in terms of the overall geometry and thicknes	55.	
Dimensionality:	3D			
Location:	Absolute and relative to other b	uilding elements		
Appearance:	Single color fill			
Parametric behaviour:	Not requested			
Alphanumeric Information:				
Identification				
Information content:	Property	Description	Oata Type	Units
		Identity Data		6
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	test	1
	Classification	Classification code according to chosen classification system.	text	1
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fatures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Sahava Air.	text	7
	System Type	Type of system e.g., supply air,	text	1
	System Name	A name that uniquely defines system. It may be user-defined or automstically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be/is installed.	text	1
	Level	Defines the reference level.	text	1
		Material		2
	Material	The primary material used to construct the object.	text	1
		Dimensional Data		
	Length	Nominal or quoted length of the object.	numeric	mm
	Width	Nominal or puoted width of the object.	numeric	mm
		Product Oata		
	Mounting Type	The way the bidet is mounted to the floor, wall, etc.	text	1
		Cost		70
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material, labor and equipment).	numeric	¢
	Estimated Unit Cost	Estimated cost of element per m ² / m ³ . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/ m²
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1
Documentation:		184		A

// IfcSanitaryTermi defled to nominal dime nd relative to other build defled to nominal dime to other build deflexit to other build deflexit to other build deflexit to other build deflexit Name Type Type Type Classification System Type System Type System Name Room Name Room Name Hourber thet from Level Level	ensions and geometry. Actual clearances modelled. ding elements	Data Type text text text text text text text te	Units I I I I I I I I I I I I I
odelled to nominal dime odelled to one huld distinguish different mat and Property Name Type Type Type Classification tem Classification tem Classification System Type System Kame Room Name Room Number Hiset from Level	ensions and geometry. Actual clearances modelled. drig elements teenals Description Identity Data Primary identifier of an object. Defines the object type, specific information about object. Defines the object type, specific information about object. Defines the object type, specific information about object. Classification code according to chosen dassification system. Defines the system for the connectors that are located on air for air terminals, equipment and fittures. For mample, out of supply Air, Return Air or bhaust Air. Type of system e.g., supply air. A care that unjuely defines system. It may be user-defined abervation for a system. Room name where component to befs installed. Room number where component to befs installed.	text text text text text text text text	
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dotinguish different mai leed Property Name Type Type Type Classification Lem Classification System Type System Type System Name Recom Name Recom Number	Description Identity Data Monary identifier of an object. Defines the object type, specific information about object. Helds the entity specific information about object. Helds the entity the entity. Cassification code according to chosen dassification system. Defines the system for the connectors that are located on air minals, equipment and fistures. For sample, connectors for air terminals, could have a system classification of supply Ar, Return Are, or bubust Ari. Type of system e.g., supply alr. A same that uniquely defines system. It may be user-defined automatical generated. Room name where component to befs installed. Room number where component to befs installed.	text text text text text text text text	
Property Property Name Type Classification Classification System Type System Type Room Name Room Name Foom Rumber fiset from Level	Description Identity Data Primary identifier of an object. Defines the object type, specific information about object. Holds the entity specific enumeration of predefined types to further classify the entity. Classification code according to chosen classification system. Defines the system for the connectors that are located on air terminals, equipment and fistures. For example, connectors for air terminals could have a system classification disupply Are, Return Air Cabuat Air. Fype of system e.g., supply air. A some that unlowed defines system. It may be user-defined or summatically generated. A user-defined ablevisition for a system. Room name where component to be/is installed. Boom number where component to be/is installed.	text text text text text text text text	
Property Property Name Type Classification Classification System Type System Type Room Name Room Name Foom Rumber fiset from Level	Description Identity Data Primary identifier of an object. Defines the object type, specific information about object. Holds the entity specific enumeration of predefined types to further classify the entity. Classification code according to chosen classification system. Defines the system for the connectors that are located on air terminals, equipment and fistures. For example, connectors for air terminals could have a system classification disupply Are, Return Air Cabuat Air. Fype of system e.g., supply air. A some that unlowed defines system. It may be user-defined or summatically generated. A user-defined ablevisition for a system. Room name where component to be/is installed. Boom number where component to be/is installed.	text text text text text text text text	
Name Type Type Classification Len Classification System Type System Name Recom Name Recom Number Hiset from Level	Identity Data Primary identifier of an object. Defines the object type, specific information about object. Inclusit the entity specific information about object. Inclusit the entity is specific enumeration of predefined types to further dassify the entity. Classification code according to chosen dassification system. Defines the system for the connectors that are located on air for air terminals, equipment and fittures. For sample, contactors for air terminals, equipment and fittures. For sample, contactors for air terminals, equipment and fittures. For sample, contactors for air terminals, equipment and fittures. Return Air Cohaust Air. A control data uniquely defines system. It may be user-defined a user-defined abbreviation for a system. Room name where component to be/is installed. Room number where component to be/is installed.	text text text text text text text text	
Name Type Type Classification Len Classification System Type System Name Recom Name Recom Number Hiset from Level	Identity Data Primary identifier of an object. Defines the object type, specific information about object. Inclusit the entity specific information about object. Inclusit the entity is specific enumeration of predefined types to further dassify the entity. Classification code according to chosen dassification system. Defines the system for the connectors that are located on air for air terminals, equipment and fittures. For sample, out of supply Air. Return Air: or bhaust Air. Type of system e.g. supply air. A same that uniquely defines system. It may be user-defined abereating uniquely defines system. A user-defined abereviation for a system. Room name where component to be/is installed. Room number where component to be/is installed.	text text text text text text text text	
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Type Classification Classification System Type System Type System Name tem Ablevelation Recom Name Room Number fister from Level	Primary identifier of an object. Defines the object type, specific information about object. Holds the entity specific enumeration of predefined types to further doublify the entity. Classification code according to chosen classification system. Defines the system for the connectors that are located on air terminals, equipment and futures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Dahaut Air. Type of system e.g., supply air. A name that unlowly defines system. It may be user-defined or automatically generated. A user-defined abbreviation for a system. Room name where component to be/is installed. Room number where component to be/is installed.	text text text text text text text	1 1 1 1 1 1 1 1
Type Classification Classification System Type System Type System Name tem Ablevelation Recom Name Room Number fister from Level	Defines the object type, specific information about object. Holds the enbity specific enumeration of predefined types to further dusby the entity. Classification code according to chosen classification system. Defines the system for the connectors that are located on air terminals, equipment and futures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Shauat Air. Type of system e.g., supply air. A name that unlowly defines system. It may be user-defined or surportationally generated. A ven-defined abbrevision for a system. Room name where component to be/is installed. Room number where component to be/is installed.	text text text text text text text	1 1 1 1 1 1 1 1
redefined Type Classification tem Classification System Type System Name tem Abbreviation Recom Name Room Rumber fiset from Level	Holds the entity specific enumeration of predefined types to further dasbify the entity. Classification code according to chosen dasbification system. Defines the system for the connectors that are located on air terminals, equipment and fistures. For example, connectors for air terminalic could have a system classification of Supply Are, Return Air Cohuast Air. Type of system e.g., supply air. A name that unlowly defines system. It may be user-defined or automatically generated. A user-defined ablevenation for a system. Room name where component to be/s installed.	text text bext bext text text text	1 1 1 1 1 1
Classification tem Classification System Type System Name tem Abbreviation Room Nime Room Number Hiset from Level	further dastify the entity: Classification code according to chosen classification system. Defines the system for the connectors that are located on air terminals, equipment and fittures. For mample, connectors for air terminals could have a system classification of Supply Air, Return Air or Shaust Air. Type of system e.g., supply air. A come chat unjuely defines system. It may be user-defined or automatically generated. A user-defined abbreviation for a system. Room name where component to be/is installed.	text bext text text text text	1 1 1 1 1
tern Classification System Type System Name tern Abbreviation Room Name Room Number Hiset from Level	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or fahaust Air. Typo of system all, system all systems and A name that uniquely defines system. It may be user-defined or automatically generated. A user-defined abbreviation for a system. Room name where component to be/is installed. Room number where component to be/is installed.	bext text text text text	1 1 1 1
System Type System Name tem Abbreviation Room Name Room Number Hiset from Level	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or fahaust Air. Typo of system all, system all systems and A name that uniquely defines system. It may be user-defined or automatically generated. A user-defined abbreviation for a system. Room name where component to be/is installed. Room number where component to be/is installed.	text text text text	1 1 1 1
System Type System Name tem Abbreviation Room Name Room Number Hiset from Level	terminals, equipment and fistures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Dahaat Air. Type of system e.g., supply air. A name that unlowly defines system. It may be user-defined or automatically generated. A user-defined abbreviation for a system. Room name where component to be/is installed. Room number where component to be/is installed.	text text text text	/ / /
System Type System Name tem Abbreviation Room Name Room Number Hiset from Level	for air terminaic could have a system classification of Supply Air, Return Air or Eshaust Air. Types of system e.g., supply air. A name that uniquely defines system. It may be user-defined or automatically generated. A user-defined abteriation for a system. Room name where component to be/is installed. Room number where component to be/is installed.	text text text text	/ / /
System Name tem Abbreviation Room Name Room Namber ffset from Level	Type of system e.g., upply alr. A name that unituely defines system. It may be user-defined or automatically generated. A user-defined abbrevisition for a system. Room name where component to be/s installed. Room number where component to be/s installed.	text fext text	/
System Name tem Abbreviation Room Name Room Namber ffset from Level	A name that uniquely defines system. It may be user-defined or automatically generated. A user-defined abbreviation for a system. Room name where component to be/is installed. Room number where component to be/is installed.	text fext text	/
tem Abbreviation Room Name Room Number Ifset from Level	or automatically generated. A user-defined abbreviation for a system. Room name where component to bo/is installed. Room number where component to be/is installed.	text text	1
tem Abbreviation Room Name Room Number Ifset from Level	A user-defined abbreviation for a system. Room name where component to be/is installed. Room number where component to be/is installed.	text text	1
Room Name Room Number Ifset from Level	Room name where component to be/is installed. Room number where component to be/is installed.	text	1
Room Number Ifset from Level	Room number where component to be/is installed.		1
ffset from Level		text	1.91
277.3.5 M - 1990	Specifies the elevation of the element relative to its level.		1
Level		numeric	m
	Defines the reference level.	text	1
	An alphanumeric value		
Description	providing a concise description	text	1
	of the element.		
Manufacturer	The organization that manufactured and / or assembled the	text	1
	item. Material	in the second	
Manufal	The primary material used to construct the object.		
Material	Dimensional Data	text	1
1	14 A 6 7 8 10 10 10 10 10 10 10 10 10 10 10 10 10	1000000	10.01
Length	Nominal or quoted length of the object,	numeric	man
Width	Nominal or quoted width of the object.	numeric	mm
Depth	Nominal or quoted depth of the object.	numeric	mm
Drain Size	The size of the drain outlet connection from the object.	numeric	mm
	Installation Data		
istallation date	The date on which the installation was carried out.	date time	date
			1
on Serial Number/Tag		numeric	1
Approved By		text	1
	6 300 NO 10 NO 10 NO 10 NO 10	1	
ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
IndelPeference	An alphanumeric value for the name of the manufactured	text	1
	item as used by the manufacturer.		1
dounting Type		text	1
Overali Cost	Sum of all costs needed for installing.	numeric	¢
nstallation Cost	Cost of installing one unit, including workforce and	numeric	£
		20000000	-
Material Cost		numeric	£
100.000			7(41)
	rominies the phase in which the object is created.	text	1
	Subcontractor on Serial Number/Tag Approved By ModelLabel KodelReference Mounting Type Overall Cost	Subcontractor A firm or person that carries out installation work: on Serial Number/Tag The Identifier assigned to installation, Approved By Approximate representing the quality and meeting the requirements of the installed element. Product Octor ModelLabel An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product. todelReference: An alphanumeric value for the name of the manufactured tem as used by the manufacturer of the product. Southing Type The way the bisit is mounted to the Floor, wall, etc. Overall Cost Sum of all costs needed for installing. estallation Cost Gost of installing one unit. Material Cost C of material for installing one unit. Phasing	Subcontractor A firm or person that carries out installation work. text on Serial Number/Tag The Identifier assigned to installation, numeric Approved By Appendent reportshile for assuming the quality and meeting the requirements of the installed element. numeric ModelLabel An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product. text ModelLabel An alphanumeric value for the name of the manufactured unit number assigned by the manufacture of the masure of the manufacture text ModelLabel An alphanumeric value for the name of the manufactured out in number assigned by the manufacture text ModelLabel An alphanumeric value for the name of the manufactured to the name of the product, item or unit number assigned by the manufacture text Mounting Type The way the bieft is mounted to the floor, wall, etc. text Overall Cost Sum of all costs needed for installing. numeric Goald of installing one unit, including workforce and equipment. numeric Material Cost Cost of material for installing one unit. numeric

nformation Delivery Milestone:	Operation					
urpose:	Plumbing					
ctor:						
bject:	"Bidet" / IfcSanitaryTermi	inal				
eometrical information:	1.44					
etail:	Element modelled to actual dimens	ions and geometry. Actual clearances and supports modelled.				
Imensionality:	3D					
ocation:	Absolute and relative to other build	ting elements				
opearance:	Color fill to distinguish different ma	- The second				
arametric behaviour:	Not requested					
Iphanumeric Information:						
lentification:						
formation content:	Property	Description	Data Type	Units		
		Identity Data				
	Name	Primary identifier of an object.	text	7		
	Туре		text	1		
	Type	Defines the object type, specific information about object.	DEXL			
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1		
	25 27 20.0	further classify the entity				
	Classification	Classification code according to chosen classification system.	text	1		
		Defines the system for the connectors that are located on air				
	System Classification	terminals, equipment and fixtures. For example, connectors	text	1		
	oystem oldssiniation	for air terminals could have a system classification of Supply	DON'S	1		
	6.00	Air, Return Air or Exhaust Air.		1.4		
	System Type	Type of system e.g., supply air.	text	1		
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1		
	System Abbreviation	A user-defined abbreviation for a system.	text	1		
	Room Name	Room name where component to be/is installed.	text	1		
	Room Number	Room number where component to be/is installed.	text			
			210200000			
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m		
	Level	Defines the reference level.	text	1		
	0	An alphanumeric value				
	Description	providing a concise description	text	1		
		of the element.				
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1		
	Fight -	A valid URL hyperlink to the	10.00	204		
	URL	manufacturer's website.	test	1		
		Material				
	Material The primary material used to construct the object. text /					
		Dimensional Data				
	Length	Nominal or quoted length of the object.	numeric	mm		
	Width	Nominal or quoted width of the object.	numeric	mm		
	Depth	Nominal or quoted depth of the object.	numeric	mm		
	Drain Size	The size of the drain outlet connection from the object.	numeric	mm		
		installation Data				
	Installation date	The date on which the installation was carried out.	date time	date		
	Subcontractor	A firm or person that carries out installation work.	text	1		
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1		
	Articologian and a	A person responsible for assuring the quality and meeting the	10000 V			
	Approved By	requirements of the installed element.	text	1		
		Warranty Data				
	Warranty ID	The identifier assigned to a warranty.	text	1		
		An alphanumeric value				
	WarrantyDescription	providing a concise description	text	1		
	and the court is the state of	of the warranty content and any exclusions.	61925			
	Warranty Start Date	The date on which the warranty commences.	date time	date		
	Warranty End Date	The date on which the warranty commences.	date time	date		
	second run vare	The physical status of the element at the time of the	And Addie	nere		
	P	inventory or audit, based on the best judgment of those	100	107		
	Condition	persons familiar with the physical characteristics and	text	1		
		condition.				
		Basic imperfection that implies any deformity in component of a building that is owing to blemished plan, inadequate or				
	Defects	of a building that is owing to blemished plan, inadequate or flawed workmanship or deficient material and once in a while	text	1		
		any blend of these.				
		Product Data	10			
	and a second	An alphanumeric value representing the product, item or unit		100		
	ModelLabel	number assigned by the manufacturer of the product.	text	1		
		An alphanumeric value for the name of the manufactured				
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1		
	Mounting Type	The way the bidet is mounted to the floor, wall, etc.	text	1		
	and a start of the	Cost		/		
	1	Sum of all costs needed for installing	numeric	¢		
	OverallCost		100115-125			
	Overall Cost	Cost of installing one unit, including workforce and	5025-0265400 FT			
	Overall Cost Installation Cost	Cost of installing one unit, including workforce and equipment.	numeric	e		
			numeric numeric	e		
	Installation Cost	equipment.	0240247.0			
	Installation Cost	equipment. Cost of material for installing one unit.	0240247.0			

Information Delivery Milestone:	Design								
Purpose:	Plumbing								
Actor:									
	10								
Object:	"Sink" / IfcSanitaryTerm	ninal							
Geometrical information:									
Detail:	Simplified volume representatio	volume representation. Modelled accurately in terms of the overall geometry and thickness.							
Dimensionality:	3D								
ocation:	Absolute and relative to other b	uliding elements							
Appearance:	Single color fill								
Parametric behaviour:	Not requested								
Alphanumerk Information:									
identification:									
nformation content:	Property	Description	Data Type	Units					
		Identity Data							
	Name	Primary identifier of an object.	text	7					
	Type	Defines the object type, specific information about object.	text	9					
	iAbe	entrance one onliner type, spectra internation adout collect.	text.	. 2					
	Classification	Classification code according to chosen classification system.	text	1					
		Defines the system for the connectors that are located on air	1,007-5	66					
	10000	terminals, equipment and fixtures. For example, connectors	tout	5 C					
	System Classification	for air terminals could have a system classification of Supply	text	2					
		Air, Return Air or Exhaust Air.							
	System Type	Type of system e.g., supply air.	text	1					
	System Name	A name that uniquely defines system. It may be user-defined	text	1					
	Postara Debaudadara	or automatically generated.							
	System Abbreviation Room Name	A user-defined abbreviation for a system.	text	1					
		Room name where component to be/is installed.		1					
	Room Number	Room number where component to be/is installed.	text	1					
	Level	Defines the reference level. Material	text	1					
	ALC 44 (2017)		1202	7					
	Sink Material	The primary material used to construct the object.	text	1					
				1					
	Length	Nominal or quoted length of the object.	numeric	mm					
	Depth	Nominal or quoted depth of the object.	numeric	mm					
		Product Data							
	Mounting Type	The way the sink is mounted to the counter, wall, etc.	text	7					
		Cost							
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material,	numeric						
	E.F.STHINE & CASE	labor and equipment).		0807					
	-	Estimated cost of element per m ² / m ³ . It is based on the							
	Estimated Unit Cost	average amount of needed resources (including material,	numeric	6/m², 6/ m*					
		labor and equipment).	and the second of						
		Phasing							
	Phase	Identifies the phase in which the object is created.	text	1					
Documentation:									

nformation Delivery Milestone:	Construction						
ourpose:	Plumbing						
Actor:							
Object:	"Sink" / IfcSanitaryTermin	nal					
Geometrical Information:							
Detail:	Element modelled to nominal dime	ensions and geometry. Actual clearances modelled.					
Dimensionality:	3D						
Location:	Absolute and relative to other build	okite and relative to other building elements					
Appearance:	Color fill to distinguish different ma						
Parametric behaviour:	Not requested						
Alphanumeric Information:							
dentification:							
information content:	Property	Description	Data Type	Units			
		Identity Data	Sere of the	oracta			
	Name	Primary identifier of an object.	text	1			
	Туре	Defines the object type, specific information about object.	text	1			
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1			
	Classification	Classification code according to chosen classification system.	text	1			
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	7			
	System Type	Type of system e.g., supply air.	text	1			
		A name that uniquely defines system. It may be user-defined					
	System Name	or automatically generated.	text	/			
	System Abbreviation	A user-defined abbreviation for a system.	text	1			
	Room Name	Room name where component to be/is installed.	text	1			
	Room Number	Room number where component to be/is installed.	text	1			
	Offset from Level	Specifies the elevation of the element relative to its level,	numeric	m			
	Level	Defines the reference level.	text	1			
	Description	An alphanumeric value providing a concise description of the element.	text	7			
	Manufacturer	The organization that manufactured and / or assembled the litem.	text	1			
		Materia	1				
	Sink Material	The primary material used to construct the object.	Text	1			
	the of the second second	Dimensional Data	CIRCOL:	1			
	Length	Nominal or quoted length of the object.	numeric	mm			
	Width	Nominal or quoted length of the object.	numeric				
	Depth		numeric				
		Nominal or quoted depth of the object.					
	Drain Size	The size of the drain outlet connection from the object.	numeric	m/h			
				200			
	Installation date	The date on which the installation was carried out.	date time	date			
	Subcontractor	A firm or person that carries out installation work.	text	1			
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1			
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1			
	2	Product Data					
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1			
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1			
	Mounting Type	The way the sink is mounted to the counter, wall, etc.	text	1			
		Cost	206				
	Overall Cost	Sum of all costs needed for installing.	numeric	£			
	Installation Cost	Cost of installing one unit, including workforce and equipment.	numeric	£			
	Material Cost	Cost of material for installing one unit.	numeric	e			
				-			
		Phasing					

Information Delivery Milestone:	Operation						
Purpose:	Plumbing						
Actor:							
Object:	"Sink" / IfcSanitaryTermin	al					
	onik / nesanitary refmin						
Geometrical information: Detail:	Element modelle dite actual d	inne and compater. Actual discovery and compater as 1.8.4					
Cloud a	Element modelled to actual dimens	ions and geometry. Actual clearances and supports modelled.					
Dimensionality:	3D Absolute and relative to other build	Ena alimente					
Location:							
Appearance:	Color fill to distinguish different ma	teriais					
Parametric behaviour:	Not requested	ee d					
Alphanumeric Information:							
Identification:							
information content:	Property	Description	Data Type	Units			
		Identity Data					
	Name	Primary identifier of an object.	text	/			
	Туре	Defines the object type, specific information about object.	text	1			
	8210308203086430	Holds the entity specific enumeration of predefined types to	V.2011 V	3.02			
	Predefined Type	further classify the entity	text	/			
	Classification	Classification code according to chosen classification system.	text	1			
	Cassalication		test	X			
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply	text	1			
		Air, Return Air or Exhaust Air.					
	System Type	Type of system e.g., supply air.	text	1			
		A name that uniquely defines system. It may be user-defined					
	System Name	or automatically generated.	text	1			
	System Abbreviation	A user-defined abbreviation for a system.	text	1			
	Room Name	Room name where component to be/is installed.	text	1			
	Room Number	Room number where component to be/is installed.	text	Ľ			
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m			
	And the state of the second		0.0203.0205				
	Level	Defines the reference level.	text	1			
	Description	An alphanumeric value providing a concise description	text	1			
		of the element.					
	Manufacturer	The organization that manufactured and / or assembled the	text	1			
	12.900.900.000	item. A valid URL hyperlink to the	1035253 Automicia				
	URL	manufacturer's website.	text	1			
		Material					
	Sink Material	The primary material used to construct the object.	text	1			
		Dimensional Data					
	Length	Nominal or quoted length of the object.	numeric	mm			
	Width	Nominal or quoted width of the object.	numeric	mm			
	Depth	Nominal or quoted depth of the object.	numeric	mm			
	Drain Size	The size of the drain outlet connection from the object.	numeric	mm			
		Installation Data					
	Installation date	The date on which the installation was carried out.	date time	date			
	Subcontractor	A firm or person that carries out installation work.	text	1			
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1			
		A person responsible for assuring the quality and meeting the					
	Approved By	requirements of the installed element.	text	1			
		Warranty Data					
	Warranty ID	The identifier assigned to a warranty.	text	1			
		An alphanumeric value					
	WarrantyDescription	providing a concise description	text	1			
	10-1000 Part PCC 70-81-2025	of the warranty content and	1.1000-010				
	Warranty Stort Date	any exclusions. The date on which the warranty commances	date time	date			
	Warranty Start Date	The date on which the warranty commences.	date time	date date			
	Warranty End Date	The date on which the warranty expires.	date time	date			
	1.00.0000000	The physical status of the element at the time of the inventory or audit, based on the best judgment of those					
	Condition	persons familiar with the physical characteristics and condition.	text	1			
		Basic imperfection that implies any deformity in component of a building that is owing to blemished plan, inadequate or					
	Defects	flawed workmanship or deficient material and once in a while	text	1			
		any blend of these.					
		Product Data					
		An alphanumeric value representing the product, item or unit					
	ModelLabel	number assigned by the manufacturer of the product.	text	1			
	CHECKER	An alphanumeric value for the name of the manufactured	2000	02			
	ModelReference	Item as used by the manufacturer.	text	1			
	Mounting Type	The way the sink is mounted to the counter, wall, etc.	text	1			
	V. 10	Cost					
	Overall Cost	Sum of all costs needed for installing.	numeric	£			
		Cost of installing one unit, including workforce and					
	Installation Cost	equipment.	numeric	¢			
	0-20200-2-00-200-	Cost of material for installing one unit.	numeric	E			
	Material Cost		manterie				
	Material Cost Phase	Phasing Identifies the phase in which the object is created.	text	1			

		sign				
urpose:	Plumbing					
ictor:						
	Intern Design / McCasile	and the same time in the				
ibject:	"Floor Drain" / IfcSanita	iryierminal				
eometrical information:	Contraction of the second					
etail:		n. Modelled accurately in terms of the overall geometry and thicknes	is.			
imensionality:	30					
ocation:	Absolute and relative to other b	uliding elements				
ppearance:	Single color fill					
arametric behaviour:	Not requested					
Iphanumeric Information:						
lentification:						
formation content:	Property	Description	Data Type	Units		
	Identity Data					
	Name	Primary identifier of an object.	text	1		
	Туре	Defines the object type, specific information about object.	text	I.		
	Classification	Classification code according to chosen classification system.	text	í.		
	System Classification	Define's the system for the connectors that are located on air terminals, equipment and futures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	1		
	System Type	Type of system e.g., supply air.	text	1		
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1		
	System Abbreviation	A user-defined abbreviation for a system.	text	1		
	Room Name	Room name where component to be/is installed.	text	1		
	Room Number	Room number where component to be/is installed.	text	1		
	Level	Defines the reference level.	text	1		
	Material					
	Material	The primary material used to construct the object	text	1 /		
		Cost	and the second second			
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material, labor and equipment).	numeric	¢		
	Estimated Unit Cost	Estimated cost of element per m ² / m ³ . It is based on the average amount of needod resources (including material, labor and equipment).	numeric	Q/m², Q/m		
		Phasing				
	Phase	Identifies the phase in which the object is created.	text	1		

nformation Delivery Milestone:	Construction						
urpose:	Plumbing						
Actor:							
Object:	"Floor Drain" / IfcSanitary	Terminal					
Geometrical Information	, , , , ,						
Detail:	Element modelled to nominal dime	insions and geometry. Actual clearances modelled.					
Dimensionality:	30	inclusioned to normal dimension and period pressure contracts indicated.					
Location;	Absolute and relative to other build	lute and relative to other building elements					
Appearance:	Color fill to distinguish different ma						
Parametric behaviour:	Not requested	and the second se					
	not requested						
Alphanumeric Information: dentification:	-						
nformation content				1.000			
ntormation content:	Property	Description Identity Data	Data Type	Units			
	Name	Primary identifier of an object.	text	1			
	Туре	Defines the object type, specific information about object.	text	1			
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1			
		further classify the entity		-			
	Classification	Classification code according to chosen classification system.	text.	1			
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	1			
	System Type	Type of system e.g., supply air.	text	1			
	and have a film	A name that uniquely defines system. It may be user-defined					
	System Name	or automatically generated.	text	1			
	System Abbreviation	A user-defined abbreviation for a system.	text	1			
	Room Name	Room name where component to be/is installed.	text	1			
	Room Number	Room number where component to be/is installed.	text	1			
	Level	Defines the reference level.	text	1			
		An alphanumeric value					
	Description	providing a concise description of the element.	text	1			
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1			
		Material					
	Material	The primary material used to construct the object	text	1			
		Dimensional Data					
	Strainer Height	Nominal height of the strainer.	numeric	mm			
	Strainer Diameter	Nominal diameter of the strainer.	numeric	mm			
	Outlet Connection Size	Size of the outlet connection from the object.	numeric	mm			
	Body Diameter	Nominal diameter of the drain body.	numeric	me			
			numeric	mm			
	Body Height	Nominal height of the drain body. Installation Data	numeric	man			
	a contration of the second		-	1.464			
	Installation date	The date on which the installation was carried out.	date time	date			
	Subcontractor	A firm or person that carries out installation work.	text	1			
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1			
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	test	1			
		the requirements of the installed element. Product Date					
			1				
	Modeltabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1			
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1			
		Cost					
	Overall Cost	Sum of all costs needed for installing.	numeric	£			
		Cost of installing one unit, including workforce and					
	Installation Cost	equipment.	numeric	e			
	Material Cost	Cost of material for installing one unit.	numeric	E			
		Phasing					
	Phase	Identifies the phase in which the object is created.	text	1			
Documentation:							

nformation Delivery Milestone:	Operation							
Purpose:	Plumbing							
Actor:								
Object:	"Floor Drain" / IfcSanitary	Terminal						
Seometrical information:	resolution (nesolitary	a second s						
etail:	Flement modelled to actual dimension	sions and geometry. Actual clearances and supports modelled.						
	Bement modeled to actual dimens	and and because 1. serves receivences and subbrars modelled.						
Dimensionality:	Absolute and relative to other build	line alements						
ocation:								
Appearance:	Color fill to distinguish different ma	UCTINES .						
Parametric behaviour:	Not requested	ed.						
Alphanumeric Information:								
dentification:				000400				
formation content:	Property	Description	Data Type	Units				
		Identity Data						
	Name	Primary identifier of an object.	text	L				
	Type	Defines the object type, specific information about object.	text	1				
		Holds the entity specific enumeration of predefined types to						
	Predefined Type	further classify the entity	text	1				
				2.				
	Classification	Classification code according to chosen classification system.	text	1				
		Defines the system for the connectors that are located on air						
	System Classification	terminals, equipment and foctures. For example, connectors	text	1				
	1545SST0CA-6COUNT	for air terminals could have a system classification of Supply Air, Potum Air or Exhaust Air	20230	- S				
	System Type	Air, Return Air or Exhaust Air. Type of system e.g., supply air.	text	1				
	Contraction of the state	A name that uniquely defines system, It may be user-defined.	19.949	201				
	System Name	or automatically generated.	text	1				
	System Abbreviation	A user-defined abbreviation for a system.	text	1				
	Room Name	Room name where component to be/is installed.	text	1				
	Room Number	Room number where component to be/s installed.	text	1				
	Level	Defines the reference level.	text	1				
	stere	An alphanumeric value	have 1					
	Description	providing a concise description	text	1				
		of the element.	2588					
	Manufacturer	The organization that manufactured and / or assembled the	text	1				
		item.		E (1)				
	URL	A valid URL hyperlink to the manufacturer's website.	text	1				
		Material						
	Material	The primary material used to construct the object	text	1				
	waterial	The primary material used to construct the object Dimensional Data	seat	1				
	Finite House	Nominal height of the strainer,	in the second se	122.02				
	Strainer Height		numeric	mm				
	Strainer Diameter	Nominal diameter of the strainer,	numeric	mm				
	Outlet Connection Size	Size of the outlet connection from the object.	numeric	mm				
	Body Diameter	Nominal diameter of the drain body.	numeric	mm				
	Body Height	Nominal height of the drain body.	numeric	mm				
		Installation Data						
	Installation date	The date on which the installation was carried out.	date time	date				
	Subcontractor	A firm or person that carries out installation work.	text	1				
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	$-\ell$				
	Approved By	A person responsible for assuring the quality and meeting	text	T				
		the requirements of the installed element.						
	Constant of the Rest of States of the	Warranty Data						
	Warranty ID	The identifier assigned to a warranty.	text	<i>K</i>				
		An alphanumeric value						
	WarrantyDescription	providing a concise description of the warranty content and	text	E.				
		any exclusions.						
	Warranty Start Date	The date on which the warranty commences.	date time	date				
	Warranty End Date	The date on which the warranty expires.	date time	date				
		The physical status of the element at the time of the						
	Condition	inventory or audit, based on the best judgment of those persons familiar with the physical characteristics and	text	1				
	Defects	condition. Basic imperfection that implies any deformity in component of a building that is owing to blemished plan, inadequate or	text	7				
		flawed workmanship or deficient material and once in a while any blend of these. Product Data		2				
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1				
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	i				
		Cost						
	Overall Cost	Sum of all costs needed for installing.	numeric	¢				
	Installation Cost	Cost of installing one unit, including workforce and	numeric	c				
		equipment.		-				
	Material Cost	Cost of material for installing one unit.	numeric	¢				
		Phasing						
Documentation:	Phase	Identifies the phase in which the object is created.	text	E				

Information Delivery Milestone:	Design								
Purpose:	Plumbing								
Actor:									
Object:	"Urinal" / IfcSanitaryTer								
Geometrical information:	Ufinal / incoanitary ren	minal							
Detail:	Rin HE in the second	volume representation. Modelled accurately in terms of the overall geometry and thickness.							
	30	 Modelleb accurately in terms of the overall geometry and thickne. 	55.						
Dimensionality:									
Location:	Absolute and relative to other bu	aliang elements							
Appearance:	Single color fill								
Parametric behaviour:	Not requested								
Alphanumeric Information:									
dentification:	and the second sec		The second s	0					
information content:	Property	Description	Data Type	Units					
		Identity Data							
	Name	Primary identifier of an object.	text	1					
	Type	Defines the object type, specific information about object.	text	I					
	Classification	Classification code according to chosen classification system.	text	1					
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fictures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	r.					
	System Type	Type of system e.g., supply air.	text	1					
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1					
	System Abbreviation	A user-defined abbreviation for a systen.	text	I					
	Room Name	Room name where component to be/is installed.	text	1					
	Room Number	Room number where component to be/is installed.	text	1					
	Level	Defines the reference level.	text	1					
		Material							
	Urinal Material	The primary material used to construct the object.	text	1					
		Dimensional Data							
	Length	Nominal or guoted length of the object.	numeric	mm					
	Width	Nominal or guoted width of the object.	numeric	ann					
		Product Data							
	Mounting Type	The way the bidet is mounted to the floor, wall, etc.	text	1					
		Cost	0000						
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material, labor and equipment).	numeric	e					
	Estimated Unit Cost	Estimated cost of element per m ² / m ⁴ . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	6/m², 6/ m³					
		Phasing							
	Phase	Identifies the phase in which the object is created.	text	1					
Documentation:			0.000						

nformation Delivery Milestone:	Construction						
Purpose:	Plumbing						
Actor:							
Object:	"Urinal" / IfcSanitaryTerm	ninal					
Geometrical information:							
Detail:	Element modelled to nominal dime	ent modelled to nominal dimensions and geometry. Actual clearances modelled,					
Dimensionality	3D						
Location:		e and relative to other building elements					
Appearance:		to distinguish different materials					
Parametric behavlour:	Not requested						
Alphanumeric information:							
identification:							
nformation content:	Property	Description	Data Type	Units			
	Property	Identity Data	Dora The	C III C			
	Name	Primary identifier of an object.	text	1			
	Type	Defines the object type, specific information about object.	text	1			
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1			
	Cassification	Classification code according to chosen classification system.	text	1			
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply	text	1			
		Air, Return Air or Exhaust Air.					
	System Type	Type of system e.g., supply air.	text	1			
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1			
	System Abbreviation	A user-defined abbreviation for a system.	text	1			
	Room Name	Room name where component to be/is installed.	text	1			
	Room Number	Room number where component to be/s installed.	text	1			
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m			
	Level	Defines the reference level.	text	1			
	Description	An alphanumeric value providing a concise description	lext	1			
		of the element.					
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1			
		Material		7			
	Urinal Material	The primary material used to construct the object.	text	1			
		Dimensional Data					
	Drain Size	The size of the drain outlet connection from the object.	numeric	mm			
	Length	Nominal or quoted length of the object.	numeric	mm			
	Depth	Nominal or quoted depth of the object.	numeric	mm			
	Width	Nominal or guoted width of the object.	numeric	(mm)			
		Installation Data					
	Installation date	The date on which the installation was carried out.	date time	date			
	Subcontractor	A firm or person that carries out installation work.	text	1			
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1			
		A person responsible for assuring the quality and meeting					
	Approved By	the requirements of the installed element. Product Data	lext	1			
	ModelLabel	An alphanumeric value representing the product, item or	text	1			
	1000 CONTON	unit number assigned by the manufacturer of the product. An alphanumeric value for the name of the manufactured	101010	60			
	ModelReference	item as used by the manufacturer.	text	1			
	Mounting Type	The way the bidet is mounted to the floor, wall, etc.	text	1			
	Dural Sec	1					
	Overall Cost	Sum of all costs needed for installing.	numeric	¢			
	Installation Cost,	Cost of installing one unit, including workforce and equipment.	numeric	¢			
	Material Cost	Cost of material for installing one unit.	numeric	c			
	Disease	Phasing		4			
	Phase	Identifies the phase in which the object is created.	text	1			

Information Delivery Milestone:	Operation			
Purpose:	Plumbing			
Actor:				
	Para and file and a second	deal		
Object:	"Urinal" / IfcSanitaryTerm	linal		
Geometrical information:				
Detail:	Element modelled to actual dimens	ions and geometry. Actual clearances and supports modelled.		
Dimensionality:	30			
Location:	Absolute and relative to other build	ling elements		
Appearance:	Color fill to distinguish different ma			
Parametric behaviour:	Not requested			
Alphanumeric Information:	The requested			
	+			
dentification:	-		120002000	10000
nformation content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
	Type	Defines the object type, specific information about object.	text	1
	194		surd.	
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1
		further classify the entity		11
	Classification	Classification code according to chosen classification system.	text	1
		Defines the system for the connectors that are located on air		
	System Classification	terminals, equipment and fixtures. For example, connectors	text	1
	- 10 A State 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	100.67	2.5
	System Type	Air, Heturn Air or Exhaust Air. Type of system e.g., supply air.	text	1
			text	
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be/is installed.	text	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
	- I and	Defines the enformance local	1	1.211
	Level	Defines the reference level.	text	1
	Description	An alphanumeric value	text	1
	Gescription	providing a concise description of the element.	west.	1
	-	The organization that manufactured and / or assembled the		
	Manufacturer	item.	text	1
	URL	A valid URL hyperlink to the	text	1
		manufacturer's website. Material		
	1		1	57 4 7
	Urinal Material	The primary material used to construct the object.	text	1
	1	Dimensional Data		
	Drain Size	The size of the drain outlet connection from the object.	numeric	mm
	Length	Nominal or quoted length of the object.	numeric	mm
	Depth	Nominal or quoted depth of the object.	numeric	mm
	Width	Nominal or quoted width of the object.	numeric	mm
		Installation Data		
	installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1
	10000000000000000000000000000000000000	Varianty Oata		015
	Weiger and the		test 1	
	Warranty ID	The identifier assigned to a warranty.	text	1
		An alphanumeric value providing a concise description		
	WarrantyDescription	of the warranty content and	text	1
		any exclusions.		
	Warranty Start Date	The date on which the warranty commences.	date time	date
	Warranty End Date	The date on which the warranty expires.	date time	date
	Man any chu Date	The physical status of the element at the time of the	Opre unit	uote
	12 1973	inventory or audit, based on the best judgment of those	5.00	
	Condition	persons familiar with the physical characteristics and	text	1
		condition.		
		Basic imperfection that implies any deformity in component		
	Defects	of a building that is owing to blemished plan, inadequate or	text	1
		flawed workmanship or deficient material and once in a while	0000	1
	-	any blend of these.		
		Product Data		
	ModelLabel	An alphanumeric value representing the product, item or unit	and a	
	ModelLabel	number assigned by the manufacturer of the product.	text	1
		An alphanumeric value for the name of the manufactured		
	ModelReference	item as used by the manufacturer.	text	1
	Mounting Type	The way the bidet is mounted to the floor, wall, etc.	text	1
	and the	Cost		1
	0.00		and a second sec	
	Overall Cost	Sum of all costs needed for installing.	numeric	¢
	Installation Cost	Cost of installing one unit, including workforce and equipment.	numeric	E
	Material Cost	Cost of material for installing one unit.	numeric	e
	Wateriai Lost		numeric	
	6	Phasing		1.941
Documentation:	Phase	Identifies the phase in which the object is created.	text	1

