VSB - TECHNICAL UNIVERSITY OF OSTRAVA

FACULTY OF CIVIL ENGINEERING

THE PREPARATION OF PROJECT DOCUMENTATION IN THE BIM METHOD

Vypracování projektové dokumentace v metodě BIM

Master thesis 2023