SanitaryTer	minal		
	10102T0		
d to actual dime	msions and geometry. Actual clearances and supports modelled.		
	ilding elements		
guish different	materials		
perty	Description	Data Type	Units
	Identity Data		
ame	Primary identifier of an object.	text	1
ype	Defines the object type, specific information about object.	text	1
ined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
fication	Classification code according to chosen classification system.	text	1
lassification	Defines the system for the connectors that are located on air terminals, equipment and fictures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	7
em Type	Type of system e.g., supply air.	text	1
m Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1
bbreviation	A user-defined abbreviation for a systen.	text	1
n Name	Room name where component to be/is installed.	text	1
Number	Room number where component to be/is installed.	text	1
rom Level	Specifies the elevation of the element relative to its level.	numeric	m
evel	Defines the reference level.	text	1

Information Delivery Milestone:	Design			
Purpose:	Plumbing			
Actor:				
	5			
Object:	"Water Closet" / IfcSani	itaryTerminal		
Geometrical information:				
Deta	Simplified volume representatio	n. Modelled accurately in terms of the overall geometry and thickne	55.	
Dimensionality:	30			
Location:	Absolute and relative to other b	silding elements		
Appearance	Single color fill			
Parametric behaviour:	Not requested			
Alphanumeric Information:				
dentification:				
Information content:	Property	Description	Data Type	Units
	roperty	Identity Data	route cline	Stites
	Name	Primary identifier of an object.		
	Name		text	1
	Туре	Defines the object type, specific information about object.	text	1
	- 10 - 11			
	Classification	Classification code according to chosen classification system.	text	1
		Defines the system for the connectors that are located on air		
	System Classification	terminals, equipment and fixtures. For example, connectors	text	1
	\$175000000000000000000000000000000000000	for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.		
	System Type	Type of system e.g., supply air.	text	1
		A name that uniquely defines system. It may be user-defined	22394	
	System Name	or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be/is installed.	text	1
	Level	Defines the reference level.	text	1
		Material		
	WaterCloset Material	Material from which the body of the water closet is constructed.	text	1
	Seat Material	Material from which the seat of the water closet is constructed.	text	1
		Dimensional Ceta		
	Length	Nominal or quoted length of the object.	numeric	mm
	Depth	Nominal or quoted depth of the object.	numeric	1973
	Width	Nominal or quoted width of the object.	numeric	mm
		Product Data		
	Mounting Type	The way the toilet is mounted to the floor, wall, etc.	text	1
	0.11	Cost		
		Estimated cost for installing one unit. It is based on the		
	Estimated Cost	average amount of needed resources (including material, labor and equipment).	numeric	٤
	Estimated Unit Cost	Estimated cost of element per m ² / m ² . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/ m³
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1
Documentation:				

Plumbing				
itaryTerminal				
mensions and geometry. Actual clearances modelled.				
uilding elements				
for fill to distinguish different materials				
Description	Date Type	Units		
Identity Data				
Primary identifier of an object.	text	1		
Defines the object type, specific information about object.	text	1		
Holds the entity specific enumeration of predefined types to	text	1		
further classify the entity	, sale	1		
Classification code according to chosen classification system.	text	1		
Defines the system for the connectors that are located on air	10000	2		
terminals, equipment and fixtures. For example, connectors	2212	20		
for air terminals could have a system classification of Supply	text	1		
Air, Return Air or Exhaust Air.				
Type of system e.g., supply air.	text	1		
A name that uniquely defines system. It may be user-defined	text	1		
or automatically generated.	Second and			
A user-defined abbreviation for a system.	text	1		
Room name where component to be/is installed.	text	1		
Room number where component to be/is installed.	text	1		
Specifies the elevation of the element relative to its level.	numeric	m		
Defines the reference level.	text	1		
An alphanumeric value	text	1		
providing a concise description	text	1		
of the element.		2		
The organization that manufactured and / or assembled the	feet	1		
item.	text	1		
Material				
Material from which the body of the valve is constructed.	text	1		
	1000			
Material from which the body of the water closet is constructed.	text	1		
Material from which the seat of the water closet is	1000	10255		
constructed.	text	1		
Dimensional Data-				
The size of the drain outlet connection from the object.	numeric	mm		
Nominal or quoted length of the object.	numeric	mm		
Nominal or guoted depth of the object.	numeric	mm		
Nominal or quoted width of the object.	numeric	mm		
Installation Data				
The date on which the installation was carried out.	date time	date		
A firm or person that carries out installation work	text	1		
g The Identifier assigned to installation.	numeric	1		
A person responsible for assuring the quality and meeting the				
requirements of the installed element.	text	1		
Product Data	,			
An alphanumeric value representing the product, item or unit	1	53.9		
An approximation of the manufacturer of the product, item or unit number assigned by the manufacturer of the product.	text	1		
An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1		
Item as used by the manufacturer. The way the toilet is mounted to the floor, wall, etc.	test	-		
The way the toriet is mounted to the floor, wall, etc.	veAt	1		
I see a second se	numeric I	ĩ		
Sum of all costs needed for installing.	numeric			
Cost of installing one unit, including workforce and environment	numeric	6		
Cost of material for installing one unit.	numeric	¢		
	Ingen (Cite			
Identifies the phase in which the object is created.	text	1		
instantes the busis in which the order is reacted.	(ext	1		
equipment Cost of material for in	stalling one unit. Phasing	stalling one unit. numeric Phasing		

Plumbing					
"Water Clocet" / HcSanit	aniTerminal				
Water croset / nesding	water closer / inclaimary reminiar				
Element modellari to actual dima	psions and geometry. Actual clearances and supports modallad				
	ildion elements				
	110 (CHORS -				
horregulated					
Property	Description	Data Tuno	Units		
Property		when side	Units		
Namo		text	7		
10000					
Type	Defines the object type, specific information about object.	text	1		
Prodefined Type	Holds the entity specific enumeration of predefined types to	text	1		
Therefore Type	further classify the entity		1		
Classification	Classification code according to chosen classification system.	text	1		
	Defines the system for the connectors that are located on air		36		
Distance Providence	terminals, equipment and fixtures. For example, connectors	1000	36		
System Classification	for air terminals could have a system classification of Supply	text	1		
	Air, Return Air or Exhaust Air.				
System Type	Type of system e.g., supply air.	text	1		
System Name		text	1		
		text	1		
			1		
Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m		
Level	Defines the reference level.	text	1		
20000000000000000000000000000000000000	An alphanumeric value	11.00.00			
Description	providing a concise description	text	1		
	of the element. The organization that manufactured and / or assembled the				
Manufacturer	The organization that manufactured and / or assembled the item.	text	1		
	A valid URL hyperlink to the				
URL	manufacturer's website.	text	1		
	Moterial				
Valve Material	Material from which the body of the valve is constructed.	text	1		
WaterCloset Material	Material from which the body of the water closet is	text	7		
motor cruster, inditer (d)	constructed.	100	8		
Seat Material	Material from which the seat of the water closet is	text	1		
171. 126 and 1818.		77	Ň		
Desile Circa		numerie.	mm		
			17.0000		
			mm		
Width		numeric	mm		
Instaliation data	and the second se	date time	date		
			date /		
and the second se					
			/		
Approved By		text	1		
	Warranty Data				
Warranty ID	The identifier assigned to a warranty.	text	1		
	An alphanumeric value				
WarrantyDescription	providing a concise description	text	1		
a second second second second			1		
Mingroup Chart Out-		data time	date		
			date date		
warranty thd uate		clace cime	date		
Stational and	inventory or audit, based on the best judgment of those	1000	10		
Condition	persons familiar with the physical characteristics and	text	1		
	condition.				
	Basic imperfection that implies any deformity in component				
Defects		text	1		
	while any blend of these.				
	Product Data				
	An alphanumeric value representing the product item or				
ModelLabel		text	1		
ModelReference		text	1		
Mounting Type		text	1		
woodmank rabe	Cost	unal.	/		
Owersell Criect		nomeric	¢		
	Cost of installing one unit, including workforce and				
Installation Cost	equipment.	numeric	€		
Material Cost	Cost of material for installing one unit.	numeric	•		
Material Cost	Cost of material for installing one unit. Phasing	numeric			
	Element modelled to actual dime 30 Absolute and relative to other bi Color fill to distingish different i Not requested Property Protection Type Classification System Type Classification System Name System Name System Name Room Number Offset from Level Description Manufacturer URL URL URL Valve Material WaterCloset Material Seat Material Description Manufacturer URL URL URL URL Description Manufacturer URL Description Manufacturer URL Material WaterCloset Material Seat Material Description Manufacturer URL WaterCloset Material Description Manufacturer URL WaterCloset Material Seat Material Description MarantyDescription WarrantyDescription WarrantyDescription WarrantyDescription WarrantyDescription	Absolute and relative to other building elements Color Fill to disregular different mitchils. Rol of Fill to disregular different mitchils. Rol Name Rol number Merce component to the disregular different disregular. Rol Name Rol number Were component to the disregular different disregular. Rol Name Rol number Were component to the disregular different disregular. Rol Name Rol number Were component to the disregular different disregular. Rol Name Rol number Were component to the disregular different disregular. Rol Name Rol number Rol number were component to the disregular disregular different disregular different disregular disregular different disregular different disregular d	Bennet modelled to actual dimensions and geometry. Actual dearances and supports modelled. BA Absolute and ministries to other building elements. Color III to distinguish offlerent minisks. Not requested Image: State of the status of the state		

Information Delivery Milestone:	Design							
Purpose:	Plumbing							
Actor:								
Object:	"Lavatory" / IfcSanitary	Terminal						
Geometrical information:								
Detail	Simplified volume representation	olume representation. Modelled accurately in terms of the overall geometry and thickness.						
Dimensionality:	30							
ocation	Absolute and relative to other b	uliding elements						
Appearance:	Single color fill							
Parametric behaviour:	Not requested							
Alphanumeric Information:								
Identification:								
information content:	Property	Description	Data Type	Units				
		identity Oata						
	Name	Primary identifier of an object.	text	1				
	Terre	Defines the object type, specific information about object.		1				
	Туре	pennes are object type, specific information adout object.	text	1				
	Classification	Classification code according to chosen classification system.	text	1				
	And designed to weathers a	Defines the system for the connectors that are located on air		-				
		terminals, equipment and fixtures. For example, connectors	text	7				
	System Classification	for air terminals could have a system classification of Supply						
		Air, Return Air or Exhaust Air.						
	System Type	Type of system e.g., supply air.	text	1				
	System Name	A name that uniquely defines system. It may be user-defined	test	I.				
		or automatically generated.		<u></u>				
	System Abbreviation	A user-defined abbreviation for a system.	text	1				
	Room Name	Room name where component to be/is installed.	text	1				
	Room Number	Room number where component to be/is installed.	text					
	Level	Defines the reference level.	text	1				
		Material						
	Sink Material	The primary material used to construct the object.	text	1				
		Dimensional Data						
	Length	Nominal or quoted length of the object.	numeric	mm				
	Depth	Nominal or quoted depth of the object.	numeric	mm				
	8	Product Data		4				
	Mounting Type	The way the sink is mounted to the counter, wall, etc.	text	1				
		Cost						
		Estimated cost for installing one unit. It is based on the						
	Estimated Cost	average amount of needed resources (including material, labor and equipment).	numeric	e				
		Estimated cost of element per m ² / m ³ . It is based on the		-				
	Estimated Unit Cost	average amount of needed resources (including material,	numeric	€/m², €/ m³				
	100000000000000000000000000000000000000	labor and equipment).	1.022403545	C. Serie Series				
	2	Phasing		60				
	Phase	Identifies the phase in which the object is created.	text	- E				
Documentation:								

Information Delivery Milestone:	Construction			
Purpose:	Plumbing			
ctor:				
	1			
Object:	"Lavatory" / IfcSanitaryTe	erminal		
Geometrical information:				
Detail:	Element modelled to cominal dime	ensions and geometry. Actual clearances modelled.		
Dimensionality:	30	and a state of the second s		
Location:	Absolute and relative to other built	tion alamants		
	Color fill to distinguish different ma			
Appearance	Not requested	scenars		
Parametric behaviour:	Not requested			
Alphanumeric Information: dentification:				
information content:				Units
niormation contene	Property	Description	Data Type	Units
		identity Data		
	Name	Primary identifier of an object.	text	1
	Type	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply	text	/
	Sutton Time	Air, Return Air or Exhaust Air.	text	7
	System Type	Type of system e.g., supply air.	text	
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be/is installed.	text	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
	Lovel	Defines the reference level.	text	1
	Description	An alphanumeric value providing a concise description	text	7
	1010-1010-007	of the element. The organization that manufactured and / or assembled the		12
	Manufacturer	item. Material	text	1
	Sink Material	The primary material used to construct the object.	test	1
		Dimensional Data		
	Length	Nominal or quoted length of the object.	numeric	mm
	Width	Nominal or guoted width of the object.	numeric	mm
	Depth	Nominal or quoted depth of the object.	numeric	mm
	Drain Size	The size of the drain outlet connection from the object.	numeric	mm
		installation Data		
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	installation Serial Number/Tag	The identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1
		Product Data		
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1
	Mounting Type	The way the sink is mounted to the counter, wall, etc.	text	1
	Concernance of the second	Cost		19442
	Overall Cost	Sum of all costs needed for installing.	numeric	c
	Installation Cost	Cost of installing one unit, including workforce and equipment.	numeric	e
	Material Cost	Cost of material for installing one unit. Phasing	numeric	£
	Phase	Phasing Identifies the phase in which the object is created.	text	1

nformation Delivery Milestone: ^J urpose:	Operation Plumbing			
the second s	Fighting			
ictor:				
	In a state of the	and the second		
Object:	"Lavatory" / IfcSanitaryTe	rminal		
Seometrical information:				
Detail:		ions and geometry. Actual clearances and supports modelled.		
Dimensionality:	3D			
Location;	Absolute and relative to other build			
Appearance	Color fill to distinguish different ma	terials		
Parametric behaviour:	Not requested			
Aphanumeric Information:				
dentification:		N	6	9
nformation content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
	Type	Defines the object type, specific information about object.	text	1
	Type		text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1
		further classify the entity		
	Classification	Classification code according to chosen classification system.	text	1
		Defines the system for the connectors that are located on air		
	Surface Characteria	terminals, equipment and fixtures. For example, connectors	test.	1.10
	System Classification	for air terminals could have a system classification of Supply	text	1
		Air, Return Air or Exhaust Air.		
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1
	System Abbreviation		text	-
	Room Name	A user-defined abbreviation for a system.	text	
	Room Name Room Number	Room name where component to be/is installed.		
		Room number where component to be/is installed.	text	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
	Level	Defines the reference level.	text	1
		An alphanumeric value		
	Description	providing a concise description	text	1
		of the element.		
	Manufacturer	The organization that manufactured and / or assembled the	text	1
		item. A valid URL hyperlink to the	12640	
	LIRL	A valid URL hyperlink to the manufacturer's website.	text	1
		Material		
	Sink Material	The primary material used to construct the object.	text	1
	Same Marchai	Dimensional Data	Same	C.
	Length	Nominal or quoted length of the object.	numeric	mm
	Width	Nominal or quoted wight of the object.	numeric	mm
	Depth Drain Size	Nominal or quoted depth of the object. The size of the drain outlet connection from the object.	numeric	mm
	Death Size	Installation Data	numeric	mm
	to configuration interest			
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element,	text	1
		Warranty Data		
	Warranty ID	The identifier assigned to a warranty.	text	1
	and ranky to	An alphanumeric value	SHAL	
	100 CT 400 NO	providing a concise description	100	10
	WarrantyDescription	of the warranty content and	text	1
		any exclusions.		
	Warranty Start Date	The date on which the warranty commences.	date time	date
	Warranty End Date	The date on which the warranty expires.	date time	date
		The physical status of the element at the time of the		
	Condition	inventory or audit, based on the best judgment of those	text	1
		persons familiar with the physical characteristics and condition		
		Basic imperfection that implies any deformity in component		
	Defects	of a building that is owing to blemished plan, inadequate or	heat	100
	undrects.	flawed workmanship or deficient material and once in a while	text	1
		any blend of these.		
		Product Data		
	ModelLabel	An alphanumeric value representing the product, item or unit	text	
	ModelLabel	number assigned by the manufacturer of the product.	LEXE	1
	The second second second	An alphanumeric value for the name of the manufactured	20.021	1 2/
	ModelReference	Item as used by the manufacturer.	text	1
	Mounting Type	The way the sink is mounted to the counter, wall, etc.	text	1
		Cost		s
	Overall Cost	Sum of all costs needed for installing.	numeric	£
	Installation Cost	Cost of installing one unit, including workforce and	and the second sec	
		equipment.	numeric	¢
	Installation Cost			
	Material Cost	Cost of material for installing one unit.	numeric	c
			numeric	c
		Cost of material for installing one unit.	numeric text	с /

Information Delivery Milestone:	Design						
Purpose:	Plumbing						
Actor:							
Object:	"Tank" / IfcTank						
Geometrical information:	and the second second						
Detail:	Simplified volume representatio	n. Modelled accurately in terms of the overall geometry and thickne	\$5.				
Dimensionality:	30						
Location:	Absolute and relative to other b	d relative to other building elements					
Appearance	Single color fill	e fi i					
Parametric behaviour:	Not requested						
Alphanumeric Information:							
identification:							
information content:	Property	Description	Data Type	Units			
		Identity Data					
	Name	Primary identifier of an object.	text	1			
	Түре	Defines the object type, specific information about object.	text	1			
	Classification	Classification code according to chosen classification system.	text	1			
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	1			
	System Type	Type of system e.g., supply air_	text	1			
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1			
	System Abbreviation	A user-defined abbreviation for a system.	text	1			
	Level	Defines the reference level	text	1			
		Material					
	Material	The primary material used to construct the object.	text	1			
		Dimensional Data		9.e-			
	Length or Diametar	The nominal length or, in the case of a vertical cylindrical tank, the nominal diameter of the tank.	numeric	mm			
	Width or Diametar	The nominal width or, in the case of a horizontal cylindrical tank, the nominal diameter of the tank.	numeric	mm			
	Depth	The nominal depth of the tank.	numeric	mm			
		Performance Data					
	Has Ladder	Indication of whether the tank is provided with a ladder (set. TRUE) for access to the top. If no ladder is provided then value is set FALSE.	boolean	YES/NO			
		Product Data					
	Nominal Capacity	The total nominal or design volumetric capacity of the tank,	numeric	m²			
		Cost					
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material, labor and equipment).	numeric	د			
	Estimated Unit Cost	Estimated cost of element per m ² / m ² . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/ m³			
		Phasing					
	Phase	Identifies the phase in which the object is created.	text	1			
Documentation:							

Information Delivery Milestone:	Construction			
Purpose:	Plumbing			
Actor:				
Object:	"Tank" / IfcTank			
Geometrical information:				
Deta il:	Element modelled to nominal dime	nsions and geometry. Actual clearances modelied.		
Dimensionality:	30			
Location:	Absolute and relative to other build	ding elements		
Appearance:	Color fill to distinguish different ma	iterials		
Parametric behaviour:	Not requested			
Alphanumeric Information:				
Identification:				
Information content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	7
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Level	Defines the reference level.	test	1
	Description	An alphanumeric value providing a concise description	text	i
	Manufacturer	of the element. The organization that manufactured and / or assembled the item.	text	1
		Material	1	
	Material	The primary material used to construct the object.	test	1
		Dimensional Data		
	to the second seco	The nominal length or, in the case of a vertical cylindrical	Entres and	1968
	Length or Diametar	tank, the nominal diameter of the tank.	numeric	m
	Width or Diametar	The nominal width or, in the case of a horizontal cylindrical	numeric	m
	Depth	tank, the nominal diameter of the tank. The nominal depth of the tank.	numeric	m
	Depth	Performance Data	aumeric.	m
	Has Ladder	Indication of whether the tank is provided with a ladder (set TRUE) for access to the top. If no ladder is provided then	boolean	YES/NO
	-	value is set FALSE.		
	2	Installation Data		2792535
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The identifier assigned to installation. A person responsible for assuring the quality and meeting the	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element. Product Data	text	1
	ModelLabel	An slphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1
	Nominal Capacity	The total nominal or design volumetric capacity of the tank.	numeric	m²
	8	Cest		
	Overall Cost	Sum of all costs needed for installing.	numeric	£
	Installation Cost	Cost of installing one unit, including workforce and equipment.	numeric	¢
	Material Cost	Cost of material for installing one unit.	numeric	£
	Phase	Phasing Identifies the phase in which the object is created.	text	1
Documentation:				

nformation Delivery Milestone:	Operation			
urpose:	Plumbing			
ctor:				
bject:	"Tank" / IfcTank			
eometrical information:	and the second second			
etail:	Element modelled to actual dimens	sions and geometry. Actual clearances and supports modelled.		
imensionality:	30	-		
ocation:	Absolute and relative to other build	ding elements		
ppearance:	Color fill to distinguish different ma			
arametric behaviour:	Not requested	000833487		
Alphanumeric Information:				
dentification:				
formation content:	Property	Description	Data Type	Units
	100000	Identity Data		
	Name	Primary identifier of an object.	test	1
	-			
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1
		further classify the entity		
	Classification	Classification code according to chosen classification system.	text	1
		Defines the system for the connectors that are located on air		
	System Classification	terminals, equipment and fixtures. For example, connectors	text	1
	system carbancarbon	for air terminals could have a system classification of Supply	2005	1
		Air, Return Air or Exhaust Air.	144.0	
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Level	Defines the reference level.	text	1
	-eru	An alphanumeric value	ant	
	Description	providing a concise description	text	1
		of the element.		
	Manufacturer	The organization that manufactured and / or assembled the	text	1
	Second Marke	item, A valid URL hyperlink to the	1000	0.26
	URL	manufacturer's website.	text	1
		Material		
	Material	The primary material used to construct the object.	text	1
		Dimensional Data		
	Langth on Pilometers	The nominal length or, in the case of a vertical cylindrical	numeric	m
	Length or Diametar	tank, the nominal diameter of the tank.	numetre	m
	Width or Diametar	The nominal width or, in the case of a horizontal cylindrical	numeric	m
		tank, the nominal diameter of the tank.		
	Depth	The nominal depth of the tank. Performance Data	numeric	m
		Indication of whether the tank is provided with a ladder (set		
	Has Ladder	TRUE) for access to the top. If no ladder is provided then	boolean	YES/NO
		value is set FALSE.	1000	
		Installation Data		
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the	text	1
	Holynaka by	requirements of the installed element.	, und	
		Warranty Data		
	Warranty ID	The identifier assigned to a warranty.	text	1
		An alphanumeric value		
	WarrantyDescription	providing a concise description of the warranty content and	text	1
		any exclusions.		
	Warranty Start Date	The date on which the warranty commences.	date time	date
	Warranty End Date	The date on which the warranty expires.	date time	date
		The physical status of the element at the time of the		
	Condition	inventory or audit, based on the best judgment of those	text	1
		persons familiar with the physical characteristics and condition.		
	-	Basic imperfection that implies any deformity in component		
		of a building that is owing to blemished plan, inadequate or		12
	Defects	flawed workmanship or deficient material and once in a while	text	1
		any blend of these.		
		Product Data		-
	ModelLabel	An alphanumeric value representing the product, item or unit	text	1
	Huvellauer	number assigned by the manufacturer of the product.	1475	1
	ModelReference	An alphanumeric value for the name of the manufactured	text	
	ModerReference	item as used by the manufacturer.	text	1
	Nominal Capacity	The total nominal or design volumetric capacity of the tank.	numeric	m³
		Cost		

	Overall Cost	Sum of all costs needed for installing.	numeric	6
	Installation Cost	Cost of installing one unit, including workforce and equipment.	numeric	e
	Material Cost	Cost of material for installing one unit.	numeric	e
		Phasing		
			222	1
	Phase	lidentifies the phase in which the object is created.		
Documentation:	Phase	identifies the phase in which the object is created,	text	

nformation Delivery Milestone:	Design	ign					
Purpose:	Electrical						
Actor:							
Object:	"Cable Tray" / IfcCableCa	rrierSegment					
Seometrical information:							
Detall	Element modelled in schematic la	yout with approximate size and shape.					
Dimensionality:	3D						
ocation:	Absolute and relative to other built	e and relative to other building elements					
lopearance:	Single color fill						
arametric behaviour:	Not requested						
Mohanumeric Information:							
dentification:							
nformation content	Property	Description	Data Type	Units			
	Identity Data						
	Name	Primary identifier of an object.	text	1			
	Туре	Defines the object type, specific information about object.	text	1			
	Classification	Classification code according to chosen classification system.	text	1			
	Lower End Bottom Elevation	Defines the elevation at the bottom of the lower end,	numeric	m			
	Level	Defines the reference level.	text	1			
	Material						
	Material	The primary material used to construct the object.	text	1			
		Dimensional Data					
	Length	Total length of all segments.	numeric	mm			
	Width	The nominal width of the segment.	numeric	mm			
	Height	The nominal height of the segment.	numeric	mm			
	Performance Data						
	Has Cover	Indication of whether the cable tray has a cover (=TRUE) or not (= FALSE). By default, this value should be set to FALSE	boolean	YE5/NO			
	Сон						
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material, labor and equipment).	numeric	£			
	Estimated Unit Cost	Estimated cost of element per m ² / m ⁴ . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	Qm², Q m			
		Phasing					
	Phase	Identifies the phase in which the object is created.	text	1			

Information Delivery Milestone:	Construction						
Purpose:	Electrical						
Actor:							
	112						
Object:	"Cable Tray" / IfcCableCa	rrierSegment					
Geometrical information:							
Detail:	Element modelled to nominal size,	shape and spacing. Actual clearancess modelled. Nominal floor ar	nd wall penetration e	lements modele			
Dimensionality.	30						
ocation:		te and relative to other building elements					
Appearance:		fil to distinguish different materials					
farametric behaviour:	Not requested	uested					
Alphanumeric Information:							
dentification:							
nformation content:	Property	Description	Data Type	Units			
		Identity Data					
	Name	Primary identifier of an object.	text	1			
	Type	Defines the object type, specific information about object.	text	1			
	Predefined Type	Holds the entity specific enumeration of predefined types to further dassify the entity	text	1			
	Classification	Classification code according to chosen classification system.	text	1			
	Lower End Bottom Elevation	Defines the elevation at the bottom of the lower end.	numeric	m			
	Level	Defines the reference level.	text	1			
	Description	An alphanumeric value providing a concise description of the element.	text	Ý			
	Manufacturer	The organization that manufactured and / or assembled the litem.	text	1			
	2	Material					
	Material	The primary material used to construct the object.	text	1			
	Dimensional Data						
	Length	Total length of all segments.	numeric	mm			
	Width	The nominal width of the segment.	numeric	mm			
	Height	The nominal height of the segment.	numeric	mm			
		Performance Data					
	Has Cover	Indication of whether the cable tray has a cover (*TRUE) or not (* FALSE). By default, this value should be set to FALSE.	boolean	YES/NO			
		Installation Data					
	Installation date	The date on which the installation was carried out.	date time	date			
	Subcontractor	A firm or person that carries out installation work.	text	1			
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1			
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1			
		Cost					
	Dverall Cost	Sum of all costs needed for installing,	numeric	E			
	Installation Cost	Cost of installing one unit, including workforce and equipment.	numeric	¢			
	Material Cost	Cost of material for installing one unit.	numeric	£			
		Phasing		2			
	Phase	Identifies the phase in which the object is created.	text	1			
Documentation:		There are an all and a mark at an and a second and the second sec					

Information Delivery Milestone:	Operation			
Purpose:	Electrical			
ctor:				
	0			
bject:	"Cable Tray" / IfcCableCar	rrierSegment		
eometrical information:				
etail:	The second second second second second	where we demonstrate the state of the second strate and a first the second strate state of the second strate strat	and a second second second second	and a most distant.
etaic		shape and spacing. Actual clearancess modelled. Actual floor and v	vali penetration elem	ents modeled.
mensionality:	30			
ication:	Absolute and relative to other build			
ppearance:	Color fill to distinguish different ma	sterials		
srametric behaviour:	Not requested			
Iphanumeric Information:				
entification:				
formation content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
				100
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	Lower End Bottom Elevation	Defines the elevation at the bottom of the lower end.	numeric	m
	Level	Defines the reference level	text	1
	1	An alphanumeric value	2	- 2
	Description .	providing a concise description of the element.	text	1
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1
	LIRL	A valid URL hyperlink to the	text	1
	URL	manufacturer's website.	texi	1
		Material	- 0	
	Material	The primary material used to construct the object.	text	1
		Dimensional Data		
	Longth	Total length of all segments.	numeric	mm
	Width	The nominal width of the segment.	numeric	mm
	Height	The nominal height of the segment.	numeric	mm
		Performance Data		
	Has Cover	Indication of whether the cable tray has a cover (=TRUE) or not (= FALSE). By default, this value should be set to FALSE.	boolean	YES/NO
		Installation Data		
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	Í.
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1
		Warranty Data		
	Warranty ID	The identifier assigned to a warranty.	text	7
	in the second se	An alphanumeric value		
	WarrantyDescription	providing a concise description of the warranty content and	text	1
		any exclusions.		
	Warranty Start Date	The date on which the warranty commences.	date time	date
	Warranty End Date	The date on which the warranty expires.	date time	date
	Condition	The physical status of the element at the time of the inventory or audit, based on the best judgment of those persons familiar with the physical characteristics and condition.	text	1
	Defects	Basic imperfection that implies any deformity in component of a building that is owing to blemished plan, inadequate or flawed workmanship or deficient material and once in a while any blend of these.	text	7
		Cost		
	Overall Cost	Sum of all costs needed for installing.	numeric	e
	Installation Cost	Cost of installing one unit, including workforce and	numeric	e
		equipment,	10003	192
	Material Cost	Cost of material for installing one unit.	numeric	¢
	Phase	Phasing Identifies the phase in which the object is created.	text	1

Information Delivery Milestone:	Design						
Purpose:	Electrical						
Actor:							
Object:	"Conduit" / IfcCableCan	rierSegment					
Geometrical information:							
Detail:	Element modelled in schematic	modelled in schematic layout with approximate size and shape.					
Dimensionality:	30						
Location:	Absolute and relative to other b	uilding elements					
Appearance:	Single color fill						
Parametric behaviour:	Not requested						
Alphanumeric Information:							
Identification:		- 10					
Information content:	Property	Description	Data Type	Units			
		Identity Data					
	Name	Primary identifier of an object.	text	7			
	Туре	Defines the object type, specific information about object.	text	1			
	Classification	Classification code according to chosen classification system.	text	7			
	Lower End Bottom	Defines the elevation at the bottom of the lower end.	numeric	m			
	Level	Defines the reference level.	text	1			
	Material						
	Material	The primary material used to construct the object.	test	7			
		Dimensional Data					
	Diametar	Nominal diameter of the conduit.	numeric	mm			
	Length	Total length of all segments.	numeric	mm			
		Performance Data		6			
	Is Rigid	Indication of whether the conduit is rigid (= TRUE) or flexible (= FALSE).	boolean	YES/NO			
		Cost					
	Estimated Cost	Estimated cost for installing one unit, it is based on the average amount of needed resources (including material, labor and equipment).	numeric	¢			
	Estimated Unit Cost	Estimated cost of element per m ^x / m ^x . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	Q/m², Q/ m			
		Phasing					
	Phase	Identifies the phase in which the object is created.	text	1			
Documentation:		· · · · · · · · · · · · · · · · · · ·					
Set of documents:	Not requested						

Information Delivery Milestone: Purpose:	Construction Electrical						
the last of the	clectrical						
Actor:							
Object:	"Conduit" / IfcCableCarrie	rSomant					
	Conduit / nccablecarrie	rsegment					
Geometrical information:	-						
Detail:	Element modelled to nominal size,	int modelled to nominal size, shape and spacing. Actual clearancess modelled. Nominal floor and wall penetration elements modeled.					
Dimensionality:	30						
Location:	Absolute and relative to other bulk	ding elements					
Appearance:	Color fill to distinguish different ma	aterials					
Parametric behaviour:	Not requested	vested					
Alphanumeric Information:							
Identification:		· · · · · · · · · · · · · · · · · · ·					
Information content:	Property	Description	Data Type	Units			
		Identity Data					
	Name	Primary identifier of an object.	test	1			
	Туре	Defines the object type, specific information about object.	text	1			
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1			
	Classification	Classification code according to chosen classification system.	text	1			
	Lower End Bottom	Defines the elevation at the bottom of the lower end.	numeric	m			
	Level	Defines the reference level.	text	1			
	Description	An alphanumeric value providing a concise description of the element.	test	1			
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1			
	2	Material					
	Material	The primary material used to construct the object.	text	1			
		Dimensional Data					
	Diametar	Nominal diameter of the conduit.	numeric	mm			
	Shape	The shape of the conduit segment.	text	1			
	Length	Total length of all segments.	numeric	mm			
		Performance Data					
	is Rigid	Indication of whether the conduit is rigid (* TRUE) or flexible (= FALSE].	boolean	YES/NO			
	1	Installation Data					
	Installation date	The date on which the installation was carried out.	date time	date			
	Subcontractor	A firm or person that carries out installation work.	text	1			
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1			
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1			
		Cost					
	Overall Cost	Sum of all costs needed for installing.	numeric	£			
	Installation Cost	Cost of installing one unit, including workforce and equipment.	numeric	C			
	Material Cost	Cost of material for installing one unit.	numeric	£			
		Phasing					
	Phase	Identifies the phase in which the object is created.	text	1			

Information Delivery Milestone:	Operation						
Purpose:	Electrical						
Actor:							
Object:	"Conduit" / IfcCableCarrie	erSegment					
Geometrical information:							
Detail:	Element modelled to accurate size,	shape and spacing. Actual clearancess modelled. Actual floor and	wall penetration elem	ents modeled.			
Dimensionality:	3D						
Location:	Absolute and relative to other build	ding elements					
Appearance:	Color fill to distinguish different ma	iteñals					
Parametric behaviour:	Not requested						
Alphanumeric Information:							
Identification:							
Information content	Property	Description	Data Type	Units			
		Identity Data					
	Name	Primary identifier of an object.	text	1			
	Туре	Defines the object type, specific information about object.	text	1			
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1			
	Classification	Classification code according to chosen classification system.	text	1			
	Lower End Bottom	Defines the elevation at the bottom of the lower end.	numeric	in			
	Level	Defines the reference level.	text	1			
	Description	An alpha numeric value providing a concise description	text	1			
	Manufacturer	of the element. The organization that manufactured and / or assembled the	text	1			
	URL	item. A valid URL hyperlink to the	text	1			
		manufacturer's website. Material					
	Material	The primary material used to construct the object.	text	1			
	Dimensional Data						
	Diametar	Nominal diameter of the conduit.	numeric	mm			
	Shape	The shape of the conduit segment.	text	1			
	Length	Total length of all segments.	numeric	mm			
		Performance Data Indication of whether the conduit is rigid (= TRUE) or flexible					
	Is Rigid	(= FALSE).	boolean	YES/NO			
	Installation date	The date on which the installation was carried out.	date time	date			
	Subcontractor	A firm or person that carries out installation work.	text	Gate			
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1			
	and a second sec	A person responsible for assuring the quality and meeting the	1000				
	Approved By	requirements of the installed element. Warranty Data	text	1			
	Warranty ID	The identifier assigned to a warranty.	text	1			
	WarrantyDescription	An alphanumeric value providing a concise description of the warranty content and	text	1			
	 mess more to an orallity. 	any exclusions.	1074.69 				
	Warranty Start Date	The date on which the warranty commences.	date time	date			
	Warranty End Date	The date on which the warranty expires.	date time	date			
	Condition	The physical status of the element at the time of the inventory or audit, based on the best judgment of those persons familiar with the physical characteristics and condition.	text	1			
	Defects	Basic imperfection that implies any deformity in component. of a building that is owing to blemithed plan, inadequate or flawed workmanship or deficient material and once in a while any blend of these.	text	1			
		Cost	95				
	Overall Cost	Sum of all costs needed for installing.	numeric	£			
	Installation Cost	Cost of installing one unit, including workforce and equipment.	numeric	e			
	Material Cost	Cost of material for installing one unit.	numeric	¢			
	Phase	Phusing Identifies the phase in which the object is created.	text	1			
		the second s	tool .	1			

Information Delivery Milestone:	Design							
Purpose:	Electrical							
Actor:								
Object:	"Switch" / IfcSwitchingI	Device						
Geometrical information:								
Detail:	Simplified volume representatio	n. Modelled accurately in terms of the overall geometry and thickne	\$5.					
2imensionality	3D							
ocation:	Absolute and relative to other b	e and relative to other building elements						
uppearance:	Single color fill	alor fill						
arametric behaviour:	Not requested	juested						
Alphanumeric Information:								
dentification:								
nformation content:	Property	Description	Data Type	Units				
		Identity Data						
	Name	Primary identifier of an object.	text	1				
	Туре	Defines the object type, specific information about object.	text	1				
	Classification	Classification code according to chosen classification system.	text	1				
	Room Name	Room name where component to be/is installed.	text	1				
	Room Number	Room number where component to be/is installed.	text	i î				
	Level	Defines the reference level.	text	1				
		Material						
	Material	The primary material used to construct the object.	text	1				
	Performance Data							
	Has Lock	Indication of whether a switching device has a key operated fock (=TRUE) or not (= FALSE).	boolean	YES/NO				
	is illuminated	An indication of whether there is an illuminated indicator to show that the switch is on (=TRUE) or not (= FALSE).	boolean	YES/NO				
	Electrical Data							
	Voltage	The voltage that a device is designed to handle.	numeric	v				
	Wattage	The amount of power device produces.	numeric	w				
		Product Data		ð.				
	Number of Gangs	Number of gangs/buttons on this switch.	numeric	1				
	Switch Function	Indicates types of switches which differs in functionality e.g., onoffswitch.	text	1				
	Cost							
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material, labor and equipment).	numeric	¢				
	Estimated Unit Cost	Estimated cost of element per m ² / m ³ . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/ m³				
		Phasing						
	Phase	identifies the phase in which the object is created.	text	1				

	ne: Construction			
Purpose:	Electrical			
Actor:				
Object:	"Switch" / IfcSwitchingDe	vice		
Seometrical information:				
etail:	Element modelled to nominal dime	nsions and geometry. Actual clearances modelled.		
imensionality:	3D			
ocation:	Absolute			
ppearance	Single color fill			
arametric behaviour:	Not requested			
Uphanumeric Information:				
lentification:				
formation content:	Property	Description	Data Type	Units
	Troperty	Identity Data	wate tipe	U.H.S
	Name	Primary identifier of an object.	text	7
				-
	Type	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be/is installed.	text	1
	Level	Defines the reference level.	text	1
	Description	An alphanumeric value providing a concise description of the element.	text	7
	Manufacturer	The organization that manufactured and / or assembled the item.	text	7
		Material		
	Material	The primary material used to construct the object.	text	7
		Dimensional Data		
	Height	Nominal height of the switching device.	numeric	mm
	Length	Nominal length of the switching device.	numeric	mm
	Width	Nominal width of the switching device.	numeric	mm
		Performance Data		
	Sector Sector	Indication of whether a switching device has a key operated	100000	
	Has Lock	lock (=TRUE) or not (= FALSE).	boolean	VES/NO
	Is Illuminated	An indication of whether there is an illuminated indicator to show that the switch is on (+TRUE) or not (+ FALSE).	boolean	YES/NO
		Electrical Data		-
	Voltage	The voltage that a device is designed to handle.	numeric	v
				w
	Wattage	The amount of power device produces. Product Data	numeric	N
	-	Produce Data		-
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
		An alphanumeric value for the name of the manufactured	1000	
	ModelReference	item as used by the manufacturer.	text	1
	Number of Gangs	Number of gangs/buttons on this switch.	numeric	1
	Set Point	Indicates the setpoint and label. For toggle switches, there are two positions, 0 for off and 1 for on. For dimmer switches, the values may indicate the fully-off and full-on positions, where missing integer values in between are interpolated. For selector switches, the range indicates the available positions.	numeric	X
	Switch Function	Indicates types of switches which differs in functionality e.g., onoffswitch.	text	1
		Installation Data		A
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1
	California and a second second	A person responsible for assuring the quality and meeting the	Description of the	
	Approved By	requirements of the installed element.	text	1
	Overall Cost	Sum of all costs needed for installing,	numeric	6
		Cost of installing one unit, including workforce and		
	Installation Cost	equipment.	numeric	٤.
	Material Cost	Cost of material for installing one unit.	numeric	ě.
	-	Phasine		-
	Phase	Identifies the phase in which the object is created.	text	1

Information Delivery Milestone:	Operation			
Purpose:	Electrical			
Actor:				
	-			
Object	"Switch" / IfcSwitchingDe	avice		
Object:	switch / neswitchingDe	5715Q		
Geometrical information:				
Detail:		sions and geometry. Actual clearances and supports modelled.		
Dimensionality:	30			
Location:	Absolute and relative to other build	ding elements		
Appearance	Single color fill			
Parametric behaviour:	Not requested			
Alphanumeric Information:				
dentification:	1			
nformation content:	Property	Description	Data Type	Units
		Identity Gata		
	Name	Primary identifier of an object.	text	1
	instru-		in the second se	66
	Туре	Defines the object type, specific information about object.	text	1
		Holds the entity specific enumeration of predefined types to	Contraction of the	1
	Predefined Type	further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	30.00030/00000010		3588857	
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where companent to be/is installed.	text	1
	Level	Defines the reference level.	text	1
	20040000	An alphanumeric value	132344	-536
	Description	providing a concise description	text	1
	-	of the element.		
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1
		A valid URL hyperlink to the		
	URL	manufacturer's website.	text	1
		Waterial		110
	Material	The primary material used to construct the object.	text	1
		Dimensional Data		
	Height	Nominal height of the switching device.	numeric	mm
				mm
	Length	Nominal length of the switching device.	numeric	
	Width	Nominal width of the switching device.	numeric	mm
		Performance Data		
	Has Lock	Indication of whether a switching device has a key operated	boolean	YES/NO
	1.001238000	lock (=TRUE) or not (= FALSE).	10080302011	1.472.82
	Is Illuminated	An indication of whether there is an illuminated indicator to	boolean	YES/NO
		show that the switch is on (=TRUE) or not (= FALSE).	1001001	
	1	Electrical Data		
	Voltage	The voltage that a device is designed to handle.	numeric	V.
	Wattage	The amount of power device produces.	numeric	w
		Product Data		
	-	18 West 19 19 19 19 19 19 19 19 19 19 19 19 19	1	
	ModelLabel	An alphanumeric value representing the product, item or unit	text	1
	02012-0202-020-0	number assigned by the manufacturer of the product.	2522000	59
	ModelReference	An alphanumeric value for the name of the manufactured	text	1
		item as used by the manufacturer.	text	
		Number of gangs/buttons on this switch.	numeric	1
	Number of Gangs			
	Number of Gangs	Indicates the setpoint and label. For toggle switches, there		
	Number of Gangs	Indicates the setpoint and label. For toggle switches, there are two positions, 0 for off and 1 for on. For dimmer		
	100-00-00	indicates the setpoint and label. For toggle switches, there are two positions, 0 for off and 1 for on. For dimmer switches, the values may indicate the fully-off and full-on	numeric	1
	Number of Gangs	Indicates the setpoint and label. For toggle switches, there are two positions, 6 for off and 1 for on. For dimmer switches, the values may indicate the fully-off and full-on positions, where missing integer values in between are	numeric	1
	100-00-00	Indicates the setpoint and label. For toggie switches, there are two positions, D for off and 1 for on. For dimmer switches, the values may indicate the fully-off and full-on positions, where missing integer values in between are interpolated. For selector switches, the range indicates the	numeric	1
	Set Point	Indicates the setpoint and label. For toggle switches, there are two positions, o for off and 1 for on. For dimmer switches, the values may indicate the fully-off and full-on positions, where missing integer values in between are interpolated. For selector switches, the range indicates the available positions.		
	100-00-00	Indicates the setpoint and label. For toggie switches, there are two positions, D for off and 1 for on. For dimmer switches, the values may indicate the fully-off and full-on positions, where missing integer values in between are interpolated. For selector switches, the range indicates the	numeric text	1
	Set Point	Indicates the sergicist and label. For toggle switches, there are two politions, 0 for off and 1 for on. For dimen- switches, the values may indicate the fully-off and full-on positions, where missing integer values in between are interpolated. For selector surface, the marge indicates the available positions. Indicates types of switches which differs in functionality e.g.,		
	Set Point Switch Function	Indicates the setpoint and label. For toggle switches, there are two positions, 0 for off and 1 for on. For dimmer switches, the values marvindices the fully-off and full-on positions, where missing integer values in between are interposited. For selector switches, the range indicates the available positions. Indicates types of switches which differs in functionality e.g., onoffswitch.	text	1
	Set Point	Indicates the sergerint and label. For toggle switches, there: are two politions, 0 for off and 1 for 0 ne. For dimmer switches, the values may indicate the fully-off and full-on positions, where missing integer values in between are interpolated. For selector switches, the mange indicates the available positions. Indicates types of switches which differs in functionality e.g., onoffswitch. Installation Data The date on which the installation was carried out.	text date time	
	Set Point Switch Function Installation date Subcontractor	Indicates the sergerint and label. For toggle switches, there are two positions, 0 for off and 1 for an. For dimmer switches, the values may indicate from 1 who for a full-on positions, where missing integer values in between are interpolated. For selector switches, the range indicates the available positions. Indicates types of switches which differs in functionality e.e., onoffswitch. Installation Data The date on which the installation was carried out. A firm or person that carries our installation work.	text date time text	/ date /
	Set Point Switch Function Installation date Subcontractor Installation Serial Number/Tag	Indicates the setpoint and label. For toggle switches, there are two positions, 0 for off and 1 for on. For dimmer switches, the values may indicate the fully-off and full-on positions, where missing integer values in between are interposteel. For selects resultches, the range indicates the available positions. Indicates types of switches which differs in functionality e.e., confisswitch. Installation Data The date on which the installation was carried out. A firm or preson that carrise out installation work. The identifier assigned to installation.	text date time text numeric	/ date /
	Set Point Switch Function Installation date Subcontractor	Indicates the sergerint and label. For toggle switches, there are two positions, 0 for off and 1 for can. For dimmer switches, the values may indicate the fully-off and full-on positions, where missing integer values in between are interpolated. For selects switches, the tange indicates the available positions. Indicates types of switches which differs in functionality e.e., onoffswitch. Installation Data The date on which the installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation.	text date time text	/ date /
	Set Point Switch Function Installation date Subcontractor Installation Serial Number/Tag	Indicates the setpoint and label. For toggle switches, there are two positions, 0 for off and 1 for on. For dimmer switches, the values may indicate the fully-off and full-on positions, where missing integer values in between are interposteel. For selects resultches, the range indicates the available positions. Indicates types of switches which differs in functionality e.e., confisswitch. Installation Data The date on which the installation was carried out. A firm or preson that carrise out installation work. The identifier assigned to installation.	text date time text numeric	/ date /
	Set Point Switch Function Installation date Subcontractor Installation Serial Number/Tag Approved By	Indicates the sergicint and label. For toggle switches, there: net two politions, 0 for off and 1 for on. For dimen politions, where missing integer values in between are interpolated. For selector surface, the targe indicates the available positions. Indicates types of switches which differs in functionality e.g., onoffswitch. Installation Data The date on which the installation was carried out. A firm or person that carries out installation work. The identifer assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installed element. Warranty Data	text date time text numeric text	/ date /
	Set Point Switch Function Installation date Subcontractor Installation Serial Number/Tag	Indicates the sergenist and label. For toggle switches, there are two positions, 0 for off and 1 for can. For dimmer switches, the values may indicate the fully-off and full-on positions, where missing integer values in between are interpolated. For selects routches, the tange indicates the available positions. Indicates types of switches which differs in functionality e.e., onoffswitch. Installation Data The date on which the installation was carried out. A firm or person that carries out installation A person responsible for assuring the quality and meeting the requirements of the installed element. Warrandy Data The identifier assigned to in avarantly.	text date time text numeric	/ date /
	Set Point Switch Function Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID	Indicates the sergicist and label. For toggle switches, there are two politions, 6 for off and 1 for one. For dimen- ionitions, the values may indicate the full-yoff and full-on positions, where missing integer values in between are interpolated. For selector switche, the range indicates the available pointons. Indicates types of evicthes which differs in functionality e.g., oneffewitch. Installation Data The date on which the installation was carried out. A firm or person that carries out installation A person responsible for assuring the quality and meeting the requirements of the installed element. Warranty Data The identifier assigned to a varranty. An alphanumer value	text date time text numeric text text	/ date / / /
	Set Point Switch Function Installation date Subcontractor Installation Serial Number/Tag Approved By	Indicates the sergenist and label. For toggle switches, there are two positions, 0 for off and 1 for can. For dimmer switches, the values may indicate the fully-off and full-on positions, where missing integer values in between are interpolated. For selects routches, the tange indicates the available positions. Indicates types of switches which differs in functionality e.e., onoffswitch. Installation Data The date on which the installation was carried out. A firm or person that carries out installation A person responsible for assuring the quality and meeting the requirements of the installed element. Warrandy Data The identifier assigned to in avarantly.	text date time text numeric text	/ date /
	Set Point Switch Function Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty/D Warranty/D	Indicates the sergerint and table. For toggle switches, there are two positions, of for off and 1 for an. For dimmer switches, the values may indicate the fully-off and full-on positions, where missing integer values in between are interpolated. For selector switches, the mange indicates the available positions. Indicates types of switches which differs in functionality e.g., onoffswitch. Installation Data The date on which the installation was carried out. A firm or person that carries out installation. A person responsible for assuring the quality and meeting the requirements of the installation. Warranty Data The identifier assigned to installation. An alphanumer evalue. Warranty Data The identifier assigned to a warranty. An alphanumer could accription of the warranty content and any exclusions.	text date time text numeric text text text	/ date / / /
	Set Point Switch Function Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID	Indicates the sergicist and label. For toggle switches, there are two politions, 6 for off and 1 for one. For dimen- rolations, 6 har off and 1 for one. For dimen- positions, where missing integer values in between are interpolated. For selector switches, the range indicates the available pointons. Indicates types of evicthes which differs in functionality e.g., condifivetch. Installation Data The date on which the installation was carried out. A firm or person that carries out installation A person responsible for assuring the quality and meeting the requirements of the installed element. Warronty Data The identifier assigned to a varranty. An alphanumer value providing a concise discription of the warranty content and	text date time text numeric text text	/ date / / /
	Set Point Switch Function Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty/D Warranty/D	Indicates the sergerint and table. For toggle switches, there are two positions, of for off and 1 for an. For dimmer switches, the values may indicate the fully-off and full-on positions, where missing integer values in between are interpolated. For selector switches, the mange indicates the available positions. Indicates types of switches which differs in functionality e.g., onoffswitch. Installation Data The date on which the installation was carried out. A firm or person that carries out installation. A person responsible for assuring the quality and meeting the requirements of the installation. Warranty Data The identifier assigned to installation. An alphanumer evalue. Warranty Data The identifier assigned to a warranty. An alphanumer could accription of the warranty content and any exclusions.	text date time text numeric text text text	/ date / / / /
	Set Point Switch Function Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty/Description Warranty Start Date	Indicates the sergenist and label. For toggle switches, there: are two positions, of for off and 1 for can. For dimmer switches, the values may indicate the fully-off and full-on positions, where missing integer values in between are interpolated. For selector switches, the mange indicates the available positions. Indicates types of switches which differs in functionality e.g., condificult of the installation was carried out. Installation Data The date on which the installation work. The identifier assigned to installation. A firm or person that carries out installation. A person responsible for assuring the quality and meeting the requirements of the installation. Warranty Data The identifier assigned to a warranty. An alphanumer called element. Warranty Data The identifier assigned to a warranty. In a service in the installation of the warranty commances. The date on which the warranty explores.	tost date time test numeric test test test test date time	/ date / / / / / / date
	Set Point Switch Function Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty/Description Warranty Start Date	Indicates the sergicit and label. For toggle switches, there are two politions, 6 for off and 1 for one. For dimen- positions, the values may indicate the fully-off and full-on positions, where missing integer values in between are interpolated. For selector suitches, the range indicates the available pointons. Indicates types of each test which differs in functionality e.g., one/fivetch. Installation Data The date on which the installation was carried out. A firm or perion that carries out installation work. The identifier assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installation. An alphanumer value providing a concise discription of the warranty content and any exclusions. The date on which the warranty capites. The date on which the warranty expires. The date, using the set using the set.	tost date time test numeric test test test test date time	/ date / / / / / / date date
	Set Point Switch Function installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty D Warranty Start Date Warranty End Date	Indicates the sergenist and label. For toggle switches, there: are two positions, of for off and 1 for one. For dimmer switches, the values may indicate the fully-off and full-on positions, where missing integer values in between are interpolated. For selector switches, the mange indicates the available positions. Indicates types of switches which differs in functionality e.g., condificult on the installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installation. Warranty Data The identifier assigned to a warranty. An alphanumer value. Warranty Data The date on which the warranty commences. The date on which the warranty commences. The date on which the warranty expires. The date on which the warranty expires.	text date time text numric text text text date time date time	/ date / / / / / / date
	Set Point Switch Function installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty D Warranty Start Date Warranty End Date	Indicates the sergicit and label. For toggle switches, there are two politions, 6 for off and 1 for on. For dimmer politions, the values may indicate the fullyoff and full-on politions, where missing integer values in between are interpolated. For selector switche, the range indicates the available pointons. Indicates types of evicthes which differs in functionality e.g., condifivetch. Installation Data The date on which the installation was carried out. A firm or person that carries our installation A person responsible for assuring the quality and meeting the requirements of the installed exement. Warronty Data The identifier assigned to installation. An alphanumeric value providing a concise discription of the warranty content and any exclusions. The date on which the warranty commences. The date on which the warranty commences. The date on which the warranty expires.	text date time text numric text text text date time date time	/ date / / / / / / date date
	Set Point Settch Function Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty/Description Warranty End Date Condition	Indicates the sergicint and label. For toggle switches, there: are two politions, 0 for off and 1 for on. For dimensions, off and null-on positions, where missing integer values in between are interpolated. For selector surface, the narge indicates the available positions. Indicates types of switches which differs in functionality e.g., onoffswitch. Installation Data The date on which the installation was carried out. A firm or person that carries our installation work. The identifier assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installation. Warranty Data The identifier assigned to a warranty. An alphanumer value providing a concise discription of the warranty content and any exclusions. The date on which the warranty commences. The date on which the warranty expires. The physical status of the element at the time of the investory or audit, based on the bod judgment of thoso persons families with the physical status of the element at the form of the investory or audit, based on the bod judgment of thoso persons families with the physical status of the element at the form of the investory or audit, based on the bod judgment of thoso persons families any deformity in component.	text date time text numric text text text date time date time	/ date / / / / / / / / / / / / / / / / / / /
	Set Point Switch Function installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty D Warranty Start Date Warranty End Date	Indicates the sergicit and label. For toggle switches, there are two politions, 6 for off and 1 for on. For dimmer eventions, 6 have share indicate the full-yoff and full-on positions, where missing integer values in between are interpolated. For selector suitche, the range didcates the available point off. The selector suitche, the range didcates the available point off. The selector suitche, the range didcates the available point off. The selector suitche, the range didcates the available point off. The selector suitche, the range didcates the available point off. The selector suitche, the range didcates the available point off. The selector suitches the selector installation Data The date on which the installation was carried out. A firm or person that carries our installation A person responsible for assuring the quality and meeting the requirements of the installed element. Werranky Data The identifier assigned to installation. A alphanumer: value providing a concise discription of the warranky content and any exclusions. The date on which the warranky commences. The date on that isong to beingering to those persons familiar with the physical characteristics and condition.	text date time text numric text text text date time date time	/ date / / / / / / date date
	Set Point Settch Function Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty/Description Warranty Start Date Warranty End Date Condition	Indicates the sergicint and label. For toggle switches, there: are two politions, 0 for off and 1 for on. For dimensions, 0 for off and 1 for on. For dimensions, where missing integer values in between are interpolated. For selector surface, the targe indicates the available positions. Indicates types of switches which differs in functionality e.g., onoffswitch. Installation Data The date on which the installation was carried out. A firm or person that carries our installation work. The identifier assigned to installation. A person responsible for surving the quality and meeting the requirements of the installation. Marrinky Data The identifier assigned to a warranty. An alphanumer value providing a concise discription of the warranty content and any exclusions. The date on which the warranty commences. The date on which the warranty commences. The date on which the warranty expires. The date on which the warranty commences. The date on which the warranty commences.	toxt date time feet numric text text text text text date time date time text	/ date / / / / / / / / / / / / / / / / / / /
	Set Point Settch Function Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty/Description Warranty Start Date Warranty End Date Condition	Indicates the sergicit and label. For toggle switches, there are two politions, 6 for off and 1 for on. For dimmer eventions, 6 have share indicate the full-yoff and full-on positions, where missing integer values in between are interpolated. For selector suitche, the range didcates the available point off. The selector suitche, the range didcates the available point off. The selector suitche, the range didcates the available point off. The selector suitche, the range didcates the available point off. The selector suitche, the range didcates the available point off. The selector suitche, the range didcates the available point off. The selector suitches the selector installation Data The date on which the installation was carried out. A firm or person that carries our installation A person responsible for assuring the quality and meeting the requirements of the installed element. Werranky Data The identifier assigned to installation. A alphanumer: value providing a concise discription of the warranky content and any exclusions. The date on which the warranky commences. The date on that isong to beingering to those persons familiar with the physical characteristics and condition.	toxt date time feet numric text text text text text date time date time text	/ date / / / / / / / / / / / / / / / / / / /
	Set Point Switch Function Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty Description Warranty End Date Condition Defects	Indicates the sergicit and label. For toggle switches, there are two politions, 0 for off and 1 for one. For dimen- politions, where missing integer values in between are morepolated. For selector suitches, the range indicates the available politions. Indicates types of switches which differs in functionality e.g., condifivetch. Installation Data The date on which the installation was carried out. A firm or perion that carries out installation work. The identifier assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installation. An alphonumer value providing a concise discription of the warranty content and any exclusions. The date on which the warranty commences. The date on which the warranty commences. The date on which the warranty commences. The date on which the warranty depress. The date on which the warranty depress. The date on which the warranty commences. The date on which t	toxt date time text text text text text text text te	/ date / / / / / / date date /
	Set Point Settch Function Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty Description Warranty End Date Condition Defects Overall Cost	Indicates the sergenist and label. For toggle switches, there: are two politions, 0 for off and 1 for on. For dimmer switches, the values imagindicates the fully-off and full-on positions, where missing integer values in between are interpolated. For selector suitches, the marge indicates the available politions. Indicates types of switches which differs in functionality e.g., onoffswitch. Installation: Data The date on which the installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installation. Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concile discription of the warranty content and any exclusions. The date on which the warranty commences. The date on which the warranty expires. The date on which the warranty commences. The date on which the warranty expires. The date on which the warranty commences. The date on which the warranty expires. The date on which the warranty commences. The date on which the warranty commences.	text date time text text text text text date time date time text text text text text text text te	/ date / / / / / / date date / / / /
	Set Point Switch Function Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty Description Warranty End Date Condition Defects	Indicates the sergicit and label. For toggle switches, there are two politions, 0 for off and 1 for one. For dimen- politions, where missing integer values in between are morepolated. For selector suitches, the range indicates the available politions. Indicates types of switches which differs in functionality e.g., condifivetch. Installation Data The date on which the installation was carried out. A firm or perion that carries out installation work. The identifier assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installation. An alphonumer value providing a concise discription of the warranty content and any exclusions. The date on which the warranty commences. The date on which the warranty commences. The date on which the warranty commences. The date on which the warranty depress. The date on which the warranty depress. The date on which the warranty commences. The date on which t	toxt date time text text text text text text text te	/ date / / / / / / date date /
	Set Point Settch Function Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty Description Warranty End Date Condition Defects Overall Cost	Indicates the sergicit and label. For toggle switches, there are two politions, 6 for off and 1 for on. For dimmer politions, the values may indicate the fully-off and full-on politions, where missing integer values in between are interpolated. For selector switche, the range indicates the available pointons. Indicates types of each to switch differs in functionality e.g., condifivetch. Installation Data The date on which the installation was carried out. A firm or person that carries our installation A person responsible for assuring the quality and meeting the requirements of the installed ensent. Warranty Data The identifier assigned to installation. A appending a concise discription of the warranty content and any exclusions. The date on which the warranty expires. The date on which the warranty expires. The date on which the warranty commences. The date on which the warranty expires. The date on which the warranty commences. The date on which the warranty expires. The date on which the warranty commences. The date on the date on the physical characteristics and condition. Cost of installing one on this inciding workforce and	text date time text text text text text date time date time text text text text text text text te	/ date / / / / / / date date / / / /
	Set Point Setich Function installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty Start Date Warranty End Date Condition Defects Overall Cost Installation Cost	Indicates the sergicint and label. For toggle switches, there: are two politions, 0 for off and 1 for on. For dimensions, 0 for off and 1 for on. For dimensions, where missing integer values in between are interpolated. For selector surface, the targe indicates the available positions. Indicates types of switches which differs in functionality e.g., onoffswitch. Installation Data The date on which the installation was carried out. A firm or person that carries our installation work. The identifier assigned to installation. A person responsible for susraing the quality and meeting the requirements of the installation. Warranty Data The identifier assigned to a warranty. An alphanumer value providing a concise discription of the warranty content and any exclusions. The date on which the warranty commences. The date of these. Cost Sum of all costs needed for installing. Cost of installing one unit, including workforce and evaluement.	text date time text text text text text date time date time text text text text text text text te	/ date / / / / / / date date / / / / / / / / / / / / / / / / / / /
	Set Point Set Point Setch Function Installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty ID Warranty Start Date Warranty Cast Date Condition Defects Overall Cost Installation Cost Material Cost	Indicates the sergeoint and label. For toggle switches, there are two politions, 6 for off and 1 for on. For dimen- politions, the values may indicate the fully-off and full-on positions, where missing integer values in between are interpolated. For selector suitches, the range indicates the available pointons. Indicates types of switches which differs in functionality e.g., condifivetch. Itestaliation Data The date on which the instaliation was carried out. A firm or perion that carries out instaliation work. The identifier assigned to instaliation. A person responsible for assuring the quality and meeting the requirements of the instaliation. An alphanumer value providing a concise discription of the warranty content and any exclusions. The date on which the warranty can be date on which the warranty capters. The date, based on the build of these persons familiae with the physical characteristics and condition. Basic insperiesciton that termise any deformally in component of a building that is owing to blemwinked plant, including any blend of these. Cost Sum of all costs needed for installing. Cost of installing one unit, including workforce and equipment. Cost of installing one unit, including workforce and equipment.	text date time text text text text text date time date time text text text text text text text te	/ date / / / / / / date date / / / / / / / / / / / / / / / / / / /
Documentation:	Set Point Setich Function installation date Subcontractor Installation Serial Number/Tag Approved By Warranty ID Warranty Start Date Warranty End Date Condition Defects Overall Cost Installation Cost	Indicates the sergenist and label. For toggle switches, there are two positions, of for off and 1 for an. For dimmer switches, the values may indicate the fully-off and full-on positions, where missing integer values in between are interpolated. For selector switchs, the mange indicates the available positions. Indicates types of switches which differs in functionality e.g., condificult on the installation was carried out. A firm or person that carries out installation work. The date on which the installation work and the installation of the installation was carried out. A firm or person that carries out installation work. The identifier assigned to installation. A person responsible for assuring the quality and meeting the requirements of the installation. A alphanumer' called element. Warranty Data The identifier assigned to a warranty. An alphanumer' called user to an any exclusions. The date on which the warranty commences. The date on which the warranty commences. Cost of material data costs of the installing. Cost of installing one unit, including workforce and eaulyment.	toxt date time feet text text text date time date time date time text text text text text text text te	/ date / / / / / / / / / / / / / / / / / / /

Information Delivery Milestone: Purpose:	Design Electrical			
	LICENTED:			
Actor:	1			
Object:	"Transformer" / IfcTrans	former		
eometrical Information:				
etail:	Simplified volume representation.	Modelled accurately in terms of the overall geometry and thickness.		
imensionality:	30			
ocation:	Absolute and relative to other built	ding elements		
opearance:	Single color fill			
arametric behaviour:	Not requested			
Iphanumeric Information:	1			
ientification:	1			
formation content:	Property	Description	Data Type	Units
	riskerd	identity Data	barn (1b)	0.005
	Name	Primary identifier of an object.	text	1
	Raite		URK.	
	Туре	Defines the object type, specific information about object.	text	1
	10000000		2362	2
	Classification	Classification code according to chosen classification system.	Cent	1
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be/is installed	text	1
	Level	Defines the reference level.	text	1
		Materal		
	Material	The primary material used to construct the object.	test	t
	involues an	Dimensional Data	1011	1
	141 Jaka		and the second sec	-
	Height	The nominal height of the transformer,	numeric	mm
	Length	The nominal length of the transformer,	numeric	17100
	Width	The nominal width of the transformer.	numeric	mm
		Electrical Data		
	Maximum Apparent Power	Maximum apparent power/capacity in VA (volt ampere).	numeric	VA
	Primary Apparent Power	The power in VA (volt ampere) that has been transformed and that runs into the transformer on the primary side.	numeric	24
	Primary Current	The current that is going to be transformed and that runs into the transformer on the primary side.	oumeric	A
	1 1 2 2 4 1 2 2 4 1 4 1 4 1 4 1 4 1 4 1	The frequency that is going to be transformed and that runs	numeric	Hz
	Primary Frequency	into the transformer on the primary side.	numeric	PL2
	Primary Voltage	The voltage that is going to be transformed and that runs into the transformer on the primary side.	numeric	v
	Beal Impedance Ratio	The ratio between the real part of the zero sequence impedance and the real part of the positive impedance (i.e. real part of the short-circuit voltage) of the transformer. Used for three-phase transformer which includes a N-conductor.	numeric	1
	Short Circuit Voltage	A complex number that specifies the real and imaginary parts of the short-circuit voltage at rated current of a transformer given in %	numeric	v
	Transformer Vector Group	Possible vector groups for the transformer from which that required may be set. Values in the enumeration list follow a standard international code where the first latter describes how the primary validings are connected, the scand where describes how the scenario values of values or onnected, and the numbers describe the toxistion of values and unreast from the primary to the scenario values in muniples of 30 degrees. D: means that the windings are delta-connected. Y means that the windings are star-connected. Z inneases that the windings are sig-ag connected (a special star-connected providing low excentee of the transformer).	text	1
		Cost		
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material,	numeric	÷
	Estimated Unit Cost	[abor and equipment]. Estimated cost of element per m ² / m ⁴ , it is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/ m
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1

formation Delivery Milestone:	Construction			
urpose:	Electrical			
ctor:				
	line of the second second			
bject:	"Transformer" / IfcTransf	tormer		
eometrical information: etail:	Element modelled to nominal disc	ensions and geometry. Actual clearances modelled.		
Netai: Amensionality:	3D	And Statistics I contrast registration to the second		
ecation:	Absolute			
Appearance:	Single color fill			
Parametric behaviour:	Not requested			
Alphanumeric Information:				
dentification: nformation content:	Property	Description	Oata Type	Units
	Toporty	identity Data	ours (fire	5000
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	10000000	Holds the entity specific enumeration of predefined types to		2013
	Predefined Type	further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be/is installed.	text	1
	tevel	Defines the reference level.	text	1
	Description	An alphanumeric value providing a concise description	text	1
		of the element.	agest .	1
	Manufacturer	The organization that manufactured and / or assembled the	text.	1
		Item. Material		12
	Material	The primary material used to construct the object.	text	7
		Diminuional Data		
	Height	The nominal height of the transformer.	numeric	mns
	Length	The nominal length of the transformer.	numeric	mm
	Width	The nominal width of the transformer. Electrical Data	numeric	mm
	Maximum Apparent Power	Maximum apparent power/capacity in VA (volt ampere).	numeric	VA
		The power in VA (volt ampere) that has been transformed		
	Primary Apparent Power	and that runs into the transformer on the primary side.	numeric	¥4
		The current that is going to be transformed and that runs into	222.02	
	Primary Current	the transformer on the primary side.	numeric	A
	Primary Frequency	The frequency that is going to be transformed and that runs into the transformer on the primary side.	numeric	Hz
	Primary Voltage	The voltage that is going to be transformed and that runs into	numeric	v
		the transformer on the primary side.		
		The ratio between the real part of the zero sequence		
	Real Impedance Ratio	Impedance and the real part of the positive impedance (i.e. real part of the short-circuit voltage) of the transformer. Used	numeric	1
		for three-phase transformer which includes a N-conductor.		
		The power in VA (volt ampere) that has been transformed		2007
	Secondary Apparent Power	and is running out of the transformer on the secondary side.	numeric	VA
	-	The current that has been transformed and is running out of		
	Secondary Current	the transformer on the secondary side.	numeric	A
	Secondary Frequency	The frequency that has been transformed and is running out of the transformer on the secondary side.	numeric	Hz
	Secondary Voltage	The voltage that has been transformed and is running out of	numeric	v
	Secondary voltage	the transformer on the secondary side.	TRACTINE I.C.	
	Short Circuit Voltage	A complex number that specifies the real and imaginary parts of the short-circuit voltage at rated current of a transformer	numeric	v
		given in X.		
		Possible vector aroups for the transformer from which that		
		required may be set. Values in the enumeration list follow a		
		standard international code where the first letter describes		
		how the primary windings are connected, the second letter describes how the secondary windings are connected, and		
	Transformer Vector Group	the numbers describe the rotation of voltages and currents	text	1
		from the primary to the secondary side in multiples of 30 degrees. D: means that the windings are delta-connected. Y:	10000000	
		means that the windings are star-connected. Z. means that		
		the windings are zig-zag connected (a special start-connected providing low reactance of the transformer); The connectivity		
		is only relevant for three phase transformers.		
				5
		Froduct Data	-	
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product	text	1
	10000000000000000000000000000000000000	number assigned by the manufacturer of the product.	10.000	2 /2. 1995
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	Text	1
		Installation Data		10
	installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The identifier assigned to installation. A person responsible for assuring the quality and meeting the	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1
		Cost		
	Overall Cost	Sum of all costs needed for installing.	numeric	e
	Installation Cost	Cost of installing one unit, including workforce and eouroment.	numeric	£
	Material Cost	Cost of material for installing one unit.	numeric	6
		Phasing		
	Phase	identifies the phase in which the object is created.	text	1
Documentation:				

nformation Delivery Milestone				
Purpose:	Electrical			
actor:				
1.	"Transformer" / IfcTransfo			
bject: eometrical information:	transformer / incitatisto	amer		
etail:	Element modelled to actual dimensi	ons and geometry. Actual clearances and supports modelled.		
imensionality:	30			
ocation:	Absolute and relative to other build	ng elements		
ppearance:	Single color fill			
arametric behaviour:	Not requested			
Iphanumeric Information: entification:	-			
formation content:	Property	Description	Data Type	Units
		identity Data		
	Name	Primary identifier of an object.	text	1
	Туро	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1
	riedenned type	further classify the entity	VCR1	
	Classification	Classification code according to chosen classification system.	text	1
	Room Name	Room name where component to be/is installed.	text.	1
	Room Number	Room number where component to be/is installed.	text	1
	Level	Defines the reference level. An alphanumeric value	text	/
	Description	providing a concise description	text	1
		of the element.		
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1
	URL	A valid URL hyperlink to the	text	1
		manufacturer's website. Material		
	Material	The primary material used to construct the object.	text	1
		Dimensional Data		
	Height	The nominal height of the transformer.	numeric	mm
	Length	The nominal length of the transformer.	numeric	mm
	Width	The nominal width of the transformer. Electrical Data	numeric	mm
	Maximum Apparent Power	Electrical Data Maximum apparent power/capacity in VA (volt ampere)	numeric	VA
	washing white some		Toyof Dig The	VA
	Primary Apparent Power	The power in VA (volt ampere) that has been transformed and that runs into the transformer on the primary side.	numeric	VA
	The second secon	The current that is going to be transformed and that runs into	1. Market Market	1
	Primary Current	the transformer on the primary side.	numeric	A
	Primary Prequency	The frequency that is going to be transformed and that runs	numeric	Hz
		Into the transformer on the primary side. The voltage that is going to be transformed and that runs into	55	100
	Primary Voltage	the transformer on the primary side.	numeric	v
		The ratio between the real part of the zero sequence		
	Real Impedance Ratio	Impedance and the real part of the positive impedance (i.e.	numeric	1
		real part of the short-circuit voltage) of the transformer. Used for three-phase transformer which includes a N-conductor.		
				-
	Secondary Apparent Power	The power in VA (volt ampere) that has been transformed and is ranning out of the transformer on the secondary side.	numeric	VA
		The current that has been transformed and is running out of	10.02572440	2012
	Secondary Current	the transformer on the secondary side.	numeric	۸
	Secondary Frequency	The frequency that has been transformed and is running out	numeric	Hz
		of the transformer on the secondary side. The voltage that has been transformed and is running out of	000000000	0.02
	Secondary Voltage	the transformer on the secondary side.	numeric	v
	Short Circuit Voltage	A complex number that specifies the real and imaginary parts of the short-circuit voltage at rated current of a transformer	numeric	v
	and the second s	of the short-circuit voltage at rated current of a transformer given in %.	- and the set	
	Transformer Vector Group	Possible vector groups for the transformer from which that required may be set. Values in the enumeration ist follow a standard international code where the frat letter describes how the primary windings are connected, the second letter describes how the secondary windings are connected, and the number d excites the instation of voltages and currents from the primary to the secondary side in multiples of 30 degrees. Thereas that the windings are deta-connected. It means that the windings are gar connected deta-connected windings are gar connected de precisi start connected providing low rescarce of the transformers. The connected providing low rescarce of the transformers.	text	1
		Product Data	1	
	Modekabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
	ModelReference	An alphanumeric value for the name of the manufactured	text	1
	modemence	item as used by the manufacturer.	uest.	1
	Installation date	Installation Data The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	date time text	uere J
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the	text.	1
	A CONTRACTOR OF A CONTRACTOR O	requirements of the installed element. Warranty Data		1
	Warranty ID	The identifier assigned to a warranty.	text	1
		An alphanumeric value		
	WarrantyDescription	providing a concise description of the warranty content and	text	1
		any exclusions.		
	Warranty Start Date	The date on which the warranty commences.	date time	date
	Warranty End Date	The date on which the warranty expires. The physical status of the element at the time of the	date time	date
	Condition	inventory or audit, based on the best judgment of those persons familiar with the physical characteristics and condition.	text	1
		Basic imperfection that implies any deformity in component of a building that is owing to blemished plan, inadequate or	text	7
	Defects	flawed workmanship or deficient material and once in a while any blend of these.	19495-04	
		flawed workmanship or deficient material and once in a while any blend of these. Cost	mumpela	
	Overall Cost	Bawed workmanship or deficient material and once in a while any blend of these. Cost Sum of all costs needed for installing.	numeric	E
	Overall Cost	flawed workmanship or deficient material and once in a while any blend of these. Cost: Sum of all costs needed for installing. Cost of installing one unit, including workforce and equipment.	numeric	¢
	Overall Cost	flawed workmanship or deficient material and once in a while any blend of these. Cost Sum of all costs needed for installing. Cost of installing one unit, including workforce and		

Information Delivery Milestone:	Design					
Purpose:	Electrical					
Actor:						
Object:	"Outlet" / IfcOutlet					
Geometrical Information:						
Detail.	Simplified volume representation	on. Modelled accurately in terms of the overall geometry and thickne	55.			
Dimensionality:	3D					
Location:	Absolute and relative to other t	building elements				
Appearance:	Single color fill					
Parametric behaviour:	Not requested					
Alphanumeric Information:						
dentification:						
Information content:	Property	Description	Data Type	Units		
		Identity Data				
	Name	Primary identifier of an object.	text	1		
	Түре	Defines the object type, specific information about object.	text	1		
	Classification	Classification code according to chosen classification system.	text	1		
	Room Name	Room name where component to be/is installed.	text	1		
	Room Number	Room number where component to be/is installed.	text	1		
	Level	Defines the reference level.	text	1		
	Material					
	Material	The primary material used to construct the object.	text	1		
	Performance Data					
	is Pluggable Outlet	Indication of whether the outlet accepts a losse plug connection (= TRUE) or whether it is directly connected (= FALSE) or whether the form of connection has not yet been determined (= UNIXNOWN).	boolean	YES/NO/UNKNOW		
		Electrical Data				
	Voltage	The voltage that a device is designed to handle.	numeric	V		
	Wattage	The amount of power device produces.	numeric	w		
	Product Data					
	Number of Sockets	The number of sockets that may be connected. In case of inconsistency, sockets defined on ports take precedence.	numeric	1		
		Cast				
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material, labor and equipment).	numeric	٤		
	Estimated Unit Cost	Estimated cost of element per m ² / m ² , it is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/ m³		
		Phasing		(h)		
	Phase	Identifies the phase in which the object is created.	text	1		
Documentation:				5.16		

ormation Delivery Milestone:	Construction			
rpose:	Electrical			
tor:				
ject:	"Outlet" / IfcOutlet			
ometrical information:				
ail:	Element modelled to nominal dime	nsions and geometry. Actual clearances modelled.		
ensionality:	30			
stion:	Absolute			
earance:	Single color fill			
metric behaviour:	Not requested			
hanumeric Information:				
tification				
mation content:	Property	Description	Data Type	Units
		Identity Data		- 325
	Name	Primary identifier of an object.	text	1
	Type	Defines the object type, specific information about object	text	1
				-
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity.	text	1
	else el		100	10
	Classification	Classification code according to chosen classification system.	text	1
	Room Name	Room name where component to be/is instaßed.	text	1
	Room Number	Room number where component to be/is installed.	text	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
	Level	Defines the reference level.	text	1
	Description	An alphanumeric value providing a concise description	text	1
	perciption	of the element.	teat	10
	Manufacturer	The organization that manufactured and / or assembled the	text	F
	Wanusacturer	Item.	TEAL	1
		Material		
	Material	The primary material used to construct the object.	text	1
		Olmensional Data		
	Height	The nominal height of the outlet.	numeric	mm
	Width	The nominal width of the outlet.	numeric	mm
		Performance Data		
		Indication of whether the outlet accepts a loose plug connection (= TRUE) or whether it is directly connected (=		
	is Pluggable Outlet	FALSE) or whether the form of connection has not yet been	boolean	YES/ND/UNKNOWN
		determined (= UNKNOWN).		
		Electrical Data		
	Voltage	The voltage that a device is designed to handle.	numeric	V
	Wattage	The amount of power device produces.	numeric	w
		Product Data		
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
				-
	ModelReference	An alphanumeric value for the name of the manufactured	text	1
		item as used by the manufacturer. The number of sockets that may be connected. In case of		1
	Number of Sockets	inconsistency, sockets defined on ports take precedence.	numeric	1
	1000000000000		and the second of the	
		Installation Data		500
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting	text	1
	replaced by	the requirements of the installed element.	154	15
		Cost		T
	Overall Cost	Sum of all costs needed for installing.	numeric	c
	Installation Cost	Cost of installing one unit, including workforce and	numeric	£
	Material Cost	equipment. Cost of material for installing one unit.	numeric	E
	insternal cuse	Cost of material for installing one unit. Phasing	Limitacue,	
	Phase	Identifies the phase in which the object is created.	text	1

Information Delivery Milestone:	Operation			
Purpose:	Electrical			
Actor:				
Object:	"Outlet" / IfcOutlet			
Geometrical information:				
Detail:	Element modelled to actual dimensi	ions and geometry. Actual clearances and supports modelled.		
Dimensionality:	3D			
Location:	Absolute and relative to other build	ling elements		
Appearance:	Single color fill			
Parametric behaviour:	Not requested			
Alphanumeric Information:	1			
Identification	1			
Information content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
	Type	Defines the object type, specific information about object.	text	1
	Type		TEAL	1
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1
		further classify the entity	2007-001	
	Classification	Classification code according to chosen classification system.	text	1
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be/is installed.	text	1
	Offset from Level			1
		Specifies the elevation of the element relative to its level.	numeric	m
	Level	Defines the reference level.	text	1
	P	An alphanumeric value	122	1.1
	Description	providing a concise description of the element.	text	/
		The organization that manufactured and / or assembled the		1
	Manufacturer	item.	text	1
	URL	A valid URE hyperlink to the	test	1
	. Mile	manufacturer's website.	1004	1 1
		Material		-
	Material	The primary material used to construct the object.	text	1
		Dimensional Data		
	Height	The nominal height of the outlet.	numeric	mm
	Width	The nominal width of the outlet.	numeric	mm
		Performance Data		
		Indication of whether the outlet accepts a loose plug		
	is Pluggable Outlet	connection (= TRUE) or whether it is directly connected (= FALSE) or whether the form of connection has not yet been	boolean	YES/NO/UNK
		determined (+ UNKNOWN).		
		Electrical Data		
	Voltage	The voltage that a device is designed to handle.	numeric	V V
	Wattage	The amount of power device produces	numeric	w
		Product Data		
	-	1		1
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
				-
	ModelReference	An alphanumeric value for the name of the manufactured	text	1
	Contraction - distance of the	item as used by the manufacturer. The number of sockets that may be connected. In case of	10000773	1
	Number of Sockets	inconsistency, sockets defined on ports take precedence.	numeric	1
			(Sector 2)	1
		Installation Data		
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the		
			Text	1
	Approved By	requirements of the installed element.		
	Approved by	requirements of the installed element. Warranty Data		
	Warranty ID	Warranty Data The identifier assigned to a warranty.	text	1
		Warranty Data The identifier assigned to a warranty. An alphanumeric value	text	1
		Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description	text. text	1
	Warranty ID	Warranty Data The identifier assigned to a warranty. An alphanumeric value		
	Warranty ID	Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty context and	text	
	Warranty ID WarrantyDescription Warranty Start Date	Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty content and any exclusions The date on which the warranty commences.	text date time	/ date
	Warranty ID WarrantyDescription	Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a cancise description of the warranty content and any exclusion.	text	1
	Warranty ID Warranty Oescription Warranty Start Date Warranty End Date	Warranty, Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty content and any exclusions. The date on which the warranty commences. The date on which the warranty expires. The providing its set on the best judgment of those	text date time date time	/ date date
	Warranty ID WarrantyDescription Warranty Start Date	Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty content and any exclusions. The date on which the warranty commences. The physical status of the element at the time of the inventory or audit, based on the best judgment of those persons families with the physical characteristics and	text date time	/ date
	Warranty ID Warranty Oescription Warranty Start Date Warranty End Date	Warranty, Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty content and any exclusions. The date on which the warranty commences. The date on which the warranty expires. The date on which the warranty expires. The date on which the warranty expires. The provide the set of the set of the inventory or axis, based on the best judgment of those persons familiar with the physical characteristics and condition.	text date time date time	/ date date
	Warranty ID WarrantyDescription Warranty Start Date Warranty End Date Condition	Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty content and any exclusions. The date on which the warranty commences. The date on which the warranty expires. The date on which the warranty expires. The providing the important of those persons familiar with the physical characteristics and condition. Basic importection that implies any deformity in component	Text date time date time Text	/ date date /
	Warranty ID Warranty Oescription Warranty Start Date Warranty End Date	Warranty Data Werker State Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty commences. The date on which the warranty expires. The d	text date time date time	date date
	Warranty ID WarrantyDescription Warranty Start Date Warranty End Date Condition	Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty content and any exclusions. The date on which the warranty commences. The date on which the warranty expires. The date on which the warranty expires. The providing the important of those persons familiar with the physical characteristics and condition. Basic importection that implies any deformity in component	Text date time date time Text	/ date date /
	Warranty ID WarrantyDescription Warranty Start Date Warranty End Date Condition	Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty content and any exclusions. The date on which the warranty commences. The date on which the warranty expires. The date which the warranty expires. The providing the warranty expires. The physical status of the element at the time of the inventory or axief, based on the best judgment of those persons familiar with the physical characteristics and condition. Basic imprefection that implies any deformity in component of a building that is owing to biemahed plan, inadequate or flawed warkmanhip or deficient material and one in a while	Text date time date time Text	/ date date /
	Warranty ID WarrantyDescription Warranty Start Date Warranty End Date Condition	Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty content and any exclusion. The date on which the warranty commences. The date on which the warranty commences. The batter on which the warranty expires. The physical status of the element at the time of the inventory or audit, based on the best judgment of those persons families with the physical characteristics and condition. Basic imperfection that implies any deformity is component of a building that is owing to blemished plan, inadequate or flawed workmaniship or deficient material and conce in a while	Text date time date time Text	/ date date /
	Warranty ID Warranty Start Date Warranty Start Date Warranty End Date Condition Defects Overall Cost	Warranty, Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty content and any exclusions. The date on which the warranty commences. The date on which the warranty expires. The date on which the warranty expires. The date on which the warranty expires. The part of the warranty expires. The part on which the warranty expires. The part on the physical characteristics and condition. Basic imperfection that implies any deformity in component of a building that is owing to biennished plan, inadequate or flawed warkmanthig or deficient material and once in a while any blend of these. Cost Sum of all costs needed for installing. Cost of installing or unit, inciding workforce and Sum of all costs needed for installing.	text date time date time text text numeric	/ date date / / /
	Warranty ID Warranty Start Date Warranty Start Date Warranty End Date Condition Defects Overall Cost Installation Cost	Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty commences. The date on which the warranty commences. The physical status of the element at the time of the inventory or auctif, based on the best judgment of those persons familiar with the physical characteristics and condition. Basic imperfection that implies any deformity in component of a building that is owing to biemained plan, inadequate or flawed workmanking or deficient material and once in a while any blend of these. Cost Sum of all costs needed for installing. Cost of a building the unit, including workforce and equipment.	text date time date time text text pameric pameric	/ date date / / /
	Warranty ID Warranty Start Date Warranty Start Date Warranty End Date Condition Defects Overall Cost	Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty content and any exclusions. The date on which the warranty commences. The provide the warranty commences. The provide the warranty commences. The physical caracteristics and condition. Basic importection that implies any deformity in component of a building that is owing to bientihed plan, inadequate or flawed workmanhig or deficient material and once in a while any blend of these. Cost Sum of all costs needed for installing. Cost of installing one unit, including workforce and equipment. Cost of installing one unit.	text date time date time text text numeric	/ date date / / /
	Warranty ID Warranty Start Date Warranty Start Date Warranty End Date Condition Defects Overall Cost Installation Cost	Warranty Data The identifier assigned to a warranty. An alphanumeric value providing a concise description of the warranty commences. The date on which the warranty commences. The physical status of the element at the time of the inventory or auctif, based on the best judgment of those persons familiar with the physical characteristics and condition. Basic imperfection that implies any deformity in component of a building that is owing to biemained plan, inadequate or flawed workmanking or deficient material and once in a while any blend of these. Cost Sum of all costs needed for installing. Cost of a building the unit, including workforce and equipment.	text date time date time text text pumeric pumeric	/ date date / /

peration	
lectrical	
Outlet" / IfcOutlet	
ement modelled to actual dimensions and geometry, Actual clearances and supports modelled.	
)	
solute and relative to other building elements	
ngle color fill	
at requested	

Information Delivery Milestone:	Design					
Purpose:	Electrical					
Actor:						
	The state for each a					
Object:	"Outlet" / IfcOutlet					
Geometrical information:						
Detail	and the second se	an. Modelled accurately in terms of the overall geometry and thickness	55.			
Dimensionality:	30					
Location:	Absolute and relative to other b	uilding elements				
Appearance:	Single color fill					
Parametric behaviour:	Not requested					
Alphanumeric Information:						
Identification:						
Information content:	Property	Description	Data Type	Units		
		(dentity Data		10		
	Name	Primary identifier of an object.	text	1		
	Туре	Defines the object type, specific information about object.	text	1		
	Classification	Classification code according to chosen classification system.	text	1		
	Room Name	Room name where component to be/is installed.	text	1		
	Room Number	Room number where component to be/is installed.	text	1		
	Level	Defines the reference level.	text	1		
	Material					
	Material	The primary material used to construct the object.	text	1		
		Performance Data		1		
	is Pluggable Outlet	Indication of whether the outlet accepts a loose plug connection (= TRUE) or whether it is directly connected (= FALSE) or whether the form of connection has not yet been determined (= UNKNOW(h)).	boolean	YES/NO/UNKNOW		
		Electrical Data				
	Voltage	The voltage that a device is designed to handle.	numeric	4		
	Wattage	The amount of power device produces.	numeric	w		
		Product Data		<u> </u>		
	Number of Sockets	The number of sockets that may be connected. In case of inconsistency, sockets defined on ports take precedence.	numeric	1		
		Cost				
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material, labor and equipment).	numeric	•		
	Estimated Unit Cost	Estimated cost of element per m ² / m ³ . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	Q′m², Q′m²		
		Fhasing				
	Phase	Identifies the phase in which the object is created.	text	1		
Documentation:						

Information Delivery Milestone:	Construction			
Purpose:	Electrical			
Actor:				
Object:	"Outlet" / IfcOutlet			
Geometrical information:	outlet / neoutlet			
Betallt	O-most and direct to compare 1 days	nsions and geometry. Actual clearances modelled.		
Dimensionality:	3D	misons and geometry. Actual clearances incoelled,		
a second contract of the second se	Absolute			
Location: Appearance:	Single color fill			
	Not requested			
Parametric behaviour: Alphanumeric Information:	Not requested			
Identification:	-		-	1
Information content:	Property	Description Identity Data	Data Type	Units
	1			1 2
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	Room Name	Room name where component to be/is installed.	text	I.
	Room Number	Room number where component to be/is installed,	text	I.
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
	Level	Defines the reference level.	text	1
	Description	An alphanumeric value providing a concise description of the element.	text	1
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1
		Material		200
	Material	The primary material used to construct the object.	text	1
		Dimensional Data		1
	Height	The nominal height of the outlet	numeric	mm
	Width	The nominal width of the outlet.	numeric	mm
		Performance Data		1
	is Pluggable Outlet	Indication of whether the outlet accepts a loose plug connection (= TRUE) or whether it is directly connected (= FALSE) or whether the form of connection has not yet been determined (= UNKNOWN).	boolean	VES/NO/UNKNOW
		Electrical Data		
	Voltage	The voltage that a device is designed to handle.	numeric	v
	Wattage	The amount of power device produces.	numeric	w
		Product Data		-
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	t.
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1
	Number of Sockets	The number of sockets that may be connected. In case of inconsistency, sockets defined on ports take precedence.	numeric	1
		Installation Data		
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1
		Cost		
	Overall Cost	Sum of all costs needed for installing.	numeric	E
			100000000	12
	Installation Cost	Cost of installing one unit, including workforce and	numeric	e
		equipment. Cost of material for installing one unit.	numeric	e e
	Installation Cost	equipment.		
	Installation Cost	equipment. Cost of material for installing one unit.		

Operation			
Electrical			
"Outlet" / IfcOutlet			
Canes / neoutier			
Element modelled to actual climan	ions and geometry. Actual clearances and supports modellad		
and the second se	nons and Bedried A. Access stear ances and supports modelled.		
200	ling closecute		
	and elements		
to the second			
Hot requested			
+			
Property	Description	Data Tunn	Units
copered		and the	Service.
Name		text	1 /
			1 10
Туре		text	1
Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
Classification		test	1
Caller Colored South C		110001003	
			1
			1
Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
Level	Defines the reference level.	text	1
120000000	An alphanumeric value	5229455	120
Description		text	/
Manufactures	The organization that manufactured and / or assembled the	and the	1
Manufacturer	item.	text	,
URL	A valid URL hyperink to the manufacturer's website.	text	1
	Material		12
Material	The primary material used to construct the object.	text	1
	Dimensional Data		
Height	The nominal height of the outlet.	numeric	mm
Width	The nominal width of the outlet.	numeric	mm
	Performance Data		
	Indication of whether the outlet accepts a loose plug		
is Pluggable Outlet	FALSE) or whether the form of connection has not yet been determined (= UNKNOWN).	boolean	YES/NO/UNKNO
	Electrical Data		
Voltage	The voltage that a device is designed to handle.	numeric	V
Wattage		numeric	w
	Product Data		
ModelLabei	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
ModelReference	An alphanumeric value for the name of the manufactured	text	1
		1000	4 ×
Number of Sockets	Inconsistency, sockets defined on ports take precedence.	numeric	/
	installation Data		-
installation date	The date on which the installation was carried out.	date time	date
Subcontractor	A firm or person that carries out installation work.	text	1
Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1
Approved By	A person responsible for assuring the quality and meeting the	test	1
			1 2
Marrie 10			
warranty io		text	/
WarrantyDescription	providing a concise description of the warranty content and	text	1
	any exclusions.		-
Warranty Start Date	The date on which the warranty commences.	date time	date
Warranty End Date	The date on which the warranty expires.	date time	date
Condition	Inventory or audit, based on the best judgment of those persons familiar with the physical characteristics and	text	7
Defects	constron. Basic imperfection that implies any deformity in component of a building that is owing to blemished plan, inadequate or flawed workmanship or deficient material and once in a while any blend of these.	text	1
	Cost		
Overall Cost	Sum of all costs needed for installing.	numeric	£
	Cost of installing one unit, including workforce and	contract sectors and	
	equipment.		-
Material Cost	Cost of material for installing one unit.	numeric	•
	Phasing		
Phase	Phasing Identifies the phase in which the object is created.	text	1
	Cutlet" / HcOutlet Element modelled to actual diment 3D Absolute and relative to other built Single color fill Not requested Name Name Cutastification Room Name Room Name Room Name Room Name Description URL USU URL USU Naterial	Poutlet" / HcOutlet Idement modelled to actual dimensions and geometry. Actual clearances and supports modelled. 30 Absolute and relative to other building elements Single color fill Not requested Property Description Name Primary identifier of an object. Type Predefined Type Nod, the entity specific enumeration of predefined types to Internet Classification code according to chosen classification system. Room Name Room number where component to be/s installed. Offset from Level Defines the elevent to be/s installed. Offset from Level Defines the effect of an object. Iter and the entity Classification Classification Classification code according to chosen classification system. Room Name Room number where component to be/s installed. Offset from Level Defines the efference level. Level Defines the efference level. Item URL manufacture: Manufacture: Material The primary material uses to construct the object. URL manufacture: Modellabel Note reminal height of the outlet. URL Material Iterminal height of the outlet. Voltage The reminal height of the outlet. Width The reminal height of the outlet. Woltage The annufacture of swebstr. Modellabel Noterial Modellabel Noterial An alphanumeric value representing the product, lever or unit number advects of swedge the locones. Modellabel Noterial An alphanumeric value representing the product. Modellabel Noterial An alphanumeric value representing the product. Modellabel Noterial Modellabel Noterial An alphanumeric value representing the product. Modellabel Noterial Noteremence level Noteremence level Noutlet Noterial	Couldet" / HCOutlet Toulet" / HCOutlet Uteness modelled to actual dimensions and generatry. Actual dearances and supports modelled. 30 Absolute and relative to other building elements Single oder BI Net requested Progenty Description Description Data Type Name Prinary Mathematics to object. Least Type Contrasting to object. Least Type Description Data Type Models are relative to other building elements Least Type Defines the object Type, specific information about object. Least Type Profile to element on opics installed. Least Glassification Classification occursocore to table installed. Least Room Name Room name where component to byfois installed. Least Boom Name Room name where component to byfois installed. Least Manufacturer? Apploraname: Name Name Description profile apploraname: Name Least Manufacturer? Room Rame Name Manuf

Information Delivery Milestone:	Design						
Purpose:	Electrical						
Actor:							
Object:	"Distribution Board" / Ifc	ElectricDistributionBoard					
Seometrical information:	-						
Detail:	Simplified volume representation.	Modelled accurately in terms of the overall geometry and thicknes	Si.				
Dimensionality:	30						
ocation:	Absolute and relative to other built	Iding elements					
Appearance:	Single color fill						
arametric behaviour:	Not requested						
Alphanumeric Information:							
dentification:							
nformation content:	Property	Description	Data Type	Units			
		Identity Data					
	Name	Primary identifier of an object.	text	1			
	Туре	Defines the object type, specific information about object.	text	1			
	Classification	Classification code according to chosen classification system.	text	1			
	Room Name	Room name where component to be/is installed.	text	1			
	Room Number	Room number where component to be/is installed.	text	1			
	Level	Defines the reference level.	text	1			
	Material						
	Material	The primary material used to construct the object.	text	7			
		Performance Data					
	Requires Qualified Operator	Identifies if the current instance requires a skilled person or instructed person to perform operations on the distribution board (TRUE) or not.	boolean	YES/NO			
	Is Main or SubMain	Identifies if the current instance is a main distribution point or topmost level in an electrical distribution hierarchy (TRUE) or not.	boolean	YES/NO			
		Electrical Data					
	Voltage	The voltage that a device is designed to handle.	numeric	v			
	Wattage	The amount of power device produces.	numeric	w			
	Number of Poles	The number of live lines that is intended to be handled by the device.	numeric	1			
		Cost					
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material, labor and equipment).	numeric	¢			
	Estimated Unit Cost	Estimated cost of element per m ² / m ⁸ . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	6/m², 6/ m³			
		Phasing					
	Phase	Identifies the phase in which the object is created.	text	7			
Documentation:				5			

Electrical						
ciectrical						
The second se						
"Distribution Board" / IfcE	ElectricDistributionBoard					
Contraction of the second s						
Not requested						
-		-				
Property		Data Type	Units			
Name	Primary identifier of an object.	text	1			
Туре	Defines the object type, specific information about object.	text	1			
Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1			
Classification	Classification code according to chosen classification system.	text	1			
Room Name	Room name where component to be/is installed.	text	1			
Room Number	Room number where component to be/is installed.	test	1			
Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m			
Level	Defines the reference level.	text	1			
Description	providing a concise description	text	1			
Manufacturer	The organization that manufactured and / or assembled the	text	1			
	Material					
Material	1	text	1			
Milesc. ow	Dimensional Data					
Height	Nominal height of the board.	numeric	mm			
Width	Nominal width of the board	numeric	mm			
	Performance Data					
Requires Qualified Operator	Identifies if the current instance requires a skilled person or instructed person to perform operations on the distribution baard (TRUE) or not.	boolean	YES/NO			
is Main or SubMain	Identifies if the current instance is a main distribution point or topmost level in an electrical distribution hierarchy (TRUE)	boolean	VES/NO			
Voltage		numeric	v			
			w			
Number of Poles	The number of live lines that is intended to be handled by the device.	numeric	1			
	Product Data					
ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1			
ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1			
	Installation Data					
Installation date	The date on which the installation was carried out.	date time	date			
Subcontractor	A firm or person that carries out installation work.	test	1			
Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1			
Approved By	requirements of the installed element.	text	1			
	Cost					
Overall Cost	Sum of all costs needed for installing.	numeric	E			
Installation Cost	Cost of installing one unit, including workforce and equipment.	numeric	٤			
Material Cost	Cost of material for installing one unit.	numeric	¢			
	Phasing		a			
Phase	Identifies the phase in which the object is created.	test	1			
	Element madelled to norvinal dime SD Absolute Single color fill Not requested Property Name Type Classification Room Name Room Name Classification Room Name Diffset from Level Level Description Manufacturer Material Height Wildth Requires Qualified Operator Is Main or SubMain Kottage Wattage Number of Poles Modellabel Modellab	Poistribution Board" / IfcElectricDistributionBoard Element motelled to norvinal dimensions and geometry. Actual clearances modelled. So Absolute Single color fil Not requested Propeny Description Identity Data Name Primary identifier of an object. Type Defines the object type, specific information about object. Predefined Type Helds the entity specific enternation of predefined types to Aurher classify the entity Classification Classification Classification Room Name Room name Room iname where component to ber/s installed. Offset from Isruel Defines the reference level. Level Defines the reference level. Manefacturer The organization to the sleement relative to its level. Level Defines the reference level. Manefacturer The organization that munufactured and <i>j</i> or assembled the term. Manefacturer The organization that munufactured Data Height Nominal width of the board. Width Nominal width of the board Width Nominal width of the board Width Nominal width of the board Width Nominal width of the current instance regulars a stilled person or instructed person to perform operations on the distribution point of as contract the doget. Defines the reference Data Height Nominal width of the board Width Nominal width of the board Modellabel Material The error instance regulars a stilled person or instructed person to perform operations on the distribution point of as contruct the object. Defines the reference Data Modellabel Material Material Material The primary material used to construct the object. Defines the advice protocole as one on instructed person to perform operations on the distribution point of as contruct the prime operations o	**Distribution Board" / IfcElectricDistributionBoard Eneret modelled to nominal dimensions and geometry. Actual classifies and modelled. 30 Acsolute Single solar fill Net requisited Name Primary Identifies of an object. Single solar fill Net requisited Name Primary Identifies of an object. Type Underlined Type Underlined Type Hids the entity, specific elementation about object. Findedlined Type Hids the entity, specific elementation object. Read in Summer Compared to be board assification system. Classification Classification code according to chosen data/Section system. Read in Summer Compared to be board and y or assembled the text Description on other description Name Description Description Head to the other to be board of a summeric data Naterial Naterial Naterial The primary identifies of the board. Name Name Name Name Name Name Name Name			

formation Delivery Milestone:	Operation			
urpose:	Electrical			
ctor:				
bject:	"Distribution Board" / IfcE	ElectricDistributionBoard		
eometrical information:				
etail:		ions and geometry. Actual clearances and supports modelled.		
imensionality:	3D Absolute and relative to other build	inn slamaate		
ocation:	Absolute and relative to other build Color fill to distinguish different ma			
ppearance: arametric behaviour:	Not requested	(CET MES		
Aphanumeric Information:	nor reduction			
dentification:				
nformation content:	Property	Description	Data Type	Units
		identity Data		
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be/is installed,	text	7
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
	Level	Defines the reference level.	text	1
	222.000	An alphanumeric value	27 . 53	10
	Description	providing a concise description	text	1
	Manufacturer	of the element. The organization that manufactured and / or assembled the item.	text	1
	URL	A valid URL hyperlink to the	text	1
	(80)C	manufacturer's website. Material	2002001	10
	Material	The primary material used to construct the object.	text	7
	0.0000000	Dimensional Data		
	Height	Nominal height of the board.	numeric	mm
	Width	Nominal width of the board	numeric	mm
		Performance Data	200	
	Requires Qualified Operator	Identifies if the current instance requires a skilled person or instructed person to perform operations on the distribution board (TRVE) or not.	boolean	VES/NO
	Is Main or SubMain	Identifies if the current instance is a main distribution point or topmost level in an electrical distribution hierarchy (TRUE)	boolean	YES/NO
		or not. Electrical Data		
	Voltage	The voltage that a device is designed to handle.	numeric	v
	Wattage	The amount of power device produces.	numeric	w
		The number of live lines that is intended to be handled by the		
	Number of Poles	device. Product Data	numeric	7
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
	ModelReference	An alphanumeric value for the name of the manufactured	text	1
		item as used by the manufacturer. Installation Data		5
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	/
	installation Serial Number/Tag	The Identifier assigned to installation.	numeriic	1
	Approved By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1
		Warranty Data		
	Warranty ID	The identifier assigned to a warranty.	text	1
	WarrantyDescription	An alphanumeric value providing a concise description of the warranty content and	text	7
		any exclusions.		
	Warranty Start Date	The date on which the warranty commences.	date time	date
	Warranty End Date	The date on which the warranty expires.	date time	date
	Condition	The physical status of the element at the time of the inventory or audit, based on the best judgment of those persons familiar with the physical characteristics and condition.	text	/
	Defects	condition. Basic imperfection that implies any deformity in component of a building that is owing to blemished plan, inadequate or flawed workmanship or deficient material and once in a while any blend of these.	text	7
		Cost		
	Overall Cost	Sum of all costs needed for installing.	numeric	٤
	Installation Cost	Cost of installing one unit, including workforce and	numeric	e
	Material Cost	equipment. Cost of material for installing one unit.	numeric	ć
	Phase	Phasing Identifies the phase in which the object is created.	text	/
				-
Documentation:				

nformation Delivery Milestone:	Design						
Purpose:	Electrical						
Actor:							
Object:	"Light Fixture" / IfcLightF	fixture					
Seometrical information:							
letail:	Simplified volume representation.	Modelled accurately in terms of the overall geometry and thicknes	53.				
Dimensionality:	30						
ocation	Absolute and relative to other bui	ilding elements					
opearance:	Single color fill						
arametric behaviour:	Not requested						
Aphanumeric Information:							
dentification:							
nformation content:	Property	Description	Data Type	Units			
		Identity Data					
	Name	Primary identifier of an object.	test	L			
	Туре	Defines the object type, specific information about object.	text	1			
	Classification	Classification code according to chosen classification system.	text	1			
	Room Name	Room name where component to be/is installed.	text	1			
	Room Number	Room number where component to be/is installed.	text	1			
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric.	m			
	Level	Defines the reference level.	test	T.			
	Material						
	Material	The primary material used to construct the object.	text	1			
		Dimensional Oata					
	Height	Nominal height of the light fixture.	numeric	mm			
	Width / Length or Diametar	Nominal width / length or diameter.	numeric	mm			
		Electrical Data		02			
	Voltage	The voltage that a device is designed to handle.	numeric	v			
	Wattage	The amount of power device produces.	numeric	W			
		Product Data					
	Placing Type	Type of placing specification e.g., ceiling	text	1			
	Mounting Type	The way the light fixture is mounted e.g., freestanding	text	1			
		Cost		11.			
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material, labor and equipment).	numeric	¢			
	Estimated Unit Cost	Estimated cost of element per m ² / m ^k . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/ m²			
		Phasing					
	Phase	Identifies the phase in which the object is created.	lext	1			

nformation Delivery Milestone: Purpose:	Construction Electrical			
Actor:	Licon Icel			
Actor:				
Object:	"Light Fixture" / IfcLightFix	xture		
Geometrical information:				
Detail:		nsions and geometry. Actual clearances modelled.		
Dimensionality:	3D			
location:	Absolute			
Appearance:	Color fill to distinguish different ma	terials		
Parametric behaviour:	Not requested			
Alphanumeric Information:				
Identification:		• · · · · · · · · · · · · · · · · · · ·		
Information content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	/
	Classification	Classification code according to chosen classification system.	text	1
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be/is installed.	text	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
	Level	Defines the reference level.	test	1
	Description	An alphanumeric value providing a concise description	test	1
	- Description	of the element.	104	2
	Manufacturer	The organization that manufactured and / or assembled the item.	text	/
		Material		
	Material	The primary material used to construct the object. Dimensional Data	text	/
	Height	Nominal height of the light fixture.	numeric	mm
	Width / Length or Diametar	Nominal width / length or diameter.	numeric	mm
		Electrical Data		
	Voltage	The voltage that a device is designed to handle.	numeric	v
	Wattage	The amount of power device produces.	numeric	w
	Maximum Plenum Sensible Load	Maximum or Peak sensible thermal load contributed to return air plenum by the light fixture.	numeric	w
	Maximum Space Sensible Load	Maximum or Peak sensible thermal load contributed to the	numeric	w
	Number of Sources	conditioned space by the light flature. Number of sources.	numeric	
	Sensible Load to Radiant	Percent of sensible thermal load to radiant heat.	numeric	*
	activities coate to hadrant	Percent of sensible thermal load to radiant heat. Product Data	inumetit.	
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	7
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1
	Placing Type	Type of placing specification e.g., ceiling.	text	1
	Mounting Type	The way the light fixture is mounted e.g., freestanding.	text	1
		Installation Data		
	Installation date	The date on which the installation was carried out,	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1
		A person responsible for assuring the quality and meeting the		
	Approved By	requirements of the installed element.	text	1
	Overall Cost		numeric	e
		Sum of all costs needed for installing. Cost of installing one unit, lectuding workforce and		
	Installation Cost	equipment.	numeric	¢
	Material Cost	Cost of material for installing one unit. Phasing	numeric	¢
	Phase	Identifies the phase in which the object is created.	text	1

Information Delivery Mileston					
Purpose:	Electrical				
Actor:					
Object:	"Light Fixture" / IfcLightFix				
Geometrical information:	Light Fixture / inclightFi	cure -			
Detail:	Element modelled to actual dimensi	iement modelled to actual dimensions and geometry. Actual clearances and supports modelled.			
Dimensionality:	3D				
Location:		solute and relative to other building elements			
Appearance:	Color fill to distinguish different ma	terials			
Parametric behaviour:	Not requested				
Alphanumeric Information: dentification:					
information content:	Property	Description	Data Type	Units	
	rioperty	Identity Data	Data (Pps	Stills	
	Name	Primary identifier of an object.	text	1	
	Type	Defines the object type, specific information about object.	text	1	
		Holds the entity specific enumeration of predefined types to	0.000	22	
	Predefined Type	further classify the entity	text	1	
	Classification	Classification code according to chosen classification system.	text	1	
	Room Name	Room name where component to be/is installed.	text	1	
	Room Number	Room number where component to be/is installed.	text	1	
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m	
	Level	Defines the reference level. An alphanumeric value	text	1	
	Description	providing a concise description	text	1	
	2-220382755-22	of the element.	0.0000	00	
	Manufacturer	The organization that manufactured and / or assembled the item.	text	1	
	URL	A valid URL hyperlink to the	text	1	
		manufacturer's website. Material	. And	a.	
	Material	The primary material used to construct the object.	test	1	
	materia	Dimensional Gata	test	1	
	Height	Nominal height of the light future.	numeric	mm	
	Width / Length or Diametar	Nominal width / length or diameter.	numeric	mm	
		Electrical Data			
	Voltage	The voltage that a device is designed to handle.	numeric	v	
	Wattage	The amount of power device produces.	numeric	W	
	Maximum Plenum Sensible Load	Maximum or Peak sensible thermal load contributed to return air plenum by the light fixture.	numeric	w	
	Maximum Space Sensible Load	Maximum or Peak sensible thermal load contributed to the	numeric	w	
	Number of Sources	conditioned space by the light fixture. Number of sources.	numeric		
	Sensible Load to Radiant	Percent of sensible thermal load to radiant heat.	numeric	56	
		Product Data			
		An alphanumeric value representing the product, item or unit			
	ModelLabel	number assigned by the manufacturer of the product.	text	1	
		An alphanumeric value for the name of the manufactured	10.767	51	
	ModelReference	Item as used by the manufacturer.	text	1	
	Placing Type	Type of placing specification e.g., ceiling.	text	1	
	Mounting Type	The way the light fixture is mounted e.g., freestanding.	text	1	
	Installation date	The date on which the installation was carried out.	date time	date	
	Subcontractor	A firm or person that carries out installation work.	test	/ date	
	Installation Serial Number/Tag	The identifier assigned to installation.	numeric	1	
	Approved By	A person responsible for assuring the quality and meeting the	text	1	
	. The new of	requirements of the installed element. Warranty Data		2	
	Warranty ID	Warranty Data The identifier assigned to a warranty.	text	7	
	an an ian cy ro	An alphanumeric value	58.75	1	
	WarrantyDescription	providing a concise description	text	1	
		of the warranty content and any exclusions.		25	
	Warranty Start Date	The date on which the warranty commences.	date time	date	
	Warranty End Date	The date on which the warranty expires.	date time	date	
		The physical status of the element at the time of the			
	Condition	inventory or audit, based on the best judgment of those persons familiar with the physical characteristics and condition.	text	1	
	Defects	Basic imperfection that implies any deformity in component of a building that is owing to blemished plan, inadequate or flawed workmanship or deficient material and once in a while any blend of these.	text	,	
	6	Cost			
	Overall Cost	Sum of all costs needed for installing.	numeric	e	
	Installation Cost	Cost of installing one unit, including workforce and equipment.	numeric	¢	
	Material Cost	Cost of material for installing one unit.	numeric	£	
		Phasing	1775045		
Documentation:	Phase	Identifies the phase in which the object is created.	text	1	

Information Delivery Milestone:	Design			
Purpose:	Electrical			
Actor:				
Object:	"Lamp" / IfcLamp			
Geometrical information:				
Detail:	Simplified volume representation	Modelled accurately in terms of the overall geometry and thickne	55	
Dimensionality:	3D			
Location:	Absolute and relative to other built	ilding elements		
Appearance	Single color fill			
Parametric behaviour:	Not requested			
Alphanumeric Information:				
Identification:		(i) (ii)		<i>v</i>
Information content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Classification	Classification code according to chosen classification system,	text	7
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be/is installed.	text	1
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
	Level	Defines the reference level.	text	1
		Material		
	Material	The primary material used to construct the object.	text	1
		Dimensional Data		
	Height or Diametar	The nominal height or diameter of the lamp.	numeric	mm
	Width or Diametar	The nominal width or diameter of the lamp.	numeric	mm
		Electrical Data		6
	Voltage	The voltage that a device is designed to handle.	numeric	v
		Product Data		
	Color Appearance	In both the DIN and CIE standards, artificial light sources are classified in terms of their color appearance.	text	/
	Color Rendering Index	The CRI indicates how well a light source renders eight standard colors compared to perfect reference lamp with the same color temperature.	numeric	CRI
	Color Temperature	The color temperatures of the commonest artificial light sources range from less than 3000K (warm white) to 4000K (intermediate) and over 5000K (daylight).	numeric	к
	Contributed Luminous Flux	Luminous flux is a photometric measure of radiant flux, i.e. the volume of light emitted from a light source.	numeric	ten
		Cost		
	Estimated Cost	Estimated cost for installing one unit. It is based on the average amount of needed resources (including material, labor and equipment).	numeric	¢
	Estimated Unit Cost	Estimated cost of element per m ¹ / m ¹ . It is based on the average amount of needed resources (including material, labor and equipment).	numeric	€/m², €/ m²
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1
Documentation:				

nformation Delivery Milestone:	Construction			
Purpose:	Electrical			
Actor:				
10-5400-0				
Object:	"Lamp" / IfcLamp			
Geometrical information:				
Detail:	Element modelled to pominal dime	rsions and geometry. Actual clearances modelled.		
	3D	and the second of the second constructs in pressurer.		
Dimensionality:	30 Absolute			
Location:				
Appearance	Color fill to distinguish different ma	iterials		
Parametric behaviour:	Not requested			
Alphanumeric Information:				
identification:				
Information content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	/
	Room Name	Room name where component to be/is installed.	text	1
	Room Number	Room number where component to be is installed.	text	1
				/
	Offset from Level	Specifies the elevation of the element relative to its level.	numeric	m
	Level	Defines the reference level.	text	1
	Description	An alphanumeric value providing a concise description	text	1
	Manufacturer	of the element. The organization that manufactured and / or assembled the	text	/
		iters.		
		Material		
	Material	The primary material used to construct the object.	text	1
		Dimensional Data		
	Height or Diametar	The nominal height or diameter of the lamp.	numeric	mm
	Width or Diametar	The nominal width or diameter of the lamp.	numeric	mm
		Electrical Data		
	Voltage	The voltage that a device is designed to handle.	numeric	v
	7. Jan	Product Data		
	Modeltabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1
		In both the DIN and CIE standards, artificial light sources are	100	28
	Color Appearance	classified in terms of their color appearance.	text	1
	Color Rendering Index	The CRI indicates how well a light source renders eight standard colors compared to perfect reference lamp with the same color temperature.	numeric	CRI
	Color Temperature	The color temperatures of the commonest artificial light sources range from less than 3000K (warm white) to 4000K (intermediate) and over 5000K (daylight).	numeric	ĸ
	Contributed Luminous Flux	Luminous flux is a photometric measure of radiant flux, i.e. the volume of light emitted from a light source.	numeric	lm
		Installation Data		
	Installation date	The date on which the installation was carried out.	date time	date
	Subcontractor	A firm or person that carries out installation work.	text	1
	Installation Serial Number/Tag	The Identifier assigned to installation.	numeric	1
		A person responsible for assuring the quality and meeting the		- 20
	Approved By	requirements of the installed element.	text	(
		LON		
	Overall Cost Installation Cost	Sum of all costs needed for installing. Cost of installing one unit, including workforce and	numeric	6
	installation Cost	equipment.	numeric	5
	Material Cost	Cost of material for installing one unit. Phasing	numeric	¢
	Phase	Identifies the phase in which the object is created.	text	/

Information Delivery Milestone:	Operation
Purpose:	Electrical
Actor:	-
	In. n. I.u.
Object:	"Lamp" / H
Geometrical information:	the second se
Detail: Dimensionality:	Element mode 3D
Location:	Absolute and r
Appearance:	Color fill to dis
Parametric behaviour	Not requested
Alphanumeric Information:	
Identification;	
Information content:	1
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d to actual dimens	ions and geometry. Actual clearances and supports modelled.		
tive to other build guish different ma			
garan anna concorn ana	LEAT BILLY		
	<u>.</u>		
serty	Description	Data Type	Units
me	Identity Data Primary identifier of an object.	text	1
		0.200-210	1
pe	Defines the object type, specific information about object.	text	1
ied Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
ication	Classification code according to chosen classification system.	text	T
Name	Room name where component to be/is installed. Room number where component to be/is installed.	text	1
	Contraction and the second state of the second		
im Level	Specifies the elevation of the element relative to its level.	numeric	m
6	Defines the reference level.	text	1
ption	An alphanumeric value providing a concise description	text	7
2	of the element.		
acturer	The organization that manufactured and / or assembled the	text	1
20°	item. A valid URL hyperlink to the	2007	
iL.	manufacturer's website.	text	1
	Material		
arial	The primary material used to construct the object.	text	1
Diametar	Dimensional Data The nominal height or diameter of the lamp.	numeric	mm
Diametar	The nominal width or diameter of the lamp.	numeric	mm
	Electrical Data		
age	The voltage that a device is designed to handle.	numeric	v
	Product Data		
Label	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	/
20000	An alphanumeric value for the name of the manufactured	doar-	
ference	item as used by the manufacturer.	text	1
earance	In both the DIN and CIE standards, artificial light sources are classified in terms of their color appearance.	text	1
	The CRI indicates how well a light source renders eight		
ering Index	standard colors compared to perfect reference lamp with the	numeric	CRI
	same color temperature. The color temperatures of the commonest artificial light		
perature	sources range from less than 3000K (warm white) to 4000K.	numeric	ĸ
Previou Acti	(intermediate) and over 5000K (daylight).		_
uminous Flux	Luminous flux is a photometric measure of radiant flux, i.e. the volume of light emitted from a light source.	numeric	Im
	Installation Data	52	
on date	The date on which the installation was carried out.	date time	date
ractor	A firm or person that carries out installation work.	text	1
al Number/Tag	The identifier assigned to installation.	numeric	1
ed By	A person responsible for assuring the quality and meeting the requirements of the installed element.	text	1
	Warranty Data		
nty ID	The identifier assigned to a warranty.	text	Ĩ
	An alphanumeric value		
escription	providing a concise description of the warranty content and	text	1
	any exclusions.		
tart Date	The date on which the warranty commences.	date time	date
End Date	The date on which the warranty expires.	date time	date
	The physical status of the element at the time of the inventory or audit, based on the best judgment of those	0.000	
tion	persons familiar with the physical characteristics and	text	1
	condition.		
	Basic imperfection that implies any deformity in component of a building that is owing to blemished plan, inadequate or		
cts	flawed workmanship or deficient material and once in a while	text	1
	any blend of these.		
a	Cost	USUSDOM/CO	-
Cast	Sum of all costs needed for installing. Cost of installing one unit, including workforce and	numeric	e
	equipment.	numeric	€
on Cost			
l Cost	Cost of material for installing one unit. Phasing	numeric	€

APPENDIX 6: III TIER: COST ESTIMATION

REQUIREMENTSSpecificator - Design Specific Requirements

		COST ESTIMATIO	
-			
1	Structural Types		
lemen	its that are from the const	ruction perspective considered different structural	types shall be modelled as individual types.
* e.g., \	wooden walls of different f	neights, that are constructed differently	
2	Description		
2	Resource Naming	1	
All rose	ources shall follow the sam	a naming convention	
All resu	urces shall follow the same	e naming convention.	
* This a	allows grouping the quanti	ties of each resource.	
	Discription of the state of the		
3	Ceiling drops and cove	5	
Ceiling	drops and coves shall be n	nodelled as walls containing the same layers as ceil	ing.
*Upto	300mm they are quantifie	d in metres.	
4	Compound elements		
Every la	aver of compound element	shall be modelled as to present the accurate dime	nsions of the accurate construction
- very is		i shan be modelled as to present the becarate anne	isons of the becarble construction.
		•	
5		and formwork in concrete elements	
5	Reinforced structures	and formwork in concrete elements	
5 If not n	Reinforced structures	and formwork in concrete elements	m modelled geometry using ratios provided by structural
5	Reinforced structures	and formwork in concrete elements	
5 If not n designe	Reinforced structures nodelled, reinforced struct er.	and formwork in concrete elements	m modelled geometry using ratios provided by structural
5 If not n designe	Reinforced structures nodelled, reinforced struct er.	and formwork in concrete elements ures and formwork quantities shall be obtained fro	m modelled geometry using ratios provided by structural
5 If not n designe	Reinforced structures nodelled, reinforced struct er. Int of reinforcement weigh	and formwork in concrete elements ures and formwork quantities shall be obtained fro	m modelled geometry using ratios provided by structural
5 If not n designe	Reinforced structures nodelled, reinforced struct er.	and formwork in concrete elements ures and formwork quantities shall be obtained fro t per unit of volume for each element category (pro	m modelled geometry using ratios provided by structural
5 If not n designe	Reinforced structures nodelled, reinforced struct er. Int of reinforcement weigh	and formwork in concrete elements ures and formwork quantities shall be obtained fro t per unit of volume for each element category (pr Reinforcement weight per unit of volume	m modelled geometry using ratios provided by structural
5 If not n designe	Reinforced structures nodelled, reinforced struct er. Int of reinforcement weigh Element Category	and formwork in concrete elements ures and formwork quantities shall be obtained fro t per unit of volume for each element category (pr Reinforcement weight per unit of volume (kg/m ³)	m modelled geometry using ratios provided by structural
5 If not n designe	Reinforced structures modelled, reinforced struct er. Int of reinforcement weigh Element Category Beams Columns Ground Concrete Slab	and formwork in concrete elements ures and formwork quantities shall be obtained fro t per unit of volume for each element category (pro- Reinforcement weight per unit of volume (kg/m ³) 300 325 65	m modelled geometry using ratios provided by structural
5 If not n designe	Reinforced structures modelled, reinforced struct er. Int of reinforcement weigh Element Category Beams Columns Ground Concrete Slab Concrete Slab	and formwork in concrete elements ures and formwork quantities shall be obtained fro t per unit of volume for each element category (pro- Reinforcement weight per unit of volume (kg/m ³) 300 325 65 110	m modelled geometry using ratios provided by structural
5 If not n designe	Reinforced structures modelled, reinforced struct er. Int of reinforcement weigh Element Category Beams Columns Ground Concrete Slab Concrete Slab Concrete Valls	and formwork in concrete elements ures and formwork quantities shall be obtained fro t per unit of volume for each element category (pro- Reinforcement weight per unit of volume (kg/m ³) 300 325 65 110 120	m modelled geometry using ratios provided by structural
5 If not n designe	Reinforced structures nodelled, reinforced struct er. Int of reinforcement weigh Element Category Beams Columns Ground Concrete Slab Concrete Slab Concrete Slab Concrete Walls Foundation Isolated Slab	and formwork in concrete elements ures and formwork quantities shall be obtained fro t per unit of volume for each element category (pr Reinforcement weight per unit of volume (kg/m ³) 300 325 65 110 120 85	m modelled geometry using ratios provided by structural
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Information Delivery Milestone:	Construction			
Purpose:	Cost Estimation			
actor:				
Object:	"Wall" / IfcWall			
Seometrical information:				
Detail:	Element model led to accurate d	imensions. All connections, omate details and openings modelled to	rough-opening dim	ensions.
Dimensionality:	30			
ocation:	Absolute and relative to other b			
Appearance: Parametric behaviour:	Color fill to distinguish different Not requested	materials		
Arametric behaviour: Alphanumeric Information:	Notrequested			
dentification		1		
nformation content:	Property	Description Identity Data	Data Type	Units
	Name	Primary identifier of an object.	text	γ.
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1
		further classify the entity	20000	<u> </u>
	Classification	Classification code according to chosen classification system.	text	
	Level Type Mark	Defines the reference level. An alphanumeric value that differentiates objects.	text	
		Material		
	* Depending on the purpose of	f the Cost Estimation, Material descriptions may vary in detail e.g., s	tone wool or stone w	iool board insulati
		composed of rock fibers.		
	Structure	The primary material used to construct the structural layer.	text	/
	Substrate	The primary material used as a substrate.	text	1
	Thermal/Air Layer	The primary material used as a thermal layer.	text	1
	Membrane Laver Finish	The primary material used as a membrane layer. The type of finish for the wall.	text text	1
		Dimensional Data		
	Length	Total nominal length of the wall along the wall center line.	numeric	mm
	Width	Total nominal width (or thickness) of the wall measured	numeric	mm
	the later	perpendicular to the wall path. Height of the element from the upper edge of the bottom	numeric	
	Height	slab to the lower edge of the upper slab. Height of the element from the finish floor level of the	-	mm
	Exposed Height	bottom storey to the finish ceiling level.	numeric	mm
	NetSideArea	Area of the wall as viewed by an elevation view of the middle plane. It does take into account all wall modifications	numeric	m²
	119-049-04995-0-0	(such as openings). Volume of the wall, after subtracting the openings and after	20020-2002	7.1585
	NetVolume	considering the connection geometry.	numeric	m²
	1.4	Cost	1202204211	
	Labor Cost Equipment Cost	Cost of workforce for installing one unit. Cost of equipment for installing one unit.	numeric	<u>с</u> с
	Material Cost	Cost of material for installing one unit.	numeric	e
	Phase	Phasing	2.5875	
Documentation:	Phase	identifies the phase in which the object is created.	text	/
1	bill of quantities, bill of material		text	/
Documentation: Set of documents: Information Delivery Milestone:			text	
set of documents: Information Delivery Milestone:	bill of quantities, bill of material		text	
Set of documents: Information Delivery Milestone: Purpose:	bill of quantities, bill of material Construction		text	/
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Erasmus Mundus Joint Master Degree Programme - ERASMUS+

Information Delivery Milestone:	Construction			
Purpose:	Cost Estimation			
Actor:				
Object:	"Ceiling" / IfcCovering			
Geometrical information:	Element modellast to scoutto d	In success All constrained as a particular and a successful rest and the state	enab dimensions	
oetai: Omensionality:	3D	limensions. All penetrations, openings and connections modelled to	rough dimensions.	
Location:	Absolute and relative to other b			
Appearance:	Color fill to distinguish different Not requested	materials		
Parametric behaviour: Alphanumeric Information:	isse requested			
dentification:			TORCE DATE:	
information content:	Property	Description Identity Data	Data Type	Units
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
		Holds the entity specific enumeration of predefined types to	100	10
	Predafined Type	further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	Level	Defines the reference level.	text	1
	Type Mark	An alphanumeric value that differentiates objects. Material	text	1
	* Depending on the purpose of	f the Cost Estimation, Material descriptions may vary in detail e.g., s	tone week or stone w	ant board in ad
	Depending on the pertuse of	composed of rock fibers.	cone water or score we	dei doare inser
	Structure	The primary material used to construct the structural layer.	text	1
	Substrate	The primary material used as a substrate.	text	1
	Thermal/Air Layer	The primary material used as a thermal layer.	text	1
	Membrane Layer	The primary material used as a membrane layer.	text	1
	Structural Deck	The primary material used as a structure deck.	text	1
	Finish	Finish selection for this object. Here specification of the surface finish for informational purposes.	text	1
	Tile length/width	Size of the ceiling tiles.	numeric	mm
		Dimensional Data		
	Thickness	Nominal thickness of the plate. Gross areas of the covering facing the space. No opening	numeric	mm
	Gross Area	that are included in the covering is subtracted.	numeric	m ³
	Net Area	Net area of the covering facing the space. All openings that are included in the covering are subtracted.	numeric	m ^a
		Cost		
	Labor Cost Equipment Cost	Cost of workforce for installing one unit. Cost of equipment for installing one unit.	numeric	E
	Material Cost	Cost of equipment or installing one unit.	numeric	e
		Fhasing		
et of documents: nformation Delivery Milestone:	Phase bill of quantities, bill of material Construction Cost Estimation	Identifies the phase in which the object is created.	text	/
iet of documents: Information Delivery Milestone: Purpose:	bill of quantities, bill of material Construction		text	
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Information Delivery Milestone:	Construction			
urpose:	Cost Estimation			
Object: Seometrical information:	"Window" / IfcWindow	n		
etaili	Element modelled to accurate di	mensions and geometry. Representation can be simplified.		
Dimensionality: Location:	3D Absolute and relative to other by	tiking elements		
ocadon: Appearance:	Color fill to distinguish different			
Parametric behaviour: Alphanumeric Information:	Not requested			
dentification:				
Information content:	Property	Description Identity Data	Data Type	Units
	Name	Primary identifier of an object.	text	1
	Type	Defines the object type, specific information about object.	text	/
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	test	12
	Level	Defines the reference level.	text	Χ.
	Type Mark	An alphanumeric value that diferentiates objects. Material	iext	6
	* Depending on the purpose of	the Cost Estimation, Material descriptions may vary in detail e.g., a	tone wool or stone wo	ol beard insula
	Frame Material	composed of rock fibers. The primary material used to construct the frame.	text	I.
	External Frame Finish	Finish selection for this object. Here specification of the	text	,
	Internal Frame Finish	surface finish for informational purposes. Finish selection for this object. Here specification of the	text	1
	Sill Matorial	surface finish for informational purposes. The primary material used to construct the sill.	text	1
	Stool Material	The primary material used to construct the stool.	text	1
	Hardware Material	The primary material of the hardware. Dimensional Data	text	/
	Area Window Height	Total area of the outer lining of the window. Total outer height of the window lining.	numeric	m² mm
	Window Width	Total outer width of the window lining.	numeric	៣៣ ៣៣
	Opening Height Opening Width	Total height of the wall opening. Total width of the wall opening.	numeric numeric	mm mm
		on the purpose of the Cost Estimation, Dimensional Data may regul		
	Frame Depth	Depth of panel frame, measured from front face to back face horizontally (i.e. perpendicular to the window (elevation)	numeric	mm
		plane. Width of panel frame, measured from inside of panel (at		
	Frame Thickness	grazing) to outside of panel (at lining), Le, parallel to the window (elevation) plane.	numeric	mm
	Frame Area	Total area of the frame.	oumeric	m²
		Product Data		
	ModelLabel	Descriptive model name of the product model (or product line) as assigned by the manufacturer e.g., Solid Timber	144	r
	ModelLabel	Dear,	text	I.
	ModelReference	Model number or designator of the product (or product line) as assigned by the manufacturer e.g., D639AD.	text	1
	Labor Cost	Cost Cost of workforce for installing one unit.	oumeric	6
	Equipment Cost	Cost of equipment for installing one unit.	numeric	¢
	Material Cost	Cost of material for installing one unit. Phasing	numeric	¢
	Phase	identifies the phase in which the object is created.	text	1
Documentation: Set of documents:	bill of quantities, bill of materials	(
Information Delivery Milestone:	Construction			
Purpose:	Cost Estimation			
Actor:				
Object:	"Roof" / IfcRoof			
Geometrical information:				
Detail:	Element modelled to accurate di	imensions. All penetrations modelled to rough-opening dimensions.		
		and the second sec	Framing modelled as	separate assen
Detail:	3D		Framing modelied as	separate assen
Dimensionality: Location:	3D Absolute and relative to other be	uilding elements	Framing modelied as	separate assem
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Dimensionality: depearance: arametris behaviour; Alphanumeric Information: denification;	3D Absolute and relative to other bi Color fill to distinguish different o	uilding elements	Framing modelied as Data Type	separate assen Units
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Dimensionality: depearance: arametris behaviour; Alphanumeric Information: denification;	3D Absolute and relative to other bi Color fill to distinguish different hoc requested Property Name Type Predefined Type Classification Level Type Mark	Ulting clements material Description Attentive Data Primary dentifier of an object. Defines the solerct type, specific information about object. Hidds the entity specific numeration of precedined types to farther disalify the entity Classification cost according to choisen displication system. Defines the reference level. Defines the reference level. An alphanumeric while that differentiates objects.	Deta Type text text text text text text text	Units <i>I</i> <i>I</i> <i>I</i> <i>I</i> <i>I</i> <i>I</i> <i>I</i>
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nformation Delivery Milestone:				
urpose:	Cost Estimation			
Object: Seometrical information:	"Stairs" / IfcStairs			
Jetail:	Element modellari to accurate dime	nsions and geometry. Stair support elements modelled. Accurat	e committee of h	andraib
	30	nisons and geometry, acts support elements induction, vocular	e presentation or n	andra its.
Dimensionality: Location:	30 Absolute and relative to other build	ing elements		
Appearance:	Color fill to distinguish different ma			
Parametric behaviour: Alphanumeric Information:	Not requested			
dentification:	6	AT. Carl Control of T	Service and the service of the servi	1
nformation content:	Property	Description	Data Type	Units
		Identity Data	Pa Nation	1
	Name	Primary identifier of an object. Defines the object type, specific information about object.	text	· ·
	Туре	Holds the entity specific enumeration of predefined types to		-
	Fredefined Type	further classify the entity	text	/
	Classification	Classification code according to chosen classification system.	text	/
	Lovel Type Mark	Defines the reference level. An alphanumeric value that diferentiates objects.	text	- /
		Material		-
	Finish	Finish selection for this object. Here specification of the surface finish for informational purposes.	text	1
	Substrate Thermal/Air Laver	The primary material used as a substrate. The primary material used as a thermal layer.	test test	/
	Membrane Layer	The primary material used as a membrane layer.	text	· · ·
	Structure	The primary material used to construct the structural layer.	text	1
	Structural Deck	The primary material used as a structure deck.	test	1
	Number of Riser	Dimensional Data Total number of the risers included in the stair.	numeric	7
	Number of Treads	Total number of treads included in the stair.	numeric	,
	Riser Height	Vertical distance from tread to tread. The riser height is supposed to be equal for all steps of a stair or stair flight.	numeric	mm
		Horizontal distance from the front of the thread to the front		
	Tread Length	of the next tread. The tread length is supposed to be equal for all steps of the stair or stair flight at the walking line.	numeric	nun
	Length (Flight)	Total length of the stair flight along the walking line.	numeric	m
	Gross Volume (Flight)	Total gross volume of the stair flight. Openings, recesses, and projections are not taken into account.	numeric.	ш,
	Net Volume (Hight)	Total net volume of the stair flight. Openings and recesses are taken into account by subtraction, projections by	numeric	m?
	transfer to the second second second	addition.		
	Labor Cost	Cost Cost of workforce for installing one unit.	numeric	E
	Equipment Cost	Cost of equipment for installing one unit.	numeric	e
	Material Cost	Cost of material for installing one unit.	numeric	6
		Phasing		
et of documents: nformation Delivery Milestone:	Phase bill of quantities, bill of materials Construction	Identifies the phase in which the object is created.	text	17
iet of documents: Information Delivery Milestone: Purpose:	bill of quantities, bill of materials		text	1
iet of documents: Information Delivery Milestone: Purpose: Actor:	bil of quantities, bill of materials Construction Cost Estimation	Identifies the phase in which the object is created.	text	1
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et of documents: information Delivery Milestone: Purpose: Actor: Dbject: Seconstrical information: Informati	bit of quantities, bit of materials bit of quantities, bit of materials Construction Cost Estimation "Structural Wall" / IfcWall Cost Estimation "Structural Wall" / IfcWall Color III to distinguish different ma Aboote and relative to other build Color III to distinguish different ma Not recuested Property Nome Type Precefined Type Classification Lavel Type Mark Structural Material Structural Material Longth Wedth Height Exposed Height Net Side Area Net Volume */ Concert/Reinforcement weight per unit of volume (for each size of the relat) */ Concert/Reinforcement quantity, (for each size of the relat) */ Concert/Reinforcement quantity, (for each size of the relat)	Identifies the phase in which the object is created.	Data Type Data Type Test Test Test Test Test Test Test Tes	nensions.

Information Delivery Milestone:	Construction			
Purpose:	Cost Estimation			
ictor:	14			
Object:	"Column" / IfcColumn			
Geometrical Information:	Element modelled to accurate dime	nsions. All connections, ornate details and openings modelled to	actual dimensions	
xetail:		inchors and other embedded objects.	reccondiniensions.	
Xmensionality:	3D Absolute and relative to other build	tion allowants		
Location : Appearance:	Color fill to distinguish different mat			
farametric behaviour. Alphanumeric Information:	Not requested			
Alphanumenc Intermation: dentification:				
nformation content:	Property	Description Identity Data	Data Type	Units
	Name	Primary identifier of an object.	text	1
	Түре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	Dassification	Classification code according to chosen classification system.	text	1
	Level	Defines the reference level.	text	1
	Type Mark	An alphanumeric value that diferentiates objects. Material	text	1
	Structural Material	The primary material used to construct the structural layer.	text	1
	ht Steel/Finish	Finah selection for this object. Here specification of the	text	1
	- and - and -	surface finish for informational purposes. Eimensional Data	text.	
	Longth	Total length of the column.	numeric	mm
	Section Dimensions/Diametar *fatoef/Weight	Width and depth / diametar of the column section. The weight of the steel per unit length.	numeric numeric	mm kg/i
	*# Concrote/Procest/Gress Volume	Volume of the column, not taking into account possible processing features (cut out's, etc.) or openings and	numeric	m²
	- see a see of the second of this would be	recesses	nument	sit"
	The Concrete (Procest)/Net Volume	Volume of the column, taking into account possible processing features (cut-out's, etc.) or openings and	numeric	m*
	Theory in the second second	recesses. Total area of the extruded surfaces of the column (not taking	64	5004
	"If Concrete/Outer Surface Area	into account the end cap areas), normally generated as perimeter * length.	numeric	m*
		Structural Data		
		Weight of reinforcement calculated per unit of volume.	numeric	kg/m3
	the rebar)			10 SAMPSA
		Quantity of reinforcement of different size for the unit.	numeric	ħg
	"If Episorete/Total Reinforcement quantity	Total quantity of reinforcement needed for the unit.	numeric	kg
	Latteral Formwork	Area of Latteral Formwork	numeric	m2
	Labor Cost	East Cost of workforce for installing one unit.	numeric	£
	Equipment Cost	Cost of equipment for installing one unit.	numeric	e
	Material Cost	Cost of material for installing one unit. Phosing	numeric	•
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formation Delivery Milestone:	Construction			
Purpose:	Cost Estimation			
Actor:				
	Inc. and a data at	1 x x x x x x		
Object:	"Foundation" / IfcFooting	/ ItcPile		
Sepmetrical information:	Element modelled to accurate dime	nsions. All penetrations and joints modelled to actual dimensions.		
Jetuil:	*Element may include reinforcing as	nd post tension elements.		
Dimensionality:	30			
location	Absolute and relative to other build			
Appearance: Parametric behaviour:	Color Fill to distinguish different met Not requested	erati		
Alphanumeric Information:	(10. To spanning			
dentification:				
information content:	Property	Description	Data Type	Units
		identity Data		
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	test	1
	Classification	Elastification code according to chosen classification system.	text	7
	Low	Defines the reference level	text	
	Type Mark	An alphanumeric value that diferentiates objects.	text	
		Materia		
	Structural Material	The primary material used to construct the structural layer.	text)
	1.000000000000000000000000000000000000	The primary material used to construct the structural deck	10000	
	Structural Deck	laver.	test	1
		Dimensional Data		
	Width	Total nominal width (or thickness) of the footing. For strip footings it is measured perpendicular to the footing path (or	numeric	001
	WOUTS	longitudial axis). For other fastings it is one of the horizontal dimensions. It should only be provided, if it is constant.	THEFT	040
	22204.63	Length of the footing, not taking into account any cut-out's or		
	Length	other processing features. For strip footings it is measured along the path, for other footings it is one of the horizoncal	numeric	man.
		dimensions. It should only be provided, if it is constant.		
	Height	Total nominal height of the footing.	numeric	inen
	"If pite/Depth	Total length of the pile not taking into account any cut-out's or other processing features.	numeric	in/m
	fil ple/Diameter	Diameter of the cross section of the pile.	numeric	mm
	*# process/Cap Height	Total nominal height of the cap.	numeric	mes
	*#precent/Capitength	Total nominal length of the cap.	numeric	mm
	"If privous/Cap Width	Total nominal width of the cap. Total area of the footing, normally generated as perimeter *	numeric	mm
	Gross Surface Area	Regith + 2 cross section area. It is the sum of Durensurface. Area + 12 x crosssection area. It is the sum of Durensurface. Area + (2 x crosssectionArea) and shall only be given, if the Oute/Surface. Area on CrossSectionArea cannot be established secarately.	numeric	m*
	Outer Surface Area	Total area of the extruded surfaces of the facting (not taking into account the end cap areas), normally generated as perimeter * length.	numeric	m!
	Net Volume	Total net volume of the footing, taking into account possible processing features (cut-out's, etc.) or openings and recesses.	numeric	m ^a
	Gross Volume	Total gross volume; not taking into account possible processing features (cut-out's, etc.) or openings and recesses.	numeric	m)
	*#Consists/Reinforcement weight	Structural Data	- 1	
	per unit of volume (for each size of the rebar)	Weight of reinforcement calculated per unit of volume.	numeric	kg/m3
	*If Conneto/Reinforcement quantity (for each size of the rebar)	Quantity of respondement of armenent size for the unit.	numeric	kg
	"Il Concerte/Total Reinforcement quantity	Total quantity of reinforcement needed for the unit.	numeric	48
	Latteral Formwork	Area of Latteral Formwork	numeric	m2
	Bottom Formwork	Area of Bottoom Forrework	numeric.	m2
	Labor Cost	Cost of workforce for installing one unit.	numeric	(
	Equipment Cost	Cost of equipment for installing one unit.	numeric	(
	Material Cost	Cost of material for installing one unit.	numerik	C
		Phadeg		
	Phase	identifies the phase in which the object is created.	text	1

	Construction			
Purpose: Actor:	Cost Estimation			
(ctor:				
Object:	"Beam" / IfcBeam			
Seometrical information:		isions. All connections, ornate details and openings modelled to	totusi dimensions.	
Detail:	*Element may include reinforcing, a 30	nchors and other embedded objects.		
Dimensionality: Location:	3D Absolute and relative to other build	ng elements		
Appearance:	Color fill to distinguish different mat	oriais		
Parametric behaviour: Alphanumeric Information:	Not requested			
dentification:				
nformation content:	Property	Description Identity Data	Data Type	Units
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object. Holds the entity specific enumeration of predefined types to	text	/
	Predefined Type	further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	Level Type Mark	Defines the reference level. An alphanumeric value that differentiates objects.	text text	1
		Material		
	Structural Material	The primary material used to construct the structural layer.	test	1
	*Il Steel/Finish	Finish selection for this object. Here specification of the surface finish for informational purposes.	text	1
	"If Steel/Section Dimensions	Dimensional Data	numeric	-
	Longth	Dimensions of the cross section (or profile) of the beam. Total length of the beam, not taking into account any cut-	numeric	mm
	"If steel/Weight	out's or other processing features. The weight of the steel per unit length,	numeric	kg/l
	*#Commone/Precast/Height	Nominal Height of the element.	numeric	m
	*If Concrete/Precast/Width	Nominal Width of the element. Total gross volume of the beam, not taking into account	numeric	m
	. Tif Concrete/Precast/Gross Volume	possible processing features (cut-out's, etc.) or openings and recesses.	numeric	m²
	*# Concreto/Procart/Net Volume	Total net volume of the beam, taking into account possible processing features (cut-out's, etc.) or openings and recesses.	numeric	m²
	*# concrene/Outer Surface Area	Total area of the extruded surfaces of the object (not taking into account the end cap areas), normally generated as perimeter * length.	numeric	m ²
	"If Concrete/Net Surface Area	Net surface area of the object, normally generated as perimeter * length + 2 * cross section area taking into account possible processing features (cut-oun's, etc.) or openings and recesses.	numeric	m²
	"If Concrete/Reinforcement weight per unit of volume (for each size of	Structural Data Weight of reinforcement calculated per unit of volume.	numeric	kg/m3
	the rebar) "If Concrete/Reinforcement quantity (for each size of the rebar)	Duantity of reinforcement of different size for the unit.	numeric	ks
	"It Concrete/Total Reinforcement	Total quantity of reinforcement needed for the unit.	numeric	×.
	quantity Latteral Formwork	Area of Latteral Formwork	numeric	m2
	Bottom Formwork	Area of Bottoom Formeark	numeric	m2
	Labor Cost	Cost of workforce for installing one unit.	numeric	¢
	Equipment Cost Material Cost	Cost of equipment for installing one unit. Cost of material for installing one unit.	numeric numeric	6 F
		Phating	- Monter Sc	
Documentation:	Phase	identifies the phase in which the object is created.	text	/
nformation Delivery Milestone:	Construction Cost Estimation			
Purpose: Actor:				
Actor: Dbject:	"Duct" / IfcDuctSegment			
Actor: Dbject:	"Duct" / IfcDuctSegment			
Actor: Object: Geometrical information: Netail:	Element modelled to nominal size, s	Page and sparing. Actual clearancess modelled. Nominal filter a	nd wail penetration e	lements modeler
Actor: Dbject: Geometrical information: Netail: Xmunsionality:			nd wail penetration o	lements modeler
Actor: Deject: Jeometrical information: wrwit: wrwitonality: opranno:	Element modelled to nominal tite, s BD Absolute and rolative to other build Color fill to distinguish different ma	ling elements	nd wall penetration o	lements modeler
Actor: Dbject: Beometrical Information: Metail Xmeesionality: constance constance constance constance constance constance	Element modelled to nominal size, s 8D Absolute and relative to other build	ling elements	nd wail penetration o	lements modeler
Actor: Dbject: Seometrical information: weak knewsionality: contain c	Element modelled to nominal ste, s ND Absolute and relative to other build Color fill to distinguish different ma Not requested	ing elements		
Actor: Dbject: Seometrical information: weak knewsionality: contain c	Element modelled to nominal tite, s BD Absolute and rolative to other build Color fill to distinguish different ma	ling elements	nd wall penetration o Data Type	lements modeler Units
Actor: Dbject: Seometrical information: weak knewsionality: contain c	Element modelled to nominal dae, s 30 Bolasohne and relative to other build Color fit to distinguish different ma Not requested Property Name	ing elements er ride Description Monity: Dota Primary identifier of an object.	Data Type text	Units /
Actor: Dbject: Seometrical information: weak knewsionality: contain c	Element modelled to nominal size, s SD SD Court fit to distriguish different ma Not requested Property Norme Type.	Ing elements tertals Description Adentity Data Primary identifier of an object. Defines the object type, specific information about object.	Data Type	Units 1 1
Actor: Dbject: Seometrical information: weak knewsionality: contain c	Element modelled to nominal dae, s 30 Bolasohne and relative to other build Color fit to distinguish different ma Not requested Property Name	ing elements er ride Description Monity: Dota Primary identifier of an object.	Data Type text	Units /
Actor: Dbject: Seometrical information: weak knewsionality: contain c	Unment modelied to nominal size, to BD Absolute and relative to other build Color fit to distriguish difference ma Not requested Property Name Type Predefined Type Classification	Ing elements errich Destription Idontity: Data Pranary identifier of an object. Defines the object type, specific information about object. Defines the object type, specific information of gradefined types to	Data Type text text	Units 1 1
Actor: Dbject: Seometrical information: weak knewsionality: contain c	Element modelled to nominal ster, t ND Aboutne and relative to other built Calor fill to discinguish different; ma Not requested Prosperty Name Type Predetined Type Classification Level	Ing elements errole Description Identify: Data Primary identifier of an object. Defines the object type, specific information about object. Defines the object type, specific information about objects turber classify the entity classification code according to chosen classification system. Defines the reference level.	Data Type Iost text text text text	Units / / /
Actor: Dbject: Seometrical information: Annotation Annotation Jacameter	Unment modelied to nominal size, to BD Absolute and relative to other build Color fit to distriguish difference ma Not requested Property Name Type Predefined Type Classification	Ing elements tertals Description Monity Duta Primary identifier of an object. Defines the object type, specific information about object wolds the onthy specific normalion of prodefined types to further classify the entity Classification code according to chosen classification system.	Data Type text text text text	Units / / /
Actor: Dbject: Seometrical information: weak knewsionality: contain c	Element modelied to nominal size, t SD Abouts and relative to other build Color fill to distriguish different ma Not requested Property Nome Type Predetined Type Classification Level Type Mark	Ing elements reprints Identity Data Primary identifier of an object. Primary identifier of an object. Primary identifier of an object. In object type, specific information about object. In object type, specific information about object. In object type, specific information about object. Classification code according to choose classification system. Defines the reference level. An alphanismus value that differentiates objects. Defines the system for the connectors that are located on air terminals, equipment and fotures. Provemption.comcorder altriants	Data Type text text text text text text text	Units / / / / / /
Actor: Dbject: ieometrical information: wesh: knewsionality: contain: paparance: asametric behaviour: Mphanoumeric information: Herification:	Unment modelied to nominal size, to bio Absolute and relative to other build Color fit to distinguish different ma Not requested Property Name Type Predefined Type Classification Level Type Mark System Classification	Bestription Bestription Bestription Both State Bestription Both State State	Data Type Iout Iout Iout Iout Iout Iout Iout Iout	Units / / / / / /
Actor: Dbject: Seometrical information: weak knewsionality: contain c	Element modelied to nominal size, to BO Absolute and relative to other build Color fill to distriguish difference ma Not requested Property Nome Type Protectined Type Classification Level Type Mark System Classification System Type	Ing elements errink Destription Addnity Data Prenary identifier of an object. Defines the object type, specific information about object. Defines the object type, specific information about objects further classify the entity robats the onthy specific ensumeration of prodefined types to further classify the entity Classification code according to choosen classification system. Defines the reference level. An alphansumer's value that differentiate is objects. Defines the information and futures. Note: one classification system. Defines the information and futures. Note: one classification system tor air terminals equipative and information is subjects. Defines the information and futures. System is autorication of Supply Air, network for a classification at system is availed in the ruppe of system et al., supply al.: A name that onlines/idefinition system, it may be user-defined or automatically generated.	Data Type text text text text text text text te	Units / / / / / / / /
Actor: Dbject: Seometrical information: weak knewsionality: contain c	Element modelled to nominal size, to 80 Absolute and relative to other build Color fit to distriguish difference ma Not requested Property Nome Type Predefined Type Classification Level Type Mark System Type System Type System Name	Ing elements tertials Densription Monitory Jona Department Primary identifier of an object. Derives the object type, specific information about object. Holds the onthy specific memoration of predefined types to further classify the entry Classification code according to chosen classification system. Derives the reference level. An alphanamics such and that differentiates objects. Derives the system for the connectors that are located on air terminals, equipment and fotures. For example, connectors dra tar- terminals, equipment and fotures. For example, someward to an exterminals could have a system classification of Supply Armen that unknock defines system, it may be user defined or automatically generated A suce differed abbreviation for a system.	Data Type heat test test test test test test test t	Units 1 1 1 1 1 1 1 1 1 1 1 1 1
Actor: Dbject: ieometrical information: wesh: knewsionality: contain: paparance: asametric behaviour: Mphanoumeric information: Herification:	Uneven modelied to nominal ster, t SD Abouts and relative to other build Color fill to distriguish different ma Not requested Property Name Type Prodefined Type Classification Level Type Mark System Classification System Type	Ing elements tertials Detertigition Monthly Data Primary identifier of an object. Primary identifier of an object. Classification code according to chosen classification system. Defines the reference level. An alphanismics value that differentiates objects. Defines the system for the connectors that are located on air terminals, equipment and fatures. For example, connectors to air terminals could have a system classification of Supply Annes that where defines system it may be user defined or automatically generated. A user defined abbreviation for a product. Naterial The primary material usel to construct the object.	Data Type 1005 test test test test test test test tes	Units / / / / / / / / / / /
Actor: Dbject: Seometrical information: weak knewsionality: contain c	Unment wadriled to nominal stee, 1 Dement wadriled to nominal stee, 1 Debug and relative to other build Calor fit to distriguish different ma Not requested Property Nome Type Prodefined Type Classification Level Type Mark System Type System Type System Type System Rami System Abbreviation Material Finish	Ing elements errink Description Identity Data Prenary identifier of an object. Defines the object type, specific information about object. Defines the object type, specific information about object. Not: Mit entity specific enterner ation of prodefined types to further classify the entity objects the senter object object. Senter objects to turber classify the entity Defines the senterner level. Sen ab himmeric value that differentiate objects. Defines the senterner level. Senter thermals object haves a specific atom value to an information of supply All, Return Air or Exhaust Air. Type of system et al. supply all. Same darked able as a system. It may be user defined or automatically generated the primary material used to contruct the object. This is selection for the object. Here specification of the material median of the object. Discussed being about the object. Discussed being about the object. Discussed being about the object.	Data Type Ioat test test test test test test test te	Units
Actor: Dbject: Seometrical information: Annotation Annotation Jacameter	Dement wadriled to nominal ster, 1 D Dement wadriled to nominal ster, 1 D D D D D D D D D D D D D D D D D D D	Ing elements errink Description Identity Data Prenary identifier of an object. Defines the object type, specific information about object work the entity operation enternation of prodefined types to further classify the entity Objects the specific enternation of prodefined types to further classify the entity Objects the specific enternation of prodefined types to further classify the entity Objects the specific enternation of prodefined types to patients the enternation of the specific enternation system. Defines the specific enternation of prodefined types to patients the specific enternation of the entity Part (Bettern Air or Tablack Air. Type of system exployed the system its information of suppry Air, Bettern Air or Tablack Air. Type of system exployed above a system the specific of the enternation of the object. Here specification of the missing exclusion of the object. The primary material used to contrivue the object. The primary material used to contrivue the object. English of the diskance between infect and outliet ports.	Dotts Type Host text text text text text text text te	Units
Actor: Dbject: Seometrical information: weak knewsionality: contain c	Unment wadriled to nominal stee, 1 Dement wadriled to nominal stee, 1 Debug and relative to other build Calor fit to distriguish different ma Not requested Property Nome Type Prodefined Type Classification Level Type Mark System Type System Type System Type System Rami System Abbreviation Material Finish	Ing elements Ingride Deterziption Identity Data Primary identitier of an object. Primary identitier of an object. Cerlines the object type, specific information boto object. In obs. the onthy specific onumeration of prodefined types to further classify the entry Classification code according to choose classification system. Defines the reference level. An objective study that that differentiates objects. Defines the system for the connectors that are located on air terminals, equipment and fotures. For example, connectors the anish transmite study tail. A name that uniquely defines system. Type of system it any beyrarised. A name that uniquely defines system. The primary material used to construct the object. This section for the object. This section of the object. In this for informational purpoace. Dimensional Data Langth of the signment, calculated at midpining the construct	Donn Type Hoat test test test test test test test te	Units
Actor: Dbject: Seometrical information: Annotation Annotation Jacameter	Unevent modelling to nominal size, to SO SO Absolute and relative to other build Color fit to distriguish different ma Not requested Property Protectined Type Classification Level Type Mark System Type System Same System Same System Same System Same System Same System Same System Same System Same	Ing elements errink	Data Type leat leat leat leat leat leat leat lea	Units
Actor: Dbject: Seometrical information: Annotation Annotation Jacameter	Unevent modellied to nominal size, to SO SO Absolute and relative to other build Color fit to distriguish different may Not requested Property Protectined Type Classification Level Type Mark System Type System Same System Same	Bestription Bestription Both State Bestription Both State Both State	Data Type leat leat leat leat leat leat leat lea	Units
	Element modelied to nominal size, to SO SO Absolute and relative to other build Color fit to distriguish different ma Not requested Property Predetined Type Predetined Type Cloudfication Level Type Mark System Type System Type	Bestription Bestription Bottly Data Bottly Data Primary identifier of an object. Defines the object type, specific information about object Primary identifier of an object. Defines the object type, specific information about object. Defines the object type, specific onterview of prindefined types to turber classify the entity Classification code according to chosen classification system. Defines the specific neuron-code object object of the set to an abbit mammeric value that differentiate objects. Defines the specific optimized objects An abbit mammeric value that differentiate objects. Defines the specific optimized objects An abbit mammeric value that differentiate objects. Defines the specific optimized object An abbit value that differentiate objects. Defines the specific optimized object An abbit value that differentiate objects. Defines the specific optimized object An abbit value that differentiate objects. Defines the specific optimized object A specific of the specific optimized object A specific of the object of the specific optimized Defines the specific optimized object Defines the specific optimized object Definise additional objects Definised boject Definised Def	Data Type box text text text text text text text te	Units
Actor: Dbject: Seometrical information: Annotation Annotation Jacameter	Unment modelied to nominal size, 1 D Unment modelied to nominal size, 1 D D D D D D D D D D D D D D D D D D D	Ing elements ter risk Ter risk Description Addnity Data Primary identifier of an object. Defines the object type, specific information about object. Defines the object type, specific information about object. Nota this unity specific neuron-action of productived types to further classify the entity Classification code according to choosen classification system. Defines the reference level. An alphanumeric value that differentiate is objects. Defines the information of this are located on allt terminals, equipment and futures. Note A name that onlings y defines system it acutication of Supply All, network or a classification system. Defines the reference level. A name that onlings y defines system it acutication of Supply All, network or a classification of supply A name that onlings y defines system. It may be user-defined or automatically generated. Material The primary material used to construct the object. Finish section for this object. Here specification of the particle finish in for this object. Here specification of the specific level of the instruction of the system. Length of the specific entities between infect and outlet parts. The nominal height of the short segment. The moninal height of the short segment. The moninal height of the short segment. The moninal height of the duct segment. The moninal height of the short segment is to accord the entit object and the short segment. Total accord the entit object and the short segment. Cost Cost of workflower for initialing one value.	Data Type ioot test test test test test test test t	Units

Purpose: Actor:				
Actor:	Cost Estimation			
Object:	"Duct Fitting" / IfcDuctFitt	ing		
Geometrical information:	oucerning / neoucerni	ing.		
Detail:	Element modelind to nominal time	shape and spacing. Actual clearancess modelled. Nominal floor a	ad us l prestation a	amaata madali
Detail:	Construction of the state of th	anape and spacing. Actual clearancess modelled, ivorninal moor a	ind wait penetration e	ements model
Dimensionality:	3D			
Location: Appearance:	Absolute and relative to other build Color fill to distinguish different ma			
Parametric behaviour:	Not requested	and the second se		
Alphanumeric Information:				
dentification:				
Information content:	Property	Description Identity Data	Data Type	Units
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	stander die der alle	Holds the entity specific enumeration of predefined types to	0.0227	
	Predefined Type	further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	Level	Defines the reference level.	text	1
	Type Mark	An alphanumeric value that diferentiates objects.	text	1
		Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors		15 C
	System Classification	for air terminals could have a system classification of Supply	text	1
	System Type	Air, Return Air or Exhaust Air. Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined	text	1
	Service Providence	or automatically generated.	9/13897-1	a <u>. 28 -</u>
	System Abbreviation	A user-defined abbreviation for a system. Material	text	/
	Material	The primary material used to construct the object.	text	1
	Finish	Finish selection for this object. Here specification of the	text	1
	(8977)	surface finish for informational purposes. Dimensional Data	1925225	1
		The length of the object. Calculated at midpoint of cross-		
	Length	section and equal to the distance along the flow path from the port inlet to the port outlet. For junction fittings, it	numeric	mm
	1.55	the port inlet to the port outlet. For junction fittings, it indicates the length of the longest flow path.		
	Diameter / Width	The nominal diameter or width of the duct segment.	numeric	mm
	*#rotungs/ar/Height	The nominal height of the duct segment. Total area of the extruded surfaces of the object (not taking	numeric	mm
	Outer Surface Area	into account the end cap areas), normally generated as	numeric	mm ²
		perimeter * length. Performance Data	10.0000000	
			1.021525070	-
	Has Exterior Insulation	TRUE if the duct has exterior insulation. FALSE if it does not.	bolean	YES/NO
	*#Insulated/Insulation Material *It insulated/Insulation Thickness	The primary material used to construct the object. Thickness of insulation.	text	1
	"It insurance, insulation interness	Cost	numeric	mm
	Labor Cost	Cost of worldorce for installing one unit.	numeric	£
	Equipment Cost	Cost of equipment for installing one unit.	numeric	£
	Material Cost	Cost of material for installing one unit.	numeric	e
	Phase	Physing Identifies the phase in which the object is created.	text	1
Documentation:		mentiones are prime in which the surject is cleaned.	10A	1
Set of documents:	bill of quantities, bill of materials			
Information Delivery Milestone:	Construction			
Purpose:	Cost Estimation			
Actor:		V V		
Actor: Object:	"Air Terminal" / IfcAirTern	ninal		
Actor: Object: Geometrical information:				
Actor: Object: Geometrical information: Detail:	Element modelled to nominal size, t	ninal spacing. Representation can be simplified.		
Actor: Object: Geometrical information: Detail: Dimensionality:	Element modelled to nominal size, a	shape and spacing. Representation can be simplified.		
Actor: Object: Geometrical information: Detail:	Element modelled to nominal size, t	shape and spacing. Representation can be simplified.		
Actor: Object: Geometrical information: Detail: Dimensionality:	Element modelled to nominal size, a	shape and spacing. Representation can be simplified.		
Actor: Object: Geometrical information: Detail: Dimensionality:	Element modelled to nominal size, 3D Absolute and relative to other build	shape and spacing. Representation can be simplified.		
Actor: Object: Geometrical information: Detail: Dimensionality: Location:	Element modelled to nominal size, 30 Absolute and relative to other build Color Fill to distinguish different ma	shape and spacing. Representation can be simplified.		
Actor: Object: Geometrical information: Detail: Dimensionality: Location:	Element modelled to nominal size, 3D Absolute and relative to other build	shape and spacing. Representation can be simplified.		
Actor: Object: Geometrical information: Detail: Unimersionality: Location: Appearance: Parametric behaviour:	Element modelled to nominal size, 30 Absolute and relative to other build Color Fill to distinguish different ma	shape and spacing. Representation can be simplified.		
Actor: Object: Geometrical information: Details Details Details Details Details Appearance: Parametric behaviour: Appearance: Parametric behaviour:	Element modelled to nominal size, 30 Absolute and relative to other build Color Fill to distinguish different ma	shape and spacing. Representation can be simplified.		
Actor: Object: Geometrical information: Denal: Den	Element modelled to nominal size, 3D Absolute and relative to other build Color fill to distinguish different ma Not requested	shape and spacing. Representation can be simplified.	Data Type	Units
Actor: Object: Geometrical information: Denal: Den	Element modelled to nominal size, 30 Absolute and relative to other build Color Fill to distinguish different ma	uhape and spacing. Representation can be simplified.	Data Type	Units
Actor: Object: Geometrical information: Denal: Den	Element modelled to nominal size, 3D Absolute and relative to other build Color fill to distinguish different ma Not requested	uhape and spacing. Representation can be simplified. Ing elements terfais Description	Data Type text	Units /
Actor: Object: Geometrical information: Denal: Den	Element modelled to nominal size, 3D Absolute and relative to other build Color fill to distinguish different ma Not requested Property	uhape and spacing. Representation can be simplified. Ing elements terials Description Identity Data		
Actor: Object: Geometrical information: Denal: Den	Element modelled to nominal size, 30 Absolute and relative to other build Color fill to distinguish different ma Not requested Property Name Type	uhape and spacing. Representation can be simplified. Ing elements. teritals teritals Primary identifier of an object. Defines the object type, specific information about object. Toda's the entry edite, enumeration of prediefined types to	text text	/
Actor: Object: Geometrical information: Denal: Den	Element modelled to nominal size, 3D Absolute and relative to other build Color fill to distinguish different ma Not requested Property Name Type Predefined Type	uhape and spacing. Representation can be simplified. Ing elements terials Description Identity Data Primary identifier of an object. Defines the object type, specific information about object. Further classify the entity.	text text text	1 1 1
Actor: Object: Geometrical information: Denal: Den	Element modelled to nominal size, 30 Absolute and relative to other build Color fill to distinguish different ma Not requested Property Name Type	uhape and spacing. Representation can be simplified. Ing elements. teritals teritals Primary identifier of an object. Defines the object type, specific information about object. Toda's the entry edite, enumeration of prediefined types to	text text	/
Actor: Object: Geometrical information: Denal: Den	Element modelled to nominal size; 3D Absolute and relative to other build Color fill to distinguish different ma Not requested Property Name Type Predefined Type Classification Level	Anape and spacing. Representation can be simplified. Ing elements Erefais Description Identity Data Primary identifier of an object. Defines the object type, specific information about object. Total the entity, specific constrained of prodefined types to Author classify the entity. Defines the reference level.	text text text text text	1 1 1 1 1
Actor: Object: Geometrical information: Denal: Den	Element modelled to norrical size, 3D Absolute and relative to other build Color fill to distinguish different ma Not requested Property Name Type Predefined Type Classification	uhape and spacing. Representation can be simplified. Ling elements. Exists a series of the series	text text text text	1 1 1
Actor: Object: Geometrical information: Denal: Den	Element modelled to nominal size, 3D Absolute and relative to other build Color fill to distinguish different ma Not requested Property Name Type Predefined Type Classification Level Type Mark	and spacing. Representation can be simplified. Ing elements Eveland Evela	text text text text text text	/ / / / /
Actor: Object: Geometrical information: Denal: Den	Element modelled to nominal size; 3D Absolute and relative to other build Color fill to distinguish different ma Not requested Property Name Type Predefined Type Classification Level	Description Descriptin Descriptin Descriptin Descriptin Descriptin	text text text text text	1 1 1 1 1
Actor: Object: Geometrical information: Denal: Den	Element modelled to nominal size, 3D Absolute and relative to other build Color fill to distinguish different ma Not requested Property Name Type Predefined Type Classification Level Type Mark	Description Description Description Description Schrötz Data Primary identifier of an object: Defines the object type: apeol fic information about object. Holds the entry Defines the object type: apeol fic information about object. Holds the entry ClassRication code according to chosen classification typem. Defines the system for the convectors that are located on air An alphanumenic value that differentiates objects. Defines the system for the convectors that are located on air An alphanumenic value that differentiates objects. Defines the object type and type and type and type and type and the system. Defines the object type of the object type of the one objects. Schröder classes and the object type of type of the object type of t	text text text text text text	/ / / / /
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Information Delivery Milestone:	Construction			
Purpose:	Cost Estimation			
Actor:				
Object:	"Coil" / IfcCoil			
Geometrical information: Detail:	Element modelled to nominal size	ee, shape and spacing. Representation can be simplified.		
limensionality:	3D	al analysis and sharings were satisfied on the surface of		
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Alphanumeric Information:				
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nformation content:	Property	Description Identity Data	Data Type	Units
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1
	Classification	further classify the entity	text	1
	Level	Classification code according to chosen classification system. Defines the reference level.	text	1
	Type Mark	An alphanumeric value that diferentiates objects.	text	1
		Defines the system for the connectors that are located on air terminals, amigment and fictures. For example, connectors		
	System Classification	terminals, equipment and factures. For example, connectors for air terminals could have a system classification of Supply	text	/
	System Type	Air, Return Air or Exhaust Air. Type of system e.g., supply air.	text	/
	System Name	A name that uniquely defines system. It may be user-defined	text	/
	System Abbreviation	or automatically generated. A user-defined abbreviation for a system.	text	1
		Material		#05
	Material	The primary material used to construct the object.	text	1
	Length	Dimensional Data Length of the element.	numeric	mm
	Width	Width of the element.	numeric	mm
	Height	Height of the element.	numeric	mm
		Product Data	1	4
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
	MadalBalassas	An alphanumeric value for the name of the manufactured	2002	7
	ModelReference	item as used by the manufacturer.	text	0
	Labor Cost	Cost of workforce for installing one unit.	numeric	¢
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	Equipment Cost	Cost of equipment for installing one unit.		
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Object:	"Boiler" / IfcBoiler			
Geometrical information:	Element modelled to nominal siz	e, shape and spacing. Representation can be simplified.		
Dimensionality:	3D	e, snape and spacing, representation can be simplified.		
location:	Absolute and relative to other bu			
Appearance:	Color fill to distinguish different to Not requested	materials		
Parametric behaviour: Alphanumeric information:	Not requested			
dentification:		1		
nformation content:	Property	Description Identity Data	Data Type	Units
	Name	Primary identifier of an object.	text	1
	Type	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1
	1000 Contention	further classify the entity		
	Classification	Classification code according to chosen classification system.	text	/
	Level Type Mark	Defines the reference level. An alphanumeric value that differentiates objects.	text text	/
		Defines the system for the connectors that are located on air		
	System Classification	terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply	test	1
		Air, Return Air or Exhaust Air.		
	System Type	Type of system e.g., supply air. A name that uniquely defines system. It may be user-defined	text	/
	System Name	or automatically generated.	text	/
	System Abbreviation	A user-defined abbreviation for a system. Material	text	1
	Material	The primary material used to construct the object.	text	1
		Dimensional Data		
	Length Width	Length of the element. Width of the element.	numeric numeric	mm
	Height	Height of the element.	numeric	mm
		Product Data		
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
		An alphanumeric value for the name of the manufactured		
	ModelReference	item as used by the manufacturer.	test	1
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	Labor Cost Equipment Cost	Cost of workforce for installing one unit. Cost of equipment for installing one unit.	numeric numeric	e e
	Material Cost	Cost of material for installing one unit.	numeric	ε
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Information Delivery Milestone:	Construction			
Purpose:	Cost Estimation			
Actor:				
Object:	"Piping" / IfcPipeSegment			
Geometrical information:				
Detail: Dimensionality:	Element modelled to nominal size, : 30	shape and spacing. Actual clearancess modelled.		
Location:	Absolute and relative to other build	ling elements		
Appearance:	Color fill to distinguish different ma	terials		
Parametric behaviour: Alphanumeric Information:	Not requested			
identification:		• · · · · · · · · · · · · · · · · · · ·		
Information content:	Property	Description	Oata Type	Linits
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Bolds the entity specific enumeration of predefined types to	text	1
		further classify the entity	test	
	Classification	Classification code according to chosen classification system.	text	1
	Level	Defines the reference level. An alphanumeric value that differentiates objects.	text text	1
	Type Mark	Defines the system for the connectors that are located on air	Text	/
	System Classification	terminals, equipment and fotures. For example, connectors for air terminals could have a system classification of Supply Air, Beturn Air or Exhaust Air.	text	1
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	1	Material		
	Material	The primary material used to construct the object. Dimensional Data	text	/
	Length	Length of the element.	numeric	mm
	Diameter	The nominal diameter of the pipe segment.	numeric	mm
	Outer surface area	Total area of the extruded surfaces of the pipe (not taking into account the end cap areas), normally generated as perimeter * fength.	numeric	mm ^a
	Has Exterior Insulation	Performance Data TRUE if the duct has exterior insulation. FALSE if it does not.	bolean	VES/NO
	*If Insulated/Insulation Material	The primary material used to construct the object.	text	1
	*Finulated/Insulation Thickness	Thickness of insulation. Product Data	numeric	mm
	MocelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	test	7
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1
		Cost		
	Labor Cost	Cost of workforce for installing one unit.	numeric	c
	Equipment Cost	Cost of equipment for installing one unit.	numeric numeric numeric	с с с
	Equipment Cost Material Cost	Cost of equipment for installing one unit. Cost of material for installing one unit. Phasing	numeric numeric	¢
Documentation:	Equipment Cost	Cost of equipment for installing one unit. Cost of material for installing one unit.	numeric	¢
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Information Delivery Milestone:	Construction				
Purpose:	Cost Estimation				
Actor:					
Object:	"BathTub" / IfcSanitaryT	ferminal			
eometrical information:					
etail:		e, shape and spacing. Representation can be simplified.			
imensionality:	30 Absolute and relative to other building elements				
ocation: ppearance:	Absolute and relative to other building elements Color fill to distinguish different materials				
arametric behaviour:	Not requested	nusus ma			
Mphanumeric Information:					
dentification:					
	Property	Description Identity Data	Data Type	Units	
	Name	Primary identifier of an object.	text	Î.	
	Туре	Defines the object type, specific information about object.	text	1	
	-	Holds the entity specific enumeration of predefined types to		20	
	Predefined Type	further classify the entity	text	1	
	Classification	Classification code according to chosen classification system.	text	1	
	Level	Defines the reference level.	text	1	
	Type Mark	An alphanumeric value that diferentiates objects.	text	1	
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors	text	1	
	aystern classification	for air terminals could have a system classification of Supply	ERKE	. A.	
	System Type	Air, Return Air or Exhaust Air. Type of system e.g., supply air.	text	T	
	System Name	A name that uniquely defines system. It may be user-defined	text	1	
	System Abbreviation	or automatically generated. A user-defined abbreviation for a system.	text	1	
	system Abbreviacion	A user-defined abbreviation for a system, Material	TRUE		
	Color	Principal color of the object.	text	/	
	Material	The primary material used to construct the object.	text	1	
	1200000	Dimensional Data	yawaw	50202	
	Length Width	Length of the element. Width of the element.	numeric	mm	
	Depth	Depth of the element.	numeric	mm	
		Product Data			
	ModelLabel	An alphanumeric value representing the product, item or	text	1	
	wodecade	unit number assigned by the manufacturer of the product.	LEAC		
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1	
	Labor Cost	Cost Cost of workforce for installing one unit.	numeríc	e	
	Equipment Cost	Cost of equipment for installing one unit.	numeric	E	
	Material Cost	Cost of material for installing one unit.	numeric	e	
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	Name	Primary identifier of an object.	text	1		
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	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1		
	Classification	Classification code according to chosen classification system.	text	1		
	Level	Defines the reference level.	text	I		
	Type Mark	An alphanumeric value that differentiates objects. Defines the system for the connectors that are located on air	text	1		
	System Classification	terminals, equipment and factures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	7		
	System Type	Type of system e.g., supply air.	text	I		
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1		
	System Abbreviation	A user-defined abbreviation for a systen.	text	Ι		
	Sink Material	Material The primary material used to construct the object.	text	1		
		Dimensional Data				
	Length Width	Length of the element. Width of the element.	numeric	mm		
	Depth	Width of the element. Depth of the element.	numeric	mm		
		Product Data				
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	T.		
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	Ĩ		
		Cost	1202220			
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Erasmus Mundus Joint Master Degree Programme – ERASMUS+

European Master in Building Information Modelling BIM A+

nformation Delivery Milestone:	Construction			
turpose:	Cost Estimation			
Actor:				
Object:	"Urinal" / IfcSanitaryTer	minal		
Geometrical information:				
Detail:	Element modelled to nominal siz	e, shape and spacing. Representation can be simplified.		
Dimensionality: .ocation:	Absolute and relative to other be	uilding elements		
Appearance:	Color fill to distinguish different			
Parametric behaviour:	Not requested			
Alphanumeric Information:				
dentification: Information content:	Property	Description	Data Type	Units
	- Coperty	Identity Data	and the	
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to	text	1
	Trebenned type	further classify the entity		
	Classification	Classification code according to chosen classification system.	text	/
	Level	Defines the reference level.	text	1
	Type Mark	An alphanumeric value that differentiates objects. Defines the system for the connectors that are located on air	teat	1
	System Classification	terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply	text	/
	System Type	Air, Return Air or Exhaust Air. Type of system e.g., supply air.	text	1
	System Type System Name	A name that uniquely defines system. It may be user-defined	text	1
		or automatically generated.	1.52551	
	System Abbreviation	A user-defined abbreviation for a system. Material	text	/
	Material	The primary material used to construct the object.	text	7
		Dimensional Data		
	Length	Length of the element.	numeric	mm
	Width Depth	Width of the element. Depth of the element.	numeric	mm mm
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	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	/
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1
		Cost		
	Labor Cost Equipment Cost	Cost of workforce for installing one unit. Cost of equipment for installing one unit.	numeric	e
	Material Cost	Cost of material for installing one unit.	numeric	
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1
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information Delivery Milestone:	Construction			
urpose:	Cost Estimation			
Actor:	1			
Object:	"Lavatory" / IfcSanitary1	[erminal		
Geometrical information:				
Detail: Dimensionality:	Element modelled to nominal siz 3D	e, shape and spacing. Representation can be simplified.		
Jemensionality: Location:	Absolute and relative to other bu	uilding elements		
Appearance:	Color fill to distinguish different r	materials		
Parametric behaviour: Alphanumeric Information:	Not requested			
dentification:				
information content:	Property	Description	Data Type	Units
	Name	Identify Data	text	1
		Primary identifier of an object.	text	
	Туре	Defines the object type, specific information about object. Holds the entity specific enumeration of predefined types to	text	1
	Predefined Type	further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	Level	Defines the reference level.	text	1
	Type Mark	An alphanumeric value that differentiates objects; Defines the system for the connectors that are located on air	text	1
	System Classification	terminals, equipment and fixtures. For example, connectors	text	1
	a Manual a substances	for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	10230-0	1225
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a systen.	text	- t
	Valve Material	Material The primary material used to construct the object	text	1
	Water Closet Material	The primary material used to construct the object. The primary material used to construct the object.	text	1
	Seat Material	The primary material used to construct the object.	text	1
	Length	Dimensional Data	numeric	mm
	Width	Width of the element.	numeric	mm mm
	Height	Height of the element.	numeric	mm
		Product Data		
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	test	1
		An alphanumeric value for the name of the manufactured		
	ModelReference	item as used by the manufacturer.	text	1
	Labor Cost	Cost Cost of workforce for installing one unit.	numeric	e
	Equipment Cost	Cost of workforce for installing one unit.	numeric	e
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	Material Cost	Cost of material for installing one unit.	numeric	
		Phasing		
	Phase	Phasing Identifies the phase in which the object is created.	text	1
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Documentation:	Phase Phase bill of quantities, bill of materials Construction Cost Estimation "Shower" / IfcSanitaryTe Dement modelled to nominal siz 3D Color fill to distinguish different is Rot requested Property Name Type Prodefined Type Classification Level Type Mark System Classification System Vane System	Plasing Identifies the phase in which the object is created. identifies the phase in which the object is created. i erminal e, shape and spacing, Representation can be simplified. auding elements materials Description Interim Data Primary identifier of an object. Defines the object type, specific information about object. Points the object type, specific information about object. Defines the object type, specific information about object. Defines the object type approximation of predefined types to further daspipert and future. For example, connectors for all terminals goal have a option classification of Supply Air, Return. Air or Lindux Air. Type of system e.g., upply air. A name that uniquely defines system. It may be user-defined arautomatid generated. Material The primary material used to construct the object. The primary material used to construct the object. The primary material used to construct the object. Wath of the element. Weth of the element. Weth of the element. Weth of the element. Height of the element. Weth of the element.	Text Data Type Data Type text text text text text text text t	/ Units / / / / / / / / / / / / / / / / / / /
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Erasmus Mundus Joint Master Degree Programme – ERASMUS+

Information Delivery Milestone:	Construction			
urpose:	Cost Estimation			
Actor:				
Object: Geometrical information:	"Tank" / IfcTank			
Geometrica) information: Detail:	Element modelled to nominal siz	e, shape and spacing. Representation can be simplified.		
Dimensionality:	3D			
Location:	Absolute and relative to other but			
Appearance:	Color fill to distinguish different i	materials		
Parametric behaviour: Alphanumeric information:	Not requested			
identification:				
information content:	Property	Description	Data Type	Units
	Name	Identity Data		
		Primary identifier of an object.	text	/
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	Level	Defines the reference level.	text	1
	Type Mark	An alphanumeric value that diferentiates objects.	text	1
		Defines the system for the connectors that are located on air		
	System Classification	terminals, equipment and fatures. For example, connectors for air terminals could have a system classification of Supply	text	1
		Air, Return Air or Exhaust Air.		
	System Type	Type of system e.g., supply air. A name that uniquely defines system. It may be user-defined	text	1
	System Name	or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.	text	1
	Material	Material The primary material used to construct the object.	text	1
	watena	Dimensional Data	HEAK :	
	Length / Diametar	Length of the element.	numeric	mm
	Width / Diametar	Width of the element.	numeric	mm
	Height	Height of the element . Product Data	numeric	៣៣
	ModelEabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1
	HER CALEN	An alphanumeric value for the name of the manufactured	51.26	10
	ModelReference	Item as used by the manufacturer.	text	1
	1.0.0	Cost		6
	Labor Cost Equipment Cost	Cost of workforce for installing one unit. Cost of equipment for installing one unit.	numeric	6
	Material Cost	Cost of material for installing one unit.	numeric	e
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1
Documentation: Set of documents:	bill of quantities, bill of materials			
Information Delivery Milestone:	Construction			
Purpose:	Cost Estimation			
Actor:				
	"Cable Tray" / IfcCableV	arrierSegment		
Object:	"Cable Tray" / IfcCableV	arrierSegment		
		arrierSegment e, shape and spacing. Representation can be simplified.		
Object: Geometrical information: Detail: Dimensionality:	Element modelled to nominal siz 3D	e, shape and spacing. Representation can be simplified.		
Object: Geometrical information: Detail: Dimensionality: Location:	Element modelled to nominal siz 3D Absolute and relative to other bu	e, shape and spacing. Representation can be simplified. Jilding elements		
Object: Geometrical information: Detail: Dimensionality: Location: Appearance:	Element modelled to nominal siz 30 Absolute and relative to other bo Color fill to distinguish different i	e, shape and spacing. Representation can be simplified. Jilding elements		
Object: Geometrical information: Detail: Dimensionality: Location: Appearance: arametric behavioar:	Element modelled to nominal siz 3D Absolute and relative to other bu	e, shape and spacing. Representation can be simplified. Jilding elements		
Object: Geometrical information: Densitionality: Location: Apperance: Parametric behaviour: Alphanumetic Information: dentification:	Element modelled to nominal siz 3D Absolute and relative to other bu Color fill to distinguish different o Not requested	e, shape and spacing. Representation can be simplified. ultding elements materials		
Object: Geometrical information: Densitionality: Location: Apperance: Parametric behaviour: Alphanumetic Information: dentification:	Element modelled to nominal siz 30 Absolute and relative to other bo Color fill to distinguish different i	e, shape and spacing. Representation can be simplified. uitking elements materials Description	Data Type	Units
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Object: Geometrical information: Densitionality: Location: Apperance: Parametric behaviour: Alphanumetic Information: dentification:	Element modelled to nominal siz 30 Color fill to distinguish different n Not recuested Property Name	e, shape and spacing. Representation can be simplified. alkling elements materials Description territy Data Primary identifier of an object.	text	1
Object: Geometrical information: Densitionality: Location: Apperance: Parametric behaviour: Alphanumetic Information: dentification:	Element modelled to nominal siz 30 Color fill to distinguish different r Not recuested Property Name Type	e, shape and spacing. Representation can be simplified. alkling elements materials Description Elemits Data Primary identifier of an abject. Defines the object type, specific information about object.		7
Object: Geometrical information: Densitionality: Location: Apperance: Parametric behaviour: Alphanumetic Information: dentification:	Element modelled to nominal siz 30 Color fill to distinguish different n Not recuested Property Name	e, shape and spacing. Representation can be simplified. alkling elements materials Description territy Data Primary identifier of an object.	text	1
Object: Geometrical information: Densitionality: Location: Apperance: Parametric behaviour: Alphanumetic Information: dentification:	Element modelled to nominal siz 30 Color fill to distinguish different r Not recuested Property Name Type	e, shape and spacing. Representation can be simplified. Iliding elements materials Description Identity Data Primary identifier of an abject. Defines the object type, specific information about object. Holds the entity specific enumeration of aredefined types to	text text	7
Object: Geometrical information: Densitionality: Location: Apperance: Parametric behaviour: Alphanumetic Information: dentification:	Element modelled to nominal siz 30 Absolute and relative to other in Color fill to distinguish different in Not recuested Property Name Type Predefined Type	e, shape and spacing. Representation can be simplified. Ilding elements Bescription Elementy Data Primary identifier of an object. Defines the object type, specific information about object. Holds the entity apactific enumeration of predefined types to further classify the entity Classification code according to chosen classification system.	text text text text text text text text	1
Object: Seometrical information: Detail: Smensionality: Section: Opparance: arametric behaviour: Nphanumeric Information: deutfication:	Element modelled to nominal siz 30 Color fill to distinguish different i Not recuested Property Name Type Predefined Type Classification	e, shape and spacing. Representation can be simplified. Ilding elements Description Fermary identifier of an object. Primary identifier of an object. Defines the object type, specific information about object. Hods the entity apedic enumeration of prodefined types to further classify the entity	text text text	/ / /
Object: Seometrical information: Detail: Smensionality: Section: Opparance: arametric behaviour: Nphanumeric Information: deutfication:	Element modelled to nominal siz 30 Color fill to distinguish different i Not recuested Property Name Type Predefined Type Classification Level Type Mark	e, shape and spacing. Representation can be simplified.	text text text text text text text text) 1 1 1 1
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Object: Geometrical information: Densitionality: Location: Apperance: Parametric behaviour: Alphanumetic Information: dentification:	Element modelled to nominal siz 30 Absolute and relative to other build Color fill to distinguish different in Not requested Property Name Type Predefined Type Classification Level Type Mark	e, shape and spacing. Representation can be simplified. Iliding elements materials	text text text text text text text text	/ / / / /
Object: Geometrical information: Densitionality: Location: Apperance: Parametric behaviour: Alphanumetic Information: dentification:	Element modelled to nominal siz 30 Color fill to distinguish different in Not recuested Property Name Type Classification Level Type Mark Material Length / Diametar	e, shape and spacing. Representation can be simplified.	text text text text text text text text) 1 1 1 1
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Object: Geometrical information: Densitionality: Location: Apperance: Parametric behaviour: Alphanumetic Information: dentification:	Element modelled to nominal siz 30 Color fill to distinguish different i Not recuested Property Name Type Classification Level Type Mark Material Length / Diametar Helph:	e, shape and spacing. Representation can be simplified.	text text text text text text text text	/ / / / / / / / / / / / / / / / / / /
Object: Geometrical information: Densitionality: Location: Apperance: Parametric behaviour: Alphanumetic Information: dentification:	Element modelled to nominal siz 30 Absolute and relative to other bu Color fill to distinguish different in Not recuested Property Name Type Predefined Type Classification Level Type Mark Material Length / Diametar Height Labor Cost	e, shape and spacing. Representation can be simplified.	text text text text text text text text	/ / / / / / / / / / / / / / / / / / /
Object: Geometrical information: Densitionality: Location: Apperance: Parametric behaviour: Alphanumetic Information: dentification:	Element modelled to nominal siz 30 Absolute and relative to other bi Color fill to distinguish different in Not requested Property Name Type Predefined Type Classification Level Type Mark Material Length / Diametar Helph Labor Cost	e, shape and spacing. Representation can be simplified. Ilding elements materials Description Identity Data Primary identifier of an abject. Defines the object type, specific information about object: Holds the entity specific enumeration of prodefined types to further classify the entity Classification code according to chosen classification system. Defines the reference level. An a phannetic value that differentiates objects. Defines the reference level. An apparentic value that differentiates object. Differential The primary material used to construct the object. Differential Length of the element. Height of the element. Cost. C	text text text text text text text text	/ / / / / / / / / / / / / / / / / / /
Object: Demetrical information: Detail: Dimensionality: Location: Appearance: Parametric behaviour: Alphanumeric: Information:	Element modelled to nominal siz 30 Absolute and relative to other bu Color fill to distinguish different in Not recuested Property Name Type Predefined Type Classification Level Type Mark Material Length / Diametar Height Labor Cost	e, shape and spacing. Representation can be simplified.	text text text text text text text text	/ / / / / / / / / / / / / / / / / / /
Object: Geometrical information: Densitionality: Location: Apperance: Parametric behaviour: Alphanumetic Information: dentification:	Element modelled to nominal siz 30 Absolute and relative to other bi Color fill to distinguish different in Not requested Property Name Type Predefined Type Classification Level Type Mark Material Length / Diametar Helph Labor Cost	e, shape and spacing. Representation can be simplified.	text text text text text text text text	/ / / / / / / / / / / / / / / / / / /

Information Delivery Milestone:	Construction			
urpose:	Cost Estimation			
Actor:				
Object:	"Conduit" / IfcCableVar	rierSegment		
Seometrical information: Detail:	Element modelled to pominal d	ze, shape and spacing. Representation can be simplified.		
Dimensionality:	3D	ac, shape and spacing, representation can be simplified.		
	These is and coloring to other it	u didition elemente		
location:	Absolute and relative to other b			
Appearance:	Color fill to distinguish different	materials		
arametric behaviour: Mphanumeric Information:	Not requested			
dentification:				
nformation content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1
	Classification	The second s	tent	7
		Classification code according to chosen classification system.	text	- <u>8</u>
	Level Type Mark	Defines the reference level. An alphanumeric value that differentiates objects.	text	
	ype mark	An alphanumeric value that diferentiates objects. Material	ARAL	
	Material	The primary material used to construct the object.	text	1
		Dimensional Data		140
	Length	Length of the element.	numeric	mm
	Diametar	Diametar of the element.	numeric	mm
	Labor Cost	Cost of workforce for installing one unit.	numeric	E
	Equipment Cost	Cost of equipment for installing one unit.	numeric	6
	Material Cost	Cost of material for installing one unit.	numeric	
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1
ocumentation:				
iet of documents:	bill of quantities, bill of material	5		
the second se	bill of quantities, bill of material Construction	15		
et of documents: nformation Delivery Milestone:	and the second se	5		
et of documents: Information Delivery Milestone: Purpose:	Construction	5		
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iet of documents: Information Delivery Milestone: Purpose: Actor:	Construction			
et of documents: Information Delivery Milestone: Purpose:	Construction Cost Estimation			
et of documents: nformation Delivery Milestone: Purpose: Actor: Dbject: Sometrical information: betail:	Construction Cost Estimation "Switch" / IfcSwitching Element modelled to nominal si			
iet of documents: Information Delivery Milestone: Purpose: Actor: Dbject: Secometrical information: Detail: Simensional ty:	Construction Cost Estimation "Switch" / IfcSwitching Utement modelled to nominal st 30	Device te, shape and spacing. Representation can be simplified.		
iet of documents: Information Delivery Milestone: Purpose: Actor: Dbject: Seometrical information: Detail Winensionality: ocation:	Construction Cost Estimation	Device 2e, shape and spacing. Representation can be simplified. sudding elements		
et of documents: nformation Delivery Milestone: Purpose: Actor: Dbject: Seometrical information: betail: immensionality: ocation: uppearance:	Construction Cost Estimation "Switch" / IfcSwitching Usernent modelled to nominal si 3D Absolute and relative to other to Color IIII to distinguish different	Device 2e, shape and spacing. Representation can be simplified. sudding elements		
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et of documents: nformation Delivery Milestone: Purpose: Actor: Dbject: Seometrical information: uotali Seometrical information: oction: ppearance: arametric behaviour: Uphanumeric information: Seotification:	Construction Cost Estimation	Device Device and spacing, Representation can be simplified. Description Description Identity Data Primary identifier of an object. Defines the object type, specific information about object.		
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Information Delivery Milestone:	Construction			
urpose:	Cost Estimation			
Actor:				
Object:	"Transformer" / IfcTran	sformer		
Geometrical Information:				
Detail:	and the second se	ze, shape and spacing. Representation can be simplified.		
Dimensionality:	30			
Location: Appearance:	Absolute and relative to other a Color fill to distinguish different			
Parametric behaviour:	Not requested	(represented)		
Alphanumeric Information:				
dentification:		All and the second s		
Information content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	/
	Туре	Defines the object type, specific information about object.	text	1
	Devel-Devel Trees	Holds the entity specific enumeration of predefined types to	4074	1
	Predefined Type	further classify the entity	text	
	Classification	Classification code according to chosen classification system.	text	1
	Level	Defines the reference level.	text	1
	Type Mark	An alphanumeric value that diferentiates objects.	text	1
		Material		
	Material	The primary material used to construct the object.	text	1
	No.	Dimensional Data		
	Height	Height of the element.	numeric	mm
	Length	Length of the element,	numeric	mm
	Width	Width of the element.	numeric	mm
		Product Data		
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufactures of the needed.	text	1
	10000000000000000	unit number assigned by the manufacturer of the product.	672535	60
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1
		cost		2. XX
	Labor Cost	Cost of workforce for installing one unit.	numeric	£
	Equipment Cost	Cost of equipment for installing one unit.	numeric	¢
	Material Cost	Cost of material for installing one unit.	numeric	£
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1
Documentation:				
Set of documents:	bill of quantities, bill of materia	5		
Information Delivery Milestone:	Construction			
Purpose:	Construction Cost Estimation			
Purpose: Actor:	Cost Estimation			
Purpose: Actor: Object:				
Purpose: Actor: Object: Geometrical information:	Cost Estimation "Outlet" / IfcOutlet	con domain and coaring Reconstruction can be simplified.		
Purpose: Actor: Object: Geometrical information: Detail:	Cost Estimation	ze, shape and spacing. Representation can be simplified.		
Purpose: Actor: Object: Geometrical information: Detail: Dimensionality:	Cost Estimation "Outlet" / IfcOutlet Element modelled to nominal s 30			
Purpose: Actor: Object: Geometrical information: Detail:	Cost Estimation	sullding elements		
Purpose: Actor: Object: Geometrical information: Detail: Dimensionality: Location: Appearance:	Cost Estimation "Outlet" / IfcOutlet Element modelled to nominal s 30 Absolute and relative to other I	sullding elements		
Purpose: Actor: Object: Geometrical information: Detail: Dimensionality: Cocation: Appearance: Parametric behaviour:	Cost Estimation "Outlet" / IfcOutlet Element modelled to nominal s 30 Absolute and relative to other Calor fill to distinguish different	sullding elements		
Purpose: Actor: Geometrical information: Destail: Dimensionality: Location: Appearance: Parametric behaviour: Alphanumeric Information:	Cost Estimation "Outlet" / IfcOutlet Eement modelled to nominal s 30 Absolute and relative to other Calor fill to distinguish stifferent Not requested	building elements (materials		
Purpose: Actor: Dbject: Geometrical Information: Detail: Denesionality: ocation: Appearance: Arametric Schaviour: Aphanumeric Information: dentification:	Cost Estimation "Outlet" / IfcOutlet Element modelled to nominal s 30 Absolute and relative to other Calor fill to distinguish different	building elements imaterials Description	Data Type	Units
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Purpose: Actor: Object: Geometrical Information: Detail: Dimensionality: Coastion: Appearance: Arametric behaviour: Alphanumeric Information: detification:	Cost Estimation "Outlet" / IfcOutlet Element modelled to nominal s 30 Absolute and relative to other I Color fill to distinguish different Not requested Property	building elements materials Description Identity Data		
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Purpose: Actor: Object: Geometrical information: Detail: Dimensionality: Location: Appearance: Parametric behaviour: Alphanumeric Information: detailcation:	Cost Estimation	Suilding elements Immaterials	text text text text text text text numeric numeric	/ / / / / / / /
Purpose: Actor: Object: Geometrical information: Detail: Dimensionality: Location: Appearance: Parametric behaviour: Alphanumeric Information: detailcation:	Cost Estimation	Suilding elements Immaterials	text text text text text text text numeric numeric	
Purpose: Actor: Object: Geometrical Information: Detail: Dimensionality: Coastion: Appearance: Arametric behaviour: Alphanumeric Information: detification:	Cost Estimation Cost Estimation Cost Estimation Cost Estimation Cost Estimation Cost Estimation Element modelled to nominal s 30 30 Abolote and relative to other Color fill to distinguish sifterent Not requested Property Name Type Protefined Type Classification Classification Classification Classification Classification Level Type Mark Height Width Width Material ModelLabel ModelLabel	Description Identity Data Primary identifier of an object. Primary identifier of an object. Defines the object type, specific information about object. Noids the entity specific information about object. Noids the entity specific unmeration of gred elined types to further classification code according to chosen classification system. Defines the reference level. An alphanumeric value that differentiates objects. Material The primary material used to construct the object. Dimensional Data Height of the element. With of the element. Product Data An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product. An alphanumeric value for the name of the manufactured Item as used by the manufacture.	text text text text text text numeric numeric text	/ / / / / / / / / / / / / / / // //////
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Purpose: Actor: Object: Geometrical information: Detail: Dimensionality: Location: Appearance: Parametric behaviour: Alphanumeric Information: detailcation:	Cost Estimation Cost Estimation Cost Estimation Cost Estimation Cost Estimation Cost Estimation Element modelled to nominal s 30 Absolute and relative to other Color III to distinguish different Not requested Property Name Type Pretefined Type Classification Level Type Mark Usel Classification Level Type Mark Material Height Width ModelReference Labor Cost Labor Cost	Suilding elements Immaterials	text text text text text text numeric numeric text text text	/ / / / / / / / / / / / / / / / / / /
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Purpose: Actor: Object: Geometrical Information: Detail: Dimensionality: Coastion: Appearance: Arametric behaviour: Alphanumeric Information: detification:	Cost Estimation Cost Estimation Cost Estimation Cost Estimation Cost Estimation Cost Estimation Element modelled to nominal s 30 Absolute and relative to other Color III to distinguish different Not requested Property Name Type Pretefined Type Classification Level Type Mark Usel Classification Level Type Mark Material Height Width ModelReference Labor Cost Labor Cost	Suilding elements Immaterials	text text text text text text numeric numeric text text text	/ / / / / / / / / / / / / / / / / / /
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Information Delivery Milestone:	Construction			
Purpose: Actor:	Cost Estimation			
Actor				
Object:	"Light Fixture" / IfcLight	tFixture		
Geometrical Information:				
Detail:	Element modelled to nominal si	ize, shape and spacing. Representation can be simplified.		
Dimensionality:	30			
location:	Absolute and relative to other b			
Appearance:	Color fill to distinguish different	t materials		
Parametric behaviour: Alphanumeric Information:	Not requested			
dentification:				
nformation content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	1
	Type	Defines the object type, specific information about object.	text	1
	Predefined Type	Bolds the entity specific enumeration of predefined types to further classify the entity	text	1
	Classification	Classification code according to chosen classification system.	text	1
	Level	Defines the reference level.	lext	1
	Type Mark	An alphanumeric value that diferentiates objects.	text	
		Material		
	Material	The primary material used to construct the object.	text	1
		Dimensional Data	10	
	Height / Diametar	Height of the element.	numeric	mm
	Width / Diametar	Width of the element.	numeric	mm
		Product Deta		
	ModelLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	/
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1
		Cost		
	Labor Cost	Cost of workforce for installing one unit.	numeric	¢
	Equipment Cost	Cost of equipment for installing one unit.	numeric	6
	Material Cost	Cost of material for installing one unit Phasing	numeric	¢
	Dhaca		tout	1
Veramentation	Phase	Identifies the phase in which the object is created.	text	1
	Phase bill of quantities, bill of material	Identifies the phase in which the object is created.	text	7
Documentation: Set of documents:	bill of quantities, bill of material	Identifies the phase in which the object is created.	text	1
		Identifies the phase in which the object is created.	text	1
et of documents:	bill of quantities, bill of material	Identifies the phase in which the object is created.	text	1
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et of Jocuments: nformation Delivery Milestone: Purpose: Actor:	bill of quantities, bill of material Construction Cost Estimation	Identifies the phase in which the object is created.	text	1
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Information Delivery Milestone:	Construction						
Purpose:	Cost Estimation						
Actor:							
Object:	"Lamp" / IfcLamp						
Geometrical information:							
Detail	Element modelled to nominal s	ize, shape and spacing. Representation can be simplified.					
Dimensionality:	30						
ocation:	Absolute and relative to other t	au Absolute and relative to other building elements					
Appearance:	Color fill to distinguish different	r materials					
Parametric behaviour	Not requested						
Alphanumeric Information:							
Identification:							
Information content:	Property	Description	Data Type	Units			
		identity Data					
	Name	Primary identifier of an object.	text	1			
	Түре	Defines the object type, specific information about object.	text	/			
	Predefined Type	Holds the entity specific enumeration of predefined types to further classify the entity	text	1			
	Classification	Classification code according to chosen classification system.	text	/			
	Level	Defines the reference level.	text	1			
	Type Mark	An alphanumeric value that diferentiates objects.	text	1			
	Material						
	Material	The primary material used to construct the object.	text	1			
		Dimensional Data					
	Height / Diametar	Height of the element.	numeric	mm			
	Width / Diametar	Width of the element.	numeric	mm			
	Product Data						
	ModeiLabel	An alphanumeric value representing the product, item or unit number assigned by the manufacturer of the product.	text	1			
	ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer.	text	1			
	Cost						
	Labor Cost	Cost of workforce for installing one unit.	numeric	e			
	Equipment Cost	Cost of equipment for installing one unit.	numeric	E			
	Material Cost	Cost of material for installing one unit.	numeric	€			
		Phasing					
	Phase	Identifies the phase in which the object is created.	text	1			
Documentation:	4						

APPENDIX 7: III TIER: ENERGY ANALYSIS

REQUIREMENTS pecificator - Energy Analysis

	ENERGY ANALYSIS	
1	Location	
Model s	hall have specified Location/Project Address.	_
2	Weather Station	_
Model s	hall have weather station defined.	
3	Analytical Surface Resolution	
Analytic	al Surface Resolution should be less than the smallest dimension of any surface to be included in energy model.	
4	Surrounding buildings	_
All exte	nal shadowing buildings shall be modelled as mass blocks. They shall not contain mass floors.	
5	Ground Plane	_
Models	hall have ground plane defined.	
6	Massing	
All mass	es that represent analysed building shall have mass floors defined.	_
7	In-place families	
Using In	-place families should be avoided.	
	s a possibility of not being properly translated to energy analysis tool.	
8	Materials	
Every e	ement shall have defined material layers.	
9	Compund elements	
Building	Elements should be modelled as single integral element that contains layers.	
10	Sandwiched Elements	
In case	of two Wall layers being placed next to each other, only one shall be RoomBounding.	
11	Wall Centreline	
In case	of aligning walls that have different thickness, centerline shall be aligned, not the exterior edge.	
12	External Elements	
All Exte	nal Elements shall be marked as Is External.	
13	Gaps	
Gaps be	tween architectural elements should be avoided.	
		_
14	Exterior Walls	

REQUIREMENTSSpecificator - Energy Analysis

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walls th	hat are continous, but made of different materials, shall be modelled separately.
	ial Thermal Data is different.
16	Shading Devices
Shading	devices should be created using wall, roof or mullion families.
Shaung	devices should be created using wail, roor of multion families.
17	Ceiling Voids
Depend	ling on the type of analysis, modelling ceilings voids for energy analysis can be:
Not inc	uding ceilings in the energy model or setting them as non-room bounding.
NOT INC	during centings in the energy model of setting them as non-room bounding.
Setting	ceiling as room bounding and modelling ceiling void as Plenum Space.
Setting	ceiling as room bounding, but not modelling separate analytical space.
18	Columns
10	
Depend	ing on their size and impact on reducing the usable floor area, modelling columns for energy analysis should be avoided.
t includ	led, they should be set as non-room bounding.
*Exclud	ing columns for energy model does not have large impact on space volume, but avoids issues in analysis softwares.
	C
19	Room/Space Placing
All inter	ior areas shall have room placed e.g., shaft and unoccupied space as well.
	s are used for differing interior and exterior space. If there is no Room adjacent to another space, then the vertical wall is red as an Exterior wall.
	red as an Exterior wall.
conside	
conside 20	red as an Exterior wall.
20 20 Elemen	red as an Exterior wall. Room Bounding Elements ts that form boundaries of rooms shall be assigned as Room Bounding.
conside 20	red as an Exterior wall. Room Bounding Elements
20 Elemen 21	red as an Exterior wall. Room Bounding Elements ts that form boundaries of rooms shall be assigned as Room Bounding.
20 20 Elemen 21 Building	red as an Exterior wall. Room Bounding Elements ts that form boundaries of rooms shall be assigned as Room Bounding. Room Bounding Disabled g Elements located outside of the main building shall have room bounding disabled.
20 Elemen 21	red as an Exterior wall. Room Bounding Elements ts that form boundaries of rooms shall be assigned as Room Bounding. Room Bounding Disabled
20 20 Elemen 21 Building 22	red as an Exterior wall. Room Bounding Elements ts that form boundaries of rooms shall be assigned as Room Bounding. Room Bounding Disabled g Elements located outside of the main building shall have room bounding disabled. Area Computations
20 20 Elemen 21 Building 22	red as an Exterior wall. Room Bounding Elements ts that form boundaries of rooms shall be assigned as Room Bounding. Room Bounding Disabled g Elements located outside of the main building shall have room bounding disabled.
20 20 Elemen 21 Building 22	red as an Exterior wall. Room Bounding Elements ts that form boundaries of rooms shall be assigned as Room Bounding. Room Bounding Disabled g Elements located outside of the main building shall have room bounding disabled. Area Computations
20 Elemen 21 Building 22 Room A 23	red as an Exterior wall. Room Bounding Elements ts that form boundaries of rooms shall be assigned as Room Bounding. Room Bounding Disabled g Elements located outside of the main building shall have room bounding disabled. Area Computations urea shall be computed at the wall finish. Rooms inside Rooms
20 Elemen 21 Building 22 Room A 23	red as an Exterior wall. Room Bounding Elements ts that form boundaries of rooms shall be assigned as Room Bounding. Room Bounding Disabled g Elements located outside of the main building shall have room bounding disabled. Area Computations rea shall be computed at the wall finish.
20 Elemen 21 Building 22 Room A 23 Placing	red as an Exterior wall. Room Bounding Elements ts that form boundaries of rooms shall be assigned as Room Bounding. Room Bounding Disabled g Elements located outside of the main building shall have room bounding disabled. Area Computations rea shall be computed at the wall finish. Rooms inside Rooms rooms inside other Rooms shall be avoided.
20 Elemen 21 Building 22 Room A 23	red as an Exterior wall. Room Bounding Elements ts that form boundaries of rooms shall be assigned as Room Bounding. Room Bounding Disabled g Elements located outside of the main building shall have room bounding disabled. Area Computations urea shall be computed at the wall finish. Rooms inside Rooms
20 20 21 21 Building 22 23 23 Placing 24	red as an Exterior wall. Room Bounding Elements ts that form boundaries of rooms shall be assigned as Room Bounding. Room Bounding Disabled g Elements located outside of the main building shall have room bounding disabled. Area Computations rea shall be computed at the wall finish. Rooms inside Rooms rooms inside other Rooms shall be avoided.
20 20 21 21 8uilding 22 23 Placing 24 Room S Room S	red as an Exterior wall. Room Bounding Elements ts that form boundaries of rooms shall be assigned as Room Bounding. Room Bounding Disabled Elements located outside of the main building shall have room bounding disabled. Area Computations rea shall be computed at the wall finish. Rooms inside Rooms rooms inside other Rooms shall be avoided. Room Separation Line eparation Line shall be used only if there is no other element e.g., wall separating two spaces. eparation Line shall not be placed next to the wall.
20 20 21 21 8uilding 22 23 Placing 24 Room S Room S	red as an Exterior wall. Room Bounding Elements ts that form boundaries of rooms shall be assigned as Room Bounding. Room Bounding Disabled g Elements located outside of the main building shall have room bounding disabled. Area Computations rea shall be computed at the wall finish. Rooms inside Rooms rooms inside other Rooms shall be avoided. Room Separation Line eparation Line shall be used only if there is no other element e.g., wall separating two spaces.
20 20 21 21 8uilding 22 23 Placing 24 Room S Room S *This ca	Room Bounding Elements ts that form boundaries of rooms shall be assigned as Room Bounding. Room Bounding Disabled g Elements located outside of the main building shall have room bounding disabled. Area Computations trea shall be computed at the wall finish. Rooms inside Rooms rooms inside other Rooms shall be avoided. Room Separation Line eparation Line shall be used only if there is no other element e.g., wall separating two spaces. eparation Line shall not be placed next to the wall. an result in bounding issues.
20 20 21 21 8uilding 22 23 23 Placing 24 Room S Room S	red as an Exterior wall. Room Bounding Elements ts that form boundaries of rooms shall be assigned as Room Bounding. Room Bounding Disabled Elements located outside of the main building shall have room bounding disabled. Area Computations rea shall be computed at the wall finish. Rooms inside Rooms rooms inside other Rooms shall be avoided. Room Separation Line eparation Line shall be used only if there is no other element e.g., wall separating two spaces. eparation Line shall not be placed next to the wall.

Erasmus Mundus Joint Master Degree Programme – ERASMUS+

REQUIREMENTSSpecificator - Energy Analysis

26	Space
	shall be modelled from finished floor to finished ceiling. In case the space contains suspended ceiling, spaces shall be made r the room space and the plenum area.
27	Space overlap
Spaces	shall not overlap. Gross area space objects shall not be included.
28	Space Phasing
All spa	es shall be in the same Project Phase as the Project Information.
29	Zone-Based Modelling
	es with similar thermal and space characteristics such as solar orientation, occupancy, lighting, and equipment shall be

Information Delivery Milestone:	Design					
Purpose:	Energy Analysis					
Actor:						
	lin II / If n					
Object:	"Space" / IfcSpace					
Beometrical information:	Conclified volume conversetation. A	to dollard new set of the taxes of the mount of the second set of the second second second second second second				
etail:	Simplified volume representation. Modelled accurately in terms of the overall geometry and dimensions. 3D					
imensionality: ocation:	Absolute and relative to other building elements					
ppearance:	Color fill to distinguish different materials					
arametric behaviour:	Not requested					
Iphanumeric Information:						
entification:						
formation content:	Property	Description	Data Type	Units		
		Identity Data				
	Name	Primary identifier of an object.	text	1		
	Type	Defines the object type, specific information about object.	text	1		
		An assigned room number. This value must be unique for	0			
	Room Number	each room in a project.	text	/		
	Room Name	The room name e.g., Conference Room.	text	1		
	Occupancy Type	Occupancy type for this object.	text	/		
	Type of Ventilation	The type of ventilation e.g., natural.	text	1		
	Zone Name	The name of the Zone this Space is a part of.	text	1		
		Material Data		0		
	Floor Covering	Label to indicate the material or finish of the space flooring.	text	1		
	Wall Covering	Label to indicate the material or finish of the space walls covering.	text	1		
	Ceiling Covering	Label to indicate the material or finish of the space ceiling	text	1		
		covering.		,		
		Dimensional Data		- 342		
	GrossPlannedArea	Total planned gross area for the space. Used for programming the space.	numeric	m²		
	NetPlannedArea	Total planned net area for the space. Used for programming the space.	numeric	m²		
		Occupancy Data		ļļ.		
	Occurrence Number	Number of people required for the activity assigned to this	aumaria	1		
	Occupancy Number	space.	numeric	/		
	Occupancy Time for Day	The amount of time during the day that the activity is required within this space.	numeric	h		
		Analytical Data				
		Indication whether the element is designed as plenum space				
	is Plenum	(TRUE) or not (FALSE).	boolean	YES/NO		
	Is External	Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). If (TRUE) it is an external	boolean	YES/NO		
		element and faces the outside of the building.				
	is Occupied	Indicates if the space is occupiable or not.	boolean	YES/NO		
	Natural Ventilation	Indication whether the space is required to have natural	boolean	YES/NO		
	9 1927 20 - 1928 (1921	ventilation (TRUE) or mechanical ventilation (FALSE). Indication whether this space requires air conditioning		T Westerators		
	Air Conditioning	provided (TRUE) or not (FALSE).	boolean	YES/NO		
		Thermal Data				
	Space Temperature Max	Maximal temperature of the space or zone, that is required from user/designer view point. If no summer or winter space temperature requirements are given, it applies all year, otherwise for the intermediate period.	numeric	°C		
	Space Temperature Min	Minimal temperature of the space or zone, that is required from user/designer view point. If no summer or winter space temperature requirements are given, it applies all year, otherwise for the intermediate period.	numeric	°C		
		Ventilation Data				
	TotalAirflow	The total design supply air flowrate required for the system for either heating or cooling conditions, whichever is greater.	numeric	m3/s.		
	EnergyGainTotal	The total amount of energy gains for the spaces served by the system during the peak cooling conditions, plus any system- level total energy gains.	numeric	w		
	Air flow rate required during the peak cooling conditions	The amount of air that needs to be circulated through a cooling system.	numeric	m3/s		
	Air flow rate required during the peak heating conditions	The amount of air that needs to be circulated through a heating system.	numeric	m3/s		
	Design exhaust air flow rate	The volume of air that needs to be removed from a space or system to achieve optimal conditions.	numeric	m3/s		
	Phase	Phasing. Identifies the phase in which the object is created.	text	1		

nformation Delivery Milestone:	Design						
urpose:	Energy Analysis						
ctor:							
bject:	"Zone" / IfcZone						
eometrical information:	Lone / Helbite						
etail:	Simplified volume representation. M	Addelled accurately in terms of the overall geometry and dimension	ons				
imensionality:	3D						
ocation:	Absolute and relative to other buildi						
	Color fill to distinguish different mat						
ppearance:	Not requested	lenais					
arametric behaviour:	Not requested						
Iphanumeric Information:							
entification:	1						
formation content:	Property	Description	Data Type	Units			
	1-26-05-05-0	Identity Data					
	Name	Primary identifier of an object.	text	/			
	Туре	Defines the object type, specific information about object.	text	1			
	Occupancy Type	Occupancy type for this object.	text	1			
	Type of Ventilation	The type of ventilation e.g., natural.	text	/			
	Type of Ventilation	Dimensional Data	UEAL	1			
	Volume		numerie	m²			
	Volume	Volume of the Zone.	numeric	1.505.0			
	GrossPlannedArea	Total planned gross area for the Zone.	numeric	m ²			
	NetPlannedArea	Total planned net area for the Zone.	numeric	m²			
		Analytical Data					
	Is Occupied	Indicates if the space is occupiable or not.	boolean	YES/NO			
		Thermal Data					
		Maximal temperature of the space or zone, that is required					
	Space Temperature Max	from user/designer view point. If no summer or winter space temperature requirements are given, it applies all year,	numeric	*C			
		otherwise for the intermediate period.					
		Minimal temperature of the space or zone, that is required					
	Space Temporature Min	from user/designer view point. If no summer or winter space	numoria	*C			
	Space Temperature Min	temperature requirements are given, it applies all year,	numeric	C.			
		otherwise for the intermediate period.					
		Cooling and Heating Data					
		Temperature at which the system will maintain the cooling in					
	Cooling Set Point	all spaces in the zone. You can specify only one set point per	numeric	°C			
	cooming set i onit	zone because a zone controls its spaces using a single	Homene				
		thermostat. A cooling set point is specified for each zone.					
		Supply air temperature used to cool all spaces in the zone. A					
	Cooling Air Temperature	cooling air temperature is specified for each zone.	numeric	°C			
		Temperature at which the system will maintain the heating in					
	Heating Set Point	all spaces in the zone. You can specify only one set point per	numeric	*C			
		zone because a zone controls its spaces using a single					
		thermostat. A heating set point is specified for each zone.					
		Supply air temperature used to heat all spaces in the zone. A	C-4-00584	15645			
	Heating Air Temperature	heating air temperature is specified for each zone.	numeric	°C			
		Outdoor Air Data					
		The amount of outdoor air required for each person (in a					
	Minimum Outdoor Air per Person	space) for all spaces in the zone.	numeric	L/s/person			
	Minimum Outdoor Air per Area	The amount of outdoor air per occupied square area of all spaces in the zone. This value is specified for each zone.	numeric	L/s/m ²			
		The number of times per hour that the air volume of all	Constanting	xattan u			
	Minimum Air Changes	occupied spaces in the zone is replaced. The value is specified	numeric	ACH			
		for each zone.					
		Mechanical - Airflow Data	a transmitter and				
	Calculated Supply Airflow	The total supply airflow for the zone.	numeric	m³/s			
	Claculated Supply Airflow per area	The Calculated Supply Airflow of the zone divided by the total	numeric	m³/s			
		area of the zone. Phasing	(CONTRACT)	1016/03			
		1005070					
	Phase	Identifies the phase in which the object is created.	text	/			

Information Delivery Milestone:	Design					
Purpose:	Energy Analysis					
Actor:						
Object:	"Wall" / IfcWall					
Geometrical information:						
Detail:	Simplified volume representation.	Modelled accurately in terms of the overall geometry and thickne	55.			
Dimensionality:	3D					
ocation:	Absolute and relative to other buil	lding elements				
ppearance:	Color fill to distinguish different m	aterials				
arametric behaviour:	Not requested					
Alphanumeric Information:						
dentification:	2					
nformation content:	Property	Description	Data Type	Units		
		Identity Data				
	Name	Primary identifier of an object.	text	1		
	Туре	Defines the object type, specific information about object.	text	1		
	Zone Name	The name of the Zone this Wall is a part of.	text	1		
	Space Name	The name of the Zone this Wall is a part of.	text	1		
	Material					
		Finish selection for this object. Here specification of the				
	Finish	surface finish for informational purposes.	text	/		
	Substrate	The primary material used as a substrate.	text	/		
	Thermal/Air Layer	The primary material used as a thermal layer.	text	1		
	Membrane Layer	The primary material used as a membrane layer.	text	1		
	Structure	The primary material used to construct the structural layer.	text	Ĺ		
	Material Thermal Data					
	*Depe	nding on the type of material, Thermal Data information requirem	nents may very.			
	Thermal Conductivity	Specifies the abilitty of material to conduct heat.	numeric	W/m·K		
	Specific Heat	Heat energy per unit mass (typically 1 kg) required to raise the temperature of a substance by one degree Celsius. The higher the specific heat capacity of a substance, the more energy is required to raise its temperature.	numeric	J/kg°C		
	Density	Substance's mass per unit of volume.	numeric	kg/l		
	Emissivity	The emissivity of the surface of a material is its effectiveness in emitting energy as thermal radiation and varies between	numeric	/		
		0.0 and 1.0.				
		Analytical Data				
	Heat Transfer Coefficient(U)	Coefficient for calculating heat transfer, typically by convection or phase change between a fluid and a solid.	numeric	W/(m ² *K)		
	Thermal Resistance®	The temperature difference by which an object or material resists a heat flow.	numeric	(m²*K)/W		
	Thermal Mass	Specifies the abbility of an element to store heat, the product of each material layer mass, and specific heat capacity.	numeric	kg ft²/(s²K)		
		Dimensional Data				
	Layer thickness	Thickness of each individual layer of the wall.	numeric	mm		
	Gross Side Area	Area of the wall as viewed by an elevation view of the middle plane of the wall. It does not take into account any wall madifications (such as analysis)	numeric	m²		
	Gross Volume	wall modifications (such as openings). Volume of the wall, without taking into account the openings and the connection geometry.	numeric	m³		
		Performance Data				
	ls External	Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). If (TRUE) it is an external	boolean	YES/NO		
	Is Room Bounding	element and faces the outside of the building. Indicates whether the object is room bounding (TRUE) or not (FALSE).	boolean	YES/NO		
		Phasing				
	Phase	Identifies the phase in which the object is created.	text	/		
Documentation:		20 20				

Analysis					
ng" / IfcCovering					
ing / necovering					
volume representation	. Modelled accurately in terms of the overall geometry and dimens	lions			
	5 5				
and relative to other bui	ilding elements				
o distinguish different m					
ested					
Property	Description	Data Type	Units		
Topoley	Identity Data	butto (fpc	onno		
Name	Primary identifier of an object.	text	1		
the second second		and a second			
Туре	Defines the object type, specific information about object.	text	/		
Zone Name	The name of the Zone this Wall is a part of.	text	/		
Space Name	The name of the Zone this Wall is a part of.	text	1		
	Material				
Finish	Finish selection for this object. Here specification of the	text	7		
(2003/25)) 	surface finish for informational purposes.	(2000) (1000)	2. 		
Substrate	The primary material used as a substrate.	text	1		
Thermal/Air Layer	The primary material used as a thermal layer.	text	1		
Membrane Layer	The primary material used as a membrane layer.	text	/		
Structure	The primary material used to construct the structural layer.	text	1		
Structural Deck	The primary material used as a structure deck.	text	1		
Material Thermal Data					
*Depending on the type of material, Thermal Data information requirements may very.					
ermal Conductivity	Specifies the abilitty of material to conduct heat.	numeric	W/m·K		
the ground/Soil Thermal Conductivity	Specifies the abilitty of material to conduct heat.	numeric	W/m·K		
Specific Heat	Heat energy per unit mass (typically 1 kg) required to raise the temperature of a substance by one degree Celsius. The higher the specific heat capacity of a substance, the more energy is required to raise its temperature.	numeric	J/kg*C		
Density	Substance's mass per unit of volume.	numeric	kg/l		
Emissivity	The emissivity of the surface of a material is its effectiveness in emitting energy as thermal radiation and varies between	numeric	1		
Emissivity	0.0 and 1.0.	mannenc			
	Analytical Data				
Transfer Coefficient(U)	Coefficient for calculating heat transfer, typically by convection or phase change between a fluid and a solid.	numeric	W/(m ² *K)		
nermal Resistance*	The temperature difference by which an object or material	numeric	(m²*K)/W		
	resists a heat flow. Specifies the abbility of an element to store heat, the	numene	(
Thermal Mass	product of each material layer mass, and specific heat	numeric	kg ft²/(s²K)		
	capacity. Dimensional Data		I		
Thickness	Nominal thickness (or width) of the plate.	numeric	mm		
	Sum of all net areas of the covering facing the space. All				
Area	openings that is included in the covering are subtracted.	numeric	m²		
Volume	Net volume of the flooring. All openings that is included in the covering are subtracted.	numeric	m ^s		
	Performance Data		k		
ls External	Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). If (TRUE) it is an external element and faces the outside of the building.	boolean	YES/NO		
s Room Bounding	Indicates whether the object is room bounding (TRUE) or not	boolean	YES/NO		
Phase	Identifies the phase in which the object is created.	text	1		
2015177771		1011010			
_		Phase Identifies the phase in which the object is created.	Keen Bounding Doolean Phasing Identifies the phase in which the object is created. text		

Information Delivery Milestone:	Design					
Purpose:	Energy Analysis					
Actor:						
Object:	"Ceiling" / IfcCovering					
Geometrical information:						
etail:	Simplified volume representation.	Modelled accurately in terms of the overall geometry and dimens	ions.			
imensionality:	3D					
ocation:	Absolute and relative to other buil	lding elements				
ppearance:	Color fill to distinguish different m	aterials				
arametric behaviour:	Not requested					
Uphanumeric Information:						
lentification:						
nformation content:	Property	Description	Data Type	Units		
		Identity Data				
	Name	Primary identifier of an object.	text	1		
		Defines the object type, specific information about object.	text	1		
	Туре	Dennes the object type, specific information about object.	text	- /		
	Zone Name	The name of the Zone this Wall is a part of.	text	1		
	Space Name	The name of the Zone this Wall is a part of.	text	1		
	Material					
	Finish	Finish selection for this object. Here specification of the	text	1		
		surface finish for informational purposes.	a	1.177		
	Substrate	The primary material used as a substrate.	text	/		
	Thermal/Air Layer	The primary material used as a thermal layer.	text	6		
	Membrane Layer	The primary material used as a membrane layer.	text	1		
	Structure	The primary material used to construct the structural layer.	text	1		
	Structural Deck	The primary material used as a structure deck.	text	1		
	Material Thermal Data					
	*Depending on the type of material, Thermal Data information requirements may very.					
	Thermal Conductivity	Specifies the abilitty of material to conduct heat.	numeric	W/m-K		
	Specific Heat	Heat energy per unit mass (typically 1 kg) required to raise the temperature of a substance by one degree Celsius. The higher the specific heat capacity of a substance, the more energy is required to raise its temperature.	numeric	J/kg*C		
	Density	Substance's mass per unit of volume.	numeric	kg/l		
	Emissivity	The emissivity of the surface of a material is its effectiveness in emitting energy as thermal radiation and varies between 0.0 and 1.0.	numeric	1		
		Analytical Data				
	Heat Transfer Coefficient(U)	Coefficient for calculating heat transfer, typically by convection or phase change between a fluid and a solid.	numeric	W/(m ²⁺ K)		
	Thermal Resistance*	The temperature difference by which an object or material resists a heat flow.	numeric	(m²*K)/W		
	Thermal Mass	Specifies the abbility of an element to store heat, the product of each material layer mass, and specific heat capacity.	numeric	kg ft²/(s²K)		
	_	Dimensional Data				
	Layer thickness	Thickness of each individual layer of the wall.	numeric	mm		
	Thickness	Nominal thickness (or width) of the plate.	numeric	mm		
	Area	Sum of all net areas of the covering facing the space. All openings that is included in the covering are subtracted.	numeric	m²		
		Phasing				
	Phase	Identifies the phase in which the object is created.	text	1		

Information Delivery Milestone				
Purpose:	Energy Analysis			
ictor:				
bject:	"Door" / IfcDoor			
eometrical information:	Cimplified volume representation	Modelled accurately in terms of the overall geometry and dimens	lans	
etail: imensionality:	3D	widdened accurately in terms of the overall geometry and dimens	ions.	
ocation:	Absolute and relative to other buil	lding elements		
ppearance:	Color fill to distinguish different m			
arametric behaviour:	Not requested	Min 2014 Ad 2 Aleman		
Iphanumeric Information:				
lentification:				
formation content:	Property	Description	Data Type	Units
		identity Data	000000	
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
		Material		
	Panel Material	The primary material used to construct the panel.	text	1
	, uncontribution	The printing material about to construct the purion	(CRC	,
	Frame Material	The primary material used to construct the frame.	text	1
	Frame Finish	Finish selection for this object. Here specification of the	text	1
		surface finish for informational purposes.	19673.	
	Panel Finish	Finish selection for this object. Here specification of the surface finish for informational purposes.	text	1
	Hardware Material	The primary material of the hardware.	text	1
		Material Thermal Data		
	*Depe	ending on the type of material, Thermal Data information requiren	nents may very.	
	Thermal Conductivity	Specifies the ability of material to conduct heat.	numeric	W/m-K
	Specific Heat	Heat energy per unit mass (typically 1 kg) required to raise the temperature of a substance by one degree Celsius. The higher the specific heat capacity of a substance, the more energy is required to raise its temperature.	numeric	J/kg°C
	Density	Substance's mass per unit of volume.	numeric	kg/i
		The emissivity of the surface of a material is its effectiveness		
	Emissivity	in emitting energy as thermal radiation and varies between	numeric	1
	1	0.0 and 1.0. Analytical Data		
		Coefficient for calculating heat transfer, typically by		
	Heat Transfer Coefficient(U)	convection or phase change between a fluid and a solid.	numeric	W/(m ² *K)
	Thermal Resistance®	The temperature difference by which an object or material resists a heat flow.	numeric	(m²*K)/W
	Thermal Mass	Specifies the abbility of an element to store heat, the product of each material layer mass, and specific heat capacity.	numeric	kg ft²/(s²K)
		Dimensional Data		
	Height	Total outer heigth of the door lining.	numeric	mm
	Width	Total outer width of the door lining. Total area of the outer lining of the door.	numeric	mm m²
	Alea	*If Glazing	numeric	in.
	Glass Thickness	Width of glass panel, measured from inside of the panel to the outside i.e. parallel to the window (elevation) plane.	numeric	mm
	Solar Heat Gain Coefficient	Indicates the fraction of incident solar radiation a window lets through that is then directly transmitted, absorbed and released inward.	numeric	1
	Solar Diffusing	Indication whether the beam solar radiation incident on the glass is transmitted as hemispherically diffuse radiation with no beam component (TRUE) or as beam radiation with no diffuse component (FALSE). If YES the glass is translucent, if NO the glass is transparent.	boolean	YES/NO
	Solar Reflectance	The ratio of incident solar radiation that is reflected by a	numeric	ratio
	Solar Absorbtion	glazing system. The ratio of incident solar radiation that is absorbed by a glazing system. It is the sum of the absorption distributed to	numeric	ratio
	Visual Light Reflectance	the exterior (a) and to the interior (qi). Fraction of the visible light that is reflected by the glazing at normal incidence. It is a value without unit.	numeric	1
	Visual Light Transmittance	Indicates the amount of visible light that passes through a glazing system.	numeric	%
	ls External	Performance Data Indication whether the element is designed for use in the exterior (TRUE) or not (FALSE). If (TRUE) it is an external	boolean	YES/NO
		element and faces the outside of the building. Phasing		
	Phase	Identifies the phase in which the object is created.	text	1

nformation Delivery Mileston Purpose:	e: Design Energy Analysis			
ctor:	miner B1 - maritons			
bject:	"Window" / IfcWindow			
cometrical information:				
tail:	Simplified volume representation. M	odelled accurately in terms of the overall geometry and dimension	ons.	
mensionality:	3D			
cation:	Absolute and relative to other buildin	ng elements		
ppearance:	Color fill to distinguish different mate	erials		
arametric behaviour:	Not requested			
lphanumeric Information:				
entification:				_
formation content:	Property	Description	Data Type	Units
	-	Identity Data		
	Name	Primary identifier of an object.	text	/
	Туре	Defines the object type, specific information about object.	text	1
	OpeningType	Defines whether the window swings inside or away of the	text	1
	Openingrype	room.	text	
		Material		
	Frame Material	The primary material used to construct the frame. Finish selection for this object. Here specification of the	text	/
	External Frame Finish	surface finish for informational purposes.	text	1
	internal Frame Finish	Finish selection for this object. Here specification of the	text	1
		surface finish for informational purposes.		
	Sill Material	The primary material used to construct the sill. The primary material used to construct the stool.	text	1
	Stool Material Hardware Material	The primary material used to construct the stool. The primary material of the hardware.	text	
	and the second sec	The primary material of the hardware. Name of the gas by which the gap between two glass layers is	text	/
	Fill Gas	filled.	text	1
		Material Thermal Data		
	*Deper	iding on the type of material, Thermal Data information requirer	nents may very.	
	Thermal Conductivity	Specifies the ability of material to conduct heat.	numeric	W/m-K
		Heat energy per unit mass (typically 1 kg) required to raise		
	Specific Heat	the temperature of a substance by one degree Celsius. The	numeric	J/kg*C
	opeone ried.	higher the specific heat capacity of a substance, the more	C. C	and c
		energy is required to raise its temperature.		
	Density	Substance's mass per unit of volume.	numeric	kg/l
	potentidor.	The emissivity of the surface of a material is its effectiveness	numeric	
	Emissivity	in emitting energy as thermal radiation and varies between 0.0 and 1.0.	numeric	/
		Analytical Data		
	Thermal Resistance	The temperature difference by which an object or material	numeric	(m ² *K)/M
	i nermai riesistance	resists a heat flow.	numenc	fun PM A
	Solar Heat Gain Coefficient	Indicates the fraction of incident solar radiation a window lets through that is then directly transmitted, absorbed and	numeric	1
	Solar Heat Gabricoenicient	released inward.	manners.	1
		Indication whether the beam solar radiation incident on the		
		glass is transmitted as hemispherically diffuse radiation with		
	Solar Diffusing	no beam component (TRUE) or as beam radiation with no diffuse component (FALSE). If YES the glass is translucent, if	boolean	YES/NO
		NO the glass is transparent.		
	Solar Reflectance	The ratio of incident solar radiation that is reflected by a	numeric	ratio
	John Henetonike	glazing system.	markers	TELM
	Solar Absorption	The ratio of incident solar radiation that is absorbed by a glazing system. It is the sum of the absorption distributed to	numeric	ratio
	Sour Hospitation	the exterior (a) and to the interior (gi).	- Hallache	THE REAL
	Heat Transfer Coefficient	Coefficient for calculating heat transfer, typically by	numeric	W/(m ² *K
		convection or phase change between a fluid and a solid.	that the the	MARIN S
	Visual Light Reflectance	Fraction of the visible light that is reflected by the glazing at normal incidence. It is a value without unit.	numeric	1
		Indicates the amount of visible light that passes through a		
	Visual Light Transmittance	glazing system.	numeric	%
		Dimensional Data		
	Height	Total outer heigth of the window lining.	000000000000000000000000000000000000000	mm
	Width	Total outer width of the window lining.	numeric	mm
	Glass Thickness	Width of glass panel, measured from inside of the panel to the	numeric	mm
	GIGGE FINARTIESS	outside Le. parallel to the window (elevation) plane.	estimate.	, imi
		Width of panel frame, measured from inside of panel (at	- approximates	
	Frame Thickness	glazing) to outside of panel (at lining), i.e. parallel to the	numeric	mm
	Area	window (elevation) plane. Total area of the outer lining of the window.	numeric	m²
	Giazing Area	Total area of the glazing.	numeric	m,
	Frame Area	Total area of the glazing. Total area of the frame.	numeric	m²
		Performance Data		
	Anapologica an	Indication whether the element is designed for use in the	1.000	
	ls External	exterior (TRUE) or not (FALSE). If (TRUE) it is an external	boolean	YES/NO
		element and faces the outside of the building.		
	Is Tempered	Indication whether the element is tempered (TRUE) or not (FALSE).	numeric	1
	Is Laminated	Indication whether the glass is layered with other materials	boolean	YES/NO
	is Laminated	(TRUE) or not (FALSE).	oouean	restrio
	Is Coated	Indication whether the glass is coated with a material (TRUE) or not (FALSE).	boolean	YES/NO
	n	or not (FALSE). Indication whether the glass includes a contained wire mesh	Lancas	
	Is Wired	to prevent break-in (TRUE) or not (FALSE).	boolean	YES/NO
		* If Shading		
	Shading Type	Specifies the type of the shading e.g., interior blind.	text	1
	741,9718-2691, 02874		110.22016	180
	Shading Control Type	Specifies how the shading device is controlled. Indication whether scheduled shading control exists (TRUE) or	text	/
	Shading Control is scheduled	indication whether scheduled shading control exists (TRUE) or not (FALSE).	boolean	YES/NO
	Glare Control is Active	Indication whether the glare control is active (TRUE) or not	boolean	YES/NO
	SHITE SERVICE IS ACTIVE	(FALSE).		Outleast
	Shading Material	The primary material used to construct the shading device.	text	1
	*If Blinds/Type of Slat Angle Control	Constitue have the stat goods to service the		
	for Blinds	Specifies how the slat angle is controlled e.g., FIXED.	text	/
		Phasing		
	20 and	Identifies the phase in which the object is created.	text	1
	Phase	include and product in which the object is created.	A MARKE	

Information Delivery Milestone:	Design					
Purpose:	Energy Analysis					
ctor:						
Dbject:	"Roof" / IfcRoof					
eometrical information:	inder y nemeer					
etail:	Simplified volume representation.	Modelled accurately in terms of the overall geometry and dimens	ions.			
imensionality:	3D		379/11/			
ocation:	Absolute and relative to other buil	ding elements				
ppearance:	Color fill to distinguish different m					
arametric behaviour:	Not requested					
Iphanumeric Information:						
dentification:	1					
formation content:	Property	Description	Data Type	Units		
ionnation content.	Property	Identity Data	Data Type	Units		
	Name	Primary identifier of an object.	text	/		
	Туре	Defines the object type, specific information about object.	text	/		
	Zone Name	The name of the Zone this Wall is a part of.	text	1		
		Material				
	Thickness	Nominal thickness (or height) of roof layers measured	numerie			
	THICKNESS	perpendicular to the roof plane.	numeric	mm		
	Layer thickness	Thickness of each individual layer of the roof.	numeric	mm		
		Total net area of the outer surface of the roof. It is the suma				
	Area	of all roof slab net areas. Roof openings, like sky windows	numeric	m ²		
		and other openings and cut-outs are taken into account.				
	221.00		0.000	1000000		
	Slope	Angle between roof surface and horizontal plane.	numeric	degrees		
	Material Thermal Data					
	*Depe	nding on the type of material, Thermal Data information requirem	ents may very.			
	Thermal Conductivity	Specifies the abilitty of material to conduct heat.	numeric	W/m-K		
	40 - Definition (Heat energy per unit mass (typically 1 kg) required to raise the temperature of a substance by one degree Celsius. The				
	Specific Heat	higher the specific heat capacity of a substance, the more	numeric	J/kg°C		
	600	energy is required to raise its temperature.				
				L D		
	Density	Substance's mass per unit of volume. The emissivity of the surface of a material is its effectiveness	numeric	kg/i		
	Emissivity	in emitting energy as thermal radiation and varies between	numeric	1		
	Emissivity	0.0 and 1.0.	nomene	· ·		
		Analytical Data				
	Heat Transfer Coefficient(U)	Coefficient for calculating heat transfer, typically by	numeric	W/(m ² *K)		
	Heat Transfer Coefficient(0)	convection or phase change between a fluid and a solid.	numeric	Wy(m·K)		
	Thermal Resistance®	The temperature difference by which an object or material	numeric	(m²*K)/W		
		resists a heat flow.	NUMBER OF THE OWNER	1.0.047		
	Thermal Mass	Specifies the abbility of an element to store heat, the product of each material layer mass, and specific heat	numeric	kg ft²/(s²K)		
	merma wass	capacity.	numeric	Kg It /(s K		
		Performance Data	2			
	100 100 200 CONT	Indication whether the element is resistent to ultra violet	(parameter)			
	ls UV Resistent	rays / sunlight (TRUE) or not (FALSE).	boolean	YES/NO		
		Phasing				
	Phase	Identifies the phase in which the object is created.	text	1		
	FlidSe	intervines the phase in which the object is cleated.	text	/		

dentification:	Information Delivery Milestone:	Design						
Dbject: "Duct" / IfcDuctSegment iscemetrical information: isingilifed volume representation. Modelled accurately in terms of the overall geometry and dimensions. assign: Absolute and relative to other building elements. operance: Color fill to distinguish different materials asametric behaviour: Not requested Uphanumeric Information: Iterative to other building elements. Ioprantice: Color fill to distinguish different materials asametric behaviour: Not requested Uphanumeric Information: Iterative to other building elements. Ioprantion content: Property Description Data Type Name Primary identifier of an object. Itext Itext System Classification System Classification Itext Itext System Name Aname the reame of the Zone this Wall is a part of. Itext Itext System Name The name of the Zone this Wall is a part of. Itext Itext System Abbreviation A user-defined abbreviation for any stylest. Itext Itext System Name The name of the Zone this Wall is a part of. Itext I	urpose:	Energy Analysis						
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		Phase	Identifies the phase in which the object is created.	text	1			
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Information Delivery Milestone:	Design					
'urpose:	Energy Analysis					
ctor:						
bject:	"Air Terminal" / IfcAirTerm	ninal				
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mensionality:	3D					
ocation:	Absolute and relative to other build	ling elements				
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entification:						
formation content:	Property	Description	Data Type	Units		
		Identity Data				
	Name	Primary identifier of an object.	text	1		
	Туре	Defines the object type, specific information about object.	text	/		
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	/		
	System Type	Type of system e.g., supply air.	text	1		
		A name that uniquely defines system. It may be user-defined				
	System Name	or automatically generated.	text	1		
	System Abbreviation	A user-defined abbreviation for a systen.				
	Zone Name	The name of the Zone this Wall is a part of.	text	1		
	Space Name	The name of the Zone this Wall is a part of.	text	1		
	Room Volume	Volume of the room where component to be/is installed.	numeric	m ³		
		Material				
	Material	The primary material used to construct the object.	text			
	Finish	The type of finish for the air terminal.	text	/		
	1 NAMES IN	Dimensional Data				
	Width	The nominal width of the air terminal.	numeric	mm		
	Height	The nominal height of the air terminal.	numeric	mm		
	DuctWidth	The nominal width of the duct.	numeric	mm		
	DuctHeight	The nominal height of the air terminal.	numeric	mm		
	Volume	The nominal width of the air terminal.	numeric	m ³		
		Performance Data				
	Has Thermal Insulation	If TRUE, the air terminal has thermal insulation.	boolean	YES/NO		
		Analytical Data				
	Maximum AirFlow Rate	The maximum flow rate of air that the air terminal can handle under peak conditions.	numeric	m³/s		
		Outlet node name for the air distribution unit to the	21.02	10. 1.45		
	Outlet Node Name	attached zone.	text	1		
	Inlet Node Name	The air-inlet node name that connects the air splitter to the	text	1		
		individual zone ADU.				
	Design AirFlow Rate	The design flow rate of air supplied or extracted by the air terminal.	numeric	m³/s		
	Pressure Control Type	The control method used by the air terminal to maintain a desired pressure setpoint.	text	/		
	Damper Control Type	The type of damper control used by the air terminal, such as NoFlow, Controllable, FixedFlow, etc.	text	/		
	Minimum Air Flow Fraction	The minimum fraction of the design air flow rate that the air terminal can modulate down to during part-load conditions.	numeric	/		
	Heating/Cooling Design Capacity	The design heating and cooling capacities of the air terminal.	numeric	w		
	Availability Schedule	A schedule that determines when the air terminal is available to operate.	text	1		
	Reheat Coil Availability Schedule	A schedule that determines when the reheat coil in the air	text	1		
	terminal is available to provide additional heating.					
	Phase	Identifies the phase in which the object is created.	text	1		
		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				

Information Delivery Milestone:	Design			
Purpose:	Energy Analysis			
Actor:				
Object:	"Coil" / IfcCoil			
Geometrical information:				
Detail:	Simplified volume representation.	Modelled accurately in terms of the overall geometry and dimensi	ions.	
Dimensionality:	3D	modelied accordingly in terms of the overall geometry and amena		
Location:	Absolute and relative to other build	ting elements		
Appearance:	Color fill to distinguish different ma			
Parametric behaviour:	Not requested			
Alphanumeric Information:	notrequested			
dentification: nformation content:	Property	Description	Data Tuno	Units
mormation content.	Property		Data Type	Units
		Identity Data		1
	Name	Primary identifier of an object.	text	/
	Туре	Defines the object type, specific information about object.	text	1
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply the Beture diversity for the system classification of Supply the Beture diversity of the Supply the	text	1
	System Type	Air, Return Air or Exhaust Air. Type of system e.g., supply air.	text	1
	-	A name that uniquely defines system. It may be user-defined		-
	System Name	or automatically generated.	text	/
	System Abbreviation	A user-defined abbreviation for a systen.		
	Zone Name	The name of the Zone this Wall is a part of.	text	1
	Space Name	The name of the Zone this Wall is a part of.	text	1
	Room Volume	Volume of the room where component to be/is installed.	numeric	m³
		Analytical Data		
	Cooling Capacity	The design capacity of the cooling coil.	numeric	w
	Heating Capacity	The design capacity of the heating coil.	numeric	w
	Inlet/Outlet Node Names	The names of the nodes where the fluid medium enters and exits the heating coil.	text	/
	Heat Exchanger Configuration	The coil is operable in two configurations: CounterFlow or CrossFlow.	text	1
	*If Steam/Maximum Steam Flow Rate	The maximum possible steam volumetric flow rate in m3/s through the steam heating coil.	numeric	mª/s
	*If Water/Maximum Water Flow Rate	The maximum possible water volume flow rate (m3/sec) through the coil.	numeric	m³/s
	Maximum Air Flow Rate	The maximum possible air volume flow rate (m3/sec) through the coil.	numeric	m³/s
	Inlet Water Temperature	The inlet water temperature for the design flow.	numeric	°C
	Outlet Water Temperature	The outlet water temperature corresponding to the rated heating capacity.	numeric	*c
	Inlet Air Temperature	The inlet air temperature for the design flow.	numeric	°c
	Outlet Air Temperature	The outlet air condition desired for design flow.	numeric	°C
	Inlet Air Humidity Ratio	The highest value of humidity ratio possible for the Design inlet air stream.	numeric	kgWater/kgDryA
	Outlet Air Humidity Ratio	The value of humidity ratio for the Design outlet air stream.	numeric	kgWater/kgDryAi
	Availability Schedule	Schedule that defines when the coil is available. The name of the schedule (ref. Schedule) that denotes whether the coil can run during a given time period. A schedule value greater than 0 (usually 1 is used) indicates that the unit can be on during a given time period. A value less than or equal to 0 (usually 0 is used) denotes that the unit is off. If this field is blank, the schedule has a value of 1 for all time periods.	numeric	1
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1
Documentation:	1 //830	periode an entre objects created.	suns.	/
Set of documents:	Occupancy and Usage Schedules			

Information Delivery Milestone:	Design			
Purpose:	Energy Analysis			
Actor:				
Object:	"Fan" / IfcFan			
Geometrical information:				
Detail:	Simplified volume representation. N	Aodelled accurately in terms of the overall geometry and dimens	ions.	
Dimensionality:	3D			
Location:	Absolute and relative to other build	ing elements		
Appearance:	Color fill to distinguish different mat	terials		
Parametric behaviour:	Not requested			
Alphanumeric Information:				
dentification:				
nformation content:	Property	Description	Data Type	Units
		Identity Data		
	Name	Primary identifier of an object.	text	/
	Туре	Defines the object type, specific information about object.	text	1
		Defines the system for the connectors that are located on air		
	System Classification	terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply	text	1
		Air, Return Air or Exhaust Air.		
	System Type	Type of system e.g., supply air.	text	1
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1
	System Abbreviation	A user-defined abbreviation for a system.		2
	Zone Name	The name of the Zone this Wall is a part of.	text	1
	Space Name	The name of the Zone this Wall is a part of.	text	1
			and the second s	, m³
	Room Volume	Volume of the room where component to be/is installed.	numeric	.m²
		Analytical Data		
	Maximum Air Flow Rate	This numeric field is the design volume flow rate of fan as installed in the HVAC system, in m3/s	numeric	m³/s
	Inlet/Outlet Node Names	The names of the air system nodes at the inlets and outlets of the fan.	text	1
	Speed Control Method	This field is used to select how the fan speed can be varied.	text	/
	Electric Power Minimum Flow Rate Fraction	This numeric field is used to describe how low a variable speed fan can be operated.	numeric	1
	Total Pressure Rise	The Total System Pressure Rise experienced by the fan in Pascals at full flow rate and altitude-adjusted standard density of dry air at 20 degrees Celsius drybulb.	numeric	Pa
	Motor Efficiency	Describes the electric motor that drives the fan. Efficiency is the shaft power divided by the electric power consumed by the motor. The value must be between 0 and 1.	numeric	/
	Motor In Air Stream Fraction	The fraction of the motor heat that is added to the air stream. The value must be between 0 and 1. A value of 0 means fan motor is located completely outside of air stream and none of the motor's heat is added to the air stream. A value of 1.0 means the motor is located completely inside of air stream and all of the motor's heat is added to the air stream.	numeric	/
	Electric Power Consumption	This numeric field is the electric power consumption at the full Design Maximum Air Flow Rate and Design Pressure Rise.	numeric	w
	Fan Efficiency	The efficiency of the fan, typically represented as a decimal value between 0 and 1.	numeric	1
	Availability Schedule	Schedule that determines when the fan is available.	numeric	1
	Phase	Phasing Identifies the phase in which the object is created.	text	/
	r. Hoate	in the provent mention of the beleased	a secta	1

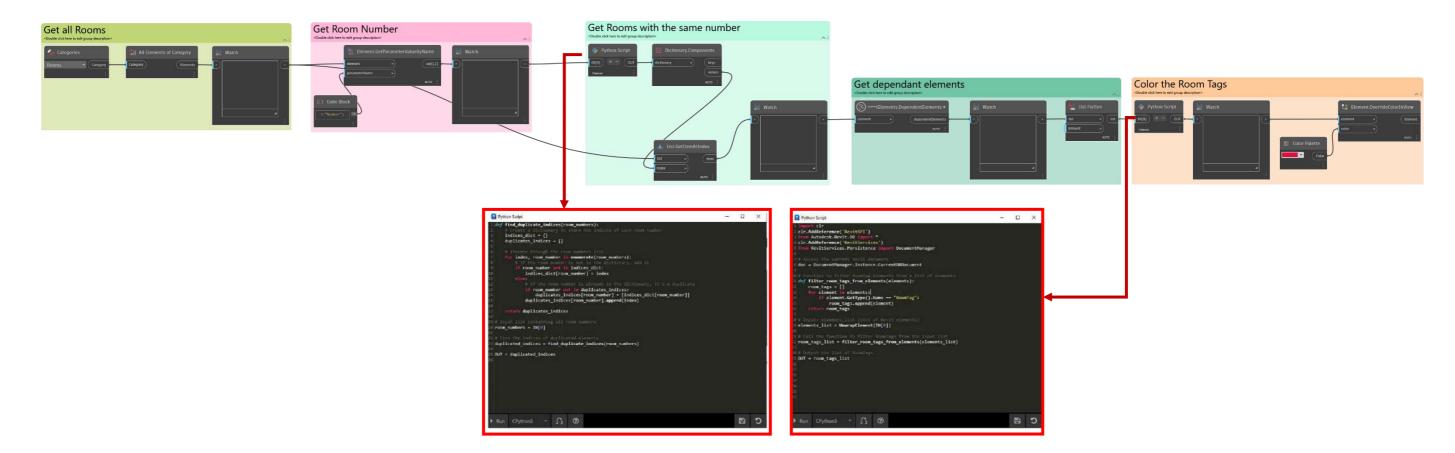
nformation Delivery Mileston Purpose:	Energy Analysis			
ctor:				
	1			
Object:	"Chiller" / IfcChiller			
Geometrical information:				
Detail:	Simplified volume representation. N	Nodelled accurately in terms of the overall geometry and dimens	ions.	
Dimensionality:	3D			
Location:	Absolute and relative to other build			
Appearance:	Color fill to distinguish different ma	terials		
Parametric behaviour:	Not requested			
Alphanumeric Information:				
dentification:		Description	Data Tara	Hales
Information content:	Property	Description Identity Data	Data Type	Units
	Name	Primary identifier of an object.	text	1
	Туре	Defines the object type, specific information about object.	text	1
		Defines the system for the connectors that are located on air		
	System Classification	terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply	text	1
		Air, Return Air or Exhaust Air.		
	System Type	Type of system e.g., supply air.	text	1
		A name that uniquely defines system. It may be user-defined	(1000 CC)	
	System Name	or automatically generated.	text	/
	System Abbreviation	A user-defined abbreviation for a systen.	text	1
	Zone Name	The name of the Zone this Wall is a part of.	text	1
	Space Name	The name of the Zone this Wall is a part of.	text	1
	Room Volume	Volume of the room where component to be/is installed.	numeric	mª
		Material	surdiction in	10.695
			1	
	Material	The primary material used to construct the object.	text	1
		Dimensional Data		
	Length	The nominal length of the chiller.	numeric	mm
	Width	The nominal width of the chiller.	numeric	mm
	Height	The nominal height of the chiller.	numeric	mm
		Analytical Data		
	Nominal Capacity	The nominal cooling capability of the chiller in Watts.	numeric	w
	é	Definer which have of contraction of the basis of		
	Condenser Type	Defines which type of condenser is modelled with chiller.	text	1
		Contains the chiller's coefficient of performance.For a water-		
	Nominal COP r	cooled chiller, this number does not include energy use due to condenser	numeric	1
		pumps and/or fans. For an air-cooled or evap-cooled chiller,		/
		this number includes condenser fan power.		
	Chilled Water Inlet/Outlet Node	Contains the identifying name for the electric chiller plant	text	1
	Names	side inlet / outlet node.	carries.	,
	Condenser Inlet/Outlet Node Names	Contains the identifying name for the electric chiller condenser side inlet / outlet node.	text	1
		Chiller's minimum part load ratio. The expected range is		
		between 0 and 1. The minimum part load is not the load	20110200055	
	Minimum Part Load Ratio	where the machine shuts off, but where the amount of	numeric	/
		power remains constant to produce smaller loads than this fraction.		
		Contains the electric chiller's maximum part load ratio. This		
	Maximum Part Load Ratio	value may exceed 1, but the normal range is between 0 and	numeric	1
		1.1.		
	Outloan Sin Sin Sin Sin Sin Sin Sin Sin Sin Si	Contains the electric chiller's optimum part load ratio. This	101100 C	
	Optimum Part Load Ratio	is the part load ratio at which the chiller performs at its maximum COP.	numeric	/
		Contains the electric chiller's condenser inlet design		2524
	Condenser Inlet Temperature	temperature in Celsius.	numeric	°C
		Contains the electric chiller's temperature rise coefficient		
	Temperature Rise Coefficient	which is defined as the ratio of the required change in condenser water temperature to a given change in chilled	numeric	/
	remperature hise coemcient	water temperature, which maintains the capacity at the	namenc	'
		nominal value.		
	Chilled Water Outlet Temperature	Contains the electric chiller's evaporator outlet design	numeric	*C
		temperature in Celsius. For variable volume chiller this is the maximum flow and for		
	Chilled Water Flow Rate	For variable volume chiller this is the maximum flow and for constant flow chiller this is the design flow rate.	numeric	m³/sec
		Contains the lower limit for the evaporator outlet		
	Minimal Chilled Water Outlet	temperature. This temperature	numeric	°C
	Temperature	acts as a cut off for heat transfer in the evaporator, so that	2010 42 23 20	1953
	12 241 2 272400	the fluid doesn't get too cold. Contains the chiller's operating condenser fluid flow rate in		132
	Condenser Fluid Flow Rate	cubic meters per second.	numeric	m³/sec
		Determines how the chiller operates with respect to the		
		intended fluid flow through the device's evaporator. There		
	Chiller Flow Mode	are three different choices for specifying operating modes	text	1
		for the intended flow behavior: "NotModulated,"		
		"ConstantFlow," and "LeavingSetpointModulated."		
		Electrical Data		
	Apparent Load	Apparent power device is needed.	numeric	VA
	Voltage	The voltage that a device is designed to handle.	numeric	٧
		Phasing		
	Phase	Identifies the phase in which the object is created.	text	1

nformation Delivery Milestone:	Design					
urpose:	Energy Analysis					
ctor:	1.					
	1/-					
Object:	"Boiler" / IfcBoiler					
Beometrical information:	boner / neboner					
	Cincellford underson developmentation &	Adelled accurately in terms of the overall geometry and dimension				
Detail:		iodelied accurately in terms of the overall geometry and dimensio	ons.			
)imensionality:	3D					
ocation:		olute and relative to other building elements or fill to distinguish different materials				
Appearance:		erials				
arametric behaviour:	Not requested					
Alphanumeric Information:						
dentification:						
nformation content:	Property	Description	Data Type	Units		
		Identity Data				
	Name	Primary identifier of an object.	text	1		
	Туре	Defines the object type, specific information about object.	text	1		
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply	text	1		
	Sustan Tune	Air, Return Air or Exhaust Air.	text	î		
	System Type	Type of system e.g., supply air.	text	/		
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1		
	System Abbreviation	A user-defined abbreviation for a systen.	text	1		
	Zone Name	The name of the Zone this Wall is a part of.	text	1		
	Space Name	The name of the Zone this Wall is a part of.	text	1		
				/		
	Room Volume	Volume of the room where component to be/is installed.	numeric	m ³		
		Analytical Data				
	Fuel Type	Specifies the type of fuel used by boiler.	text	1		
	Nominal Capacity	Nominal operating capacity of the boller.	numeric	w		
	Nominal Thermal Efficiency	Contains the heating efficiency (as a fraction between 0 and 1) of the boiler's burner. This is the efficiency relative to the higher heating value (HHV) of fuel at a part load ratio of 1.0.	numeric	/		
	Water Flow Rate	Contains the maximum design water volumetric flow rate in m3/sec. This should be the largest flow rate than can be heated.	numeric	m³/sec		
	Minimum Part Load Ratio	Contains the minimum part load ratio. If the ratio of demand to boiler nominal capacity is less than the minimum part load ratio, then the Min PLR. Will determine the operating PLR. The expected range is between 0 and 1.	numeric	Ī		
	Maximum Part Load Ratio	Contains the maximum part load ratio. If the ratio of demand to boller nominal capacity is greater than the maximum part load ratio, then the Max PLR will determine the operating PLR. This value may exceed 1, but the normal range is between 0 and 1.1.	numeric	1		
	Optimum Part Load Ratio	This is the part load ratio at which the	numeric	1		
		boiler performs at its maximum efficiency.				
	Inlet/Outlet Water Node Names	The names of the water inlet/outlet node names.	text	/		
	Water Outlet Upper Temperature Limit	The outlet temperature upper limit.	numeric	"С		
	Boiler Flow Mode	Determines how the boiler operates with respect to the intended fluid flow through the device. There are three different choices for specifying operating modes for the intended flow behavior: "NotModulated," "ConstantFlow," and "LeavingSetpointModulated."	text	1		
	*If Steam/Maximum Operating Pressure	The maximum value of pressure up to which the boiler would operate, or the maximum design pressure.	numeric	Pa		
	"if Steam/Outlet Steam Temperature	The maximum value of steam temperature the boiler can provide.	numeric	"с		
	*If Steam/Inlet/Outlet Steam Node Names	The names of the water inlet/outlet node names.	text	1		
		Phasing				
				1		

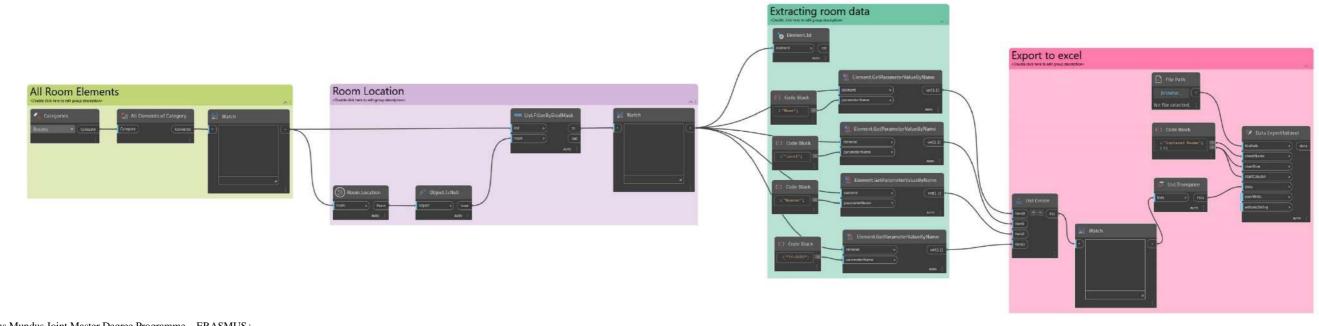
Information Delivery Milestone:	Design					
Purpose:	Energy Analysis					
Actor:						
	•					
Object:	"AirConditioning" / IfcUnitaryEquipment					
Geometrical information:						
Detail:	Simplified volume representation. Modelled accurately in terms of the overall geometry and dimensions.					
Dimensionality:	30					
ocation:	Absolute and relative to other building elements					
Appearance:	Color fill to distinguish different materials					
Parametric behaviour:	Not requested					
Alphanumeric Information:						
dentification:						
Information content:	Property	Description	Data Type	Units		
		Identity Data				
	Name	Primary identifier of an object.	text	1		
		2 46 35 010 States al 10 M AS		10		
	Туре	Defines the object type, specific information about object.	text	1		
	System Classification	Defines the system for the connectors that are located on air terminals, equipment and fixtures. For example, connectors for air terminals could have a system classification of Supply Air, Return Air or Exhaust Air.	text	1		
	System Type	Type of system e.g., supply air.	text	1		
	System Name	A name that uniquely defines system. It may be user-defined or automatically generated.	text	1		
	System Abbreviation	A user-defined abbreviation for a systen.	text	1		
	Zone Name	The name of the Zone this Wall is a part of.	text	1		
	Space Name	The name of the Zone this Wall is a part of.	text	1		
	Room Volume	Volume of the room where component to be/is installed.	numeric	m³		
	Material					
	Material	The primary material used to construct the object.	text	1		
	Analytical Data					
	Length	The nominal length of the air conditioning unit.	numeric	mm		
	Width	The nominal width of the air conditioning unit.	numeric	mm		
	Height	The nominal height of the air conditioning unit.	numeric	mm		
	Mechanical Data					
	Heating Capacity	Heating capacity.	numeric	BTU/Hr		
	Cooling Capacity	Cooling capacity.	numeric	BTU/Hr		
	Condenser Flowrate	Flow rate of fluid through the condenser.	numeric	liter/min		
	Cooling Efficiency	Coefficient of Performance: Ratio of cooling energy output to energy input under full load operating conditions.	numeric	1		
	Electrical Data					
	Apparent Load	Apparent power device is needed.	numeric	VA		
	Voltage	The voltage that a device is designed to handle.	numeric	v		
	Phasing					
	Phase	Identifies the phase in which the object is created.	text	1		

Information Delivery Milestone:	Design					
Purpose:	Energy Analysis					
Actor:						
Object:	"Transformer" / IfcTransfo	ormer				
Geometrical information:						
Detail:	Simplified volume representation. Modelled accurately in terms of the overall geometry and dimensions.					
Dimensionality:	3D Absolute and relation to other build	ling demonts				
Location:	Absolute and relative to other building elements					
Appearance: Parametric behaviour:	Color fill to distinguish different materials Not requested					
Alphanumeric Information:						
Identification:						
Information content:	Property	Description	Data Type	Units		
		Identity Data				
	Name	Primary identifier of an object.	text	1		
	Туре	Defines the object type, specific information about object.	text	1		
	Zone Name	The name of the Zone this Wall is a part of.	text	/		
	Space Name	The name of the Zone this Wall is a part of.	text	1		
			Set and states	/		
	Room Volume	Volume of the room where component to be/is installed.	numeric	m*		
	internet internet	Material				
	Material	The primary material used to construct the object.	text	/		
		Dimensional Data	-	100 C		
	Height	The nominal height of the transformer.	numeric	mm		
	Length Width	The nominal length of the transformer. The nominal width of the transformer.	numeric	mm		
	width	The nominal width of the transformer. Analytical Data	numeric	mm		
		Indicates one of the three supported transformer application				
	Trasnformer Usage	types: PowerInFromGrid,	text	1		
		PowerOutToGrid, and LoadCenterPowerConditioning.				
		Contains the fraction of transformer's losses that enter the				
	Radiative Fraction	zone as long-wave thermal radiation. This numeric filed should have a value between 0.0 and 1.0. The balance of the				
		losses is				
		convective.				
	Rated Capacity	Defines the rated capacity of the transformer in VA.	numeric	VA		
		Indicates whether the transformer is a single phase or three		- 54M		
	Phase	phase type. The two alternative	numeric	1		
		values are 1 or 3.		122.1		
	Full Load Temperature Rise	Defines the temperature rise of the windings above the ambient temperature, when the transformer is loaded at its	numeric	*C		
	run cour remperatore mae	nameplate rating.	in on include	c		
		Defines the fraction of load losses resulting from the eddy	numeric			
		currents. Transformer's load losses comprise two parts: the ohmic loss due to the current flowing in the resistance of the				
	Fraction of Eddy Current Losses	windings and the eddy and stray losses due to the eddy		1		
	and a start of the start to see	currents. This field indicates the fraction of the load losses				
		due to the eddy currents. This numeric field should have a				
		value between 0.0 and 1.0.				
		Contains the value for transformer efficiency at a given per	(i)	8		
	Nameplate Efficiency	unit load and specified reference temperature.	numeric	/		
		Defines the percentage of the rated capacity at which the				
		nameplate efficiency is measured. According to the NEMA				
		(National Electrical Manufactures Association) Standard TP-1,				
	Per Unit Load for Nameplate Efficiency	the per	numeric	/		
		unit load takes the value of 0.35 for dry-type distribution				
		transformers and it takes the value of 0.50 for liquid-filled distribution transformers. The default is 0.35.				
		Contains the schedule name (ref. Schedule objects) that				
	Availability Schedule	contains information on the availability of the transformer. A schedule value greater than 0 (usually 1 is used) indicates				
		that the transformer is available to convert AC power from	120000			
		one voltage to another. A value less than or equal to 0	text	/		
		(usually 0 is used) denotes that the transformer is not				
		available. If this field is blank, the schedule has values of 1 for all time periods.				
		the relation of a reliant time periods.				
		Obseine				
	2 	Phasing	I			
	Phase	Identifies the phase in which the object is created.	text	/		
Documentation:						
Set of documents:	Occupancy and Usage Schedules					

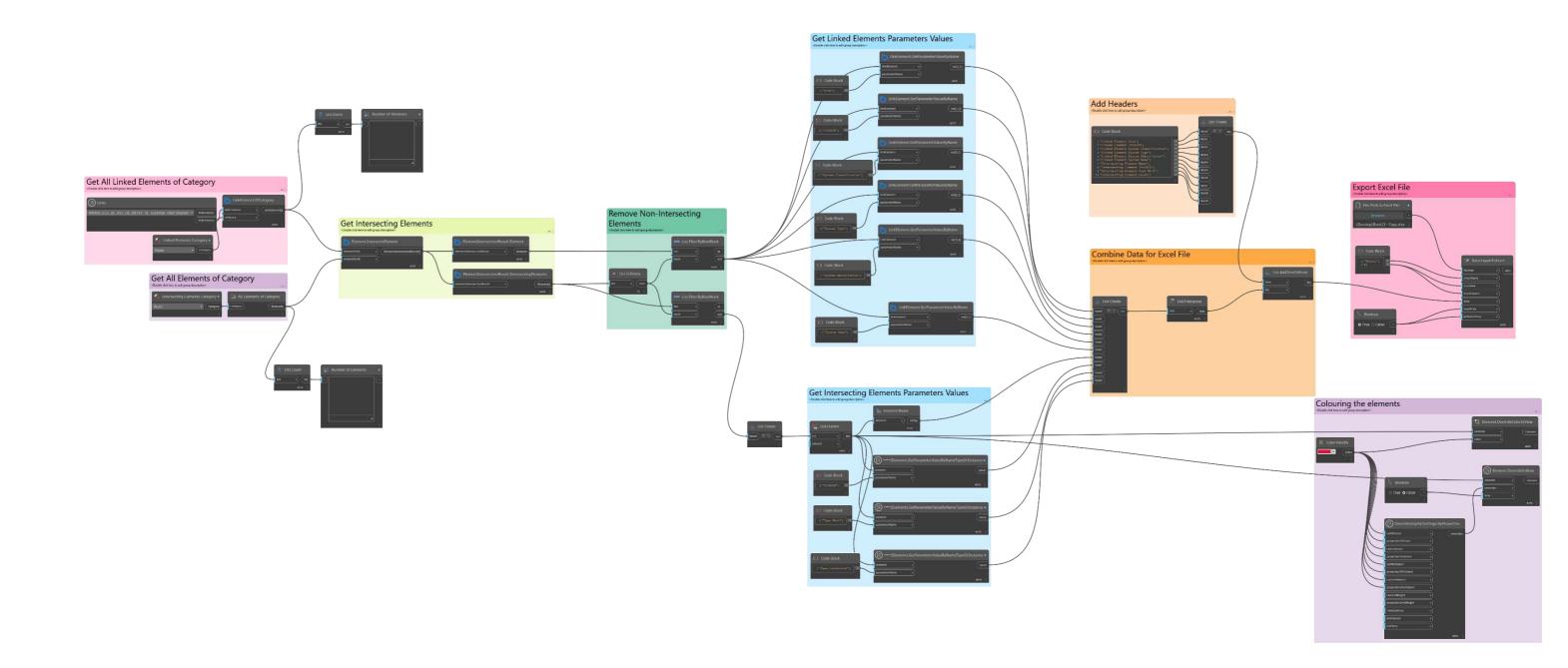
APPENDIX 8: DYNAMO SCRIPT: UNIQUE ROOM NAMING



APPENDIX 9: DYNAMO SCRIPT – UNALLOCATED / UNPLACED ROOMS



APPENDIX 10: DYNAMO SCRIPT – INTERSECTING ELEMENTS



APPENDIX 11: IFCOPENSHELL SCRIPT: MINIMAL HANDRAIL HEIGHT

```
1 import ifcopenshell
2
3 # Open the IFC file
  ifc_file_path = '05.ifc'
4
5 ifc file = ifcopenshell.open(r'C:\Users\adjuk\Desktop\Case Studies\IfcOpenShell.RailingHeight\05.ifc')
6
7 railings = ifc_file.by_type("IfcRailing")
8
9 def get_property_value(ifc_object, property_name):
10
       prop_value = None
11
       for property_set in ifc_object.IsDefinedBy:
12
           if property_set.is_a("IfcRelDefinesByProperties"):
               if property_set.RelatingPropertyDefinition.is_a("IfcPropertySet") and \
13
14
                       property_set.RelatingPropertyDefinition.Name == "Pset_RailingCommon":
15
                   prop_value = next((prop.NominalValue.wrappedValue for prop in
    property_set.RelatingPropertyDefinition.HasProperties if prop.Name == property_name), None)
16
      return prop_value
17
18 total_railings = len(railings)
19 railings_not_meeting_requirement = 0
20
21 for railing in railings:
22
       height = get_property_value(railing, "Height")
23
       if height is not None and height < 0.9:
24
           name = railing.Name if hasattr(railing, "Name") else "N/A"
25
           guid = railing.GlobalId
26
           print(f"Railing Name: {name} | Railing GUID: {guid} | Height does not meet requirement ({height}m)")
27
           railings_not_meeting_requirement += 1
28
29 print(f"Total Railings: {total_railings}")
30 print(f"Railings Not Meeting Requirement: {railings_not_meeting_requirement}")
31
```

APPENDIX 12: IFCOPENSHELL SCRIPT: ROOM AREA

```
1 import ifcopenshell
2 import ifcopenshell.geom
3 from trimesh import Trimesh
4 import openpyxl
5 import pandas as pd
6
 7 # Set up IFC file and settings
8 settings = ifcopenshell.geom.settings()
9 ifc_file = ifcopenshell.open(r'C:\Users\adjuk\Desktop\Case Studies\IfcOpenShell.Room Schedule\05.ifc')
10 spaces = ifc_file.by_type('IfcSpace')
11
12 # Read Excel file
13 excel_file = r'C:\Users\adjuk\Desktop\Case Studies\IfcOpenShell.Room Schedule\Room Schedule.xlsx'
14 data = pd.read_excel(excel_file)
15 excel_areas = dict(zip(data['Room Number'], data['Room Area']))
16
17 # Initialize counters
18 pass_count = 0
19 fail_count = 0
20
21 # Create a Trimesh for each space and calculate its area, then compare with Excel data
22 for space in spaces:
       shape = ifcopenshell.geom.create_shape(settings, space)
23
24
       faces = shape.geometry.faces
25
       verts = shape.geometry.verts
       grouped_verts = [[verts[i], verts[i + 1], verts[i + 2]] for i in range(0, len(verts), 3)]
26
       grouped_faces = [[faces[i], faces[i + 1], faces[i + 2]] for i in range(0, len(faces), 3)]
27
28
       mesh = Trimesh(grouped_verts, grouped_faces)
29
       area = round(mesh.section([0, 0, 1], mesh.centroid).to_planar()[0].area, 2) # Round to 2 decimal places
30
31
       name = space.Name
32
       long_name = space.LongName
33
       room_number = name # Assuming room number is the same as the space name
34
35
       excel_area = excel_areas.get(room_number)
36
37
       if excel_area is not None:
38
           if area == excel area:
               print(f"Room Area Pass: {name}, {long_name}, Room Number: {room_number}, Area: {area} m<sup>2</sup>")
39
40
                pass count += 1
41
           else:
42
               print(f"Room Area Fail: {name}, {long_name}, Room Number: {room_number}, "
43
                     f"Area in IFC: {area} m<sup>2</sup>, Area in Excel: {excel_area} m<sup>2</sup>")
44
               fail_count += 1
45
       else:
           print(f"Room Area Fail: {name}, {long_name}, Room Number: {room_number}, "
46
                  f"Area in IFC: {area} m<sup>2</sup>, No matching Room Number in Excel")
47
48
           fail_count += 1
49
50 # Print pass and fail counts
51 print(f"Pass Count: {pass_count}")
52 print(f"Fail Count: {fail_count}")
```

APPENDIX 13: IFCOPENSHELL SCRIPT: ELEMENTS LOCATION – DOORS/WINDOWS

```
1 import ifcopenshell
     import ifcopenshell.util.element
 4 # Open the IFC file
     ifc_file_path = '05.ifc'
 5
 6 ifc file = ifcopenshell.open(r'C:\Users\adjuk\Desktop\Case Studies\IfcOpenShell.Levels\05.ifc')
 8 # Initialize counters
    total_doors = 0
10 total_windows = 0
11 failures = 0
12
13 # Find doors and windows associated with a wall through IfcRelVoidsElement and IfcRelFillsElement relationships
14 def find_doors_and_windows(wall):
15
          doors = []
          windows = []
16
          # Find IfcRelVoidsElement relationships
18
          void_relations = ifc_file.by_type("IfcRelVoidsElement")
19
          for rel in void_relations:
20
21
               if rel.RelatingBuildingElement == wall:
                    opening = rel.RelatedOpeningElement
if opening.is_a("IfcOpeningElement"):
22
23
                          # Find IFcRelFillsElement relationships for the opening
fill_relations = ifc_file.by_type("IfcRelFillsElement")
for fill_rel in fill_relations:
24
25
26
                               if fill_rel.RelatingOpeningElement == opening:
    filling = fill_rel.RelatedBuildingElement
27
28
29
                                     if filling.is_a("IfcDoor"):
                                          doors.append(filling)
30
31
                                     elif filling.is_a("IfcWindo
32
                                          windows.append(filling)
33
34
         return doors, windows
35
36 # Get all IfcWall elements from the IFC file
37 walls = ifc_file.by_type('IfcWall')
38
39 # Loop through each wall
40 for wall in walls:
41
          # Find doors and windows associated with the wall
          wall_doors, wall_windows = find_doors_and_windows(wall)
42
43
          # Check if the wall has doors or windows
44
45
          if wall_doors:
46
               total_doors += len(wall_doors)
47
48
              # Find the spatial container (building storey) for the wall
               container = ifcopenshell.util.element.get_container(wall)
49
               wall_level = container.Name if container else "Unknown Level"
50
51
               for door in wall_doors:
                    door_level = ifcopenshell.util.element.get_container(door)
door_level_name = door_level.Name if door_level else "Unknown Level"
53
54
55
                     if door_level_name != wall_level:
                          failures += 1
56
                          Tailures += 1
print("Fail: Door level does not match wall level.")
print("Wall Name:", wall.Name)
print("Wall GUID:", wall.GlobalId)
print("Wall Level:", wall_level)
print("Door Name:", door.Name, "| Door Level:", door_level_name, "| Door GUID:", door.GlobalId)
57
58
59
60
61
62
                          print("----")
63
64
        if wall_windows:
65
               total_windows += len(wall_windows)
              # Find the spatial container (building storey) for the wall
container = ifcopenshell.util.element.get_container(wall)
67
68
69
               wall_level = container.Name if container else "Unknown Level"
70
71
              for window in wall_windows:
                    window_level = ifcopenshell.util.element.get_container(window)
window_level_name = window_level.Name if window_level else "Unknown Level"
72
73
74
                     if window_level_name != wall_level:
75
                          failures += 1
                          trailures += 1
print("Fail: Window level does not match wall level.")
print("Wall:", wall.Name)
print("GuID:", wall.GlobalId)
print("Wall Level:", wall_level)
print("Window:", window.Name, "| Window Level:", window_level_name, "| Window GUID:", window.GlobalId)

77
78
79
80
                          print("---")
81
82
83 # Print summary
84 print("Total Doors:", total_doors)
85 print("Total Windows:", total_windows)
86 print("Total Failures:", failures)
```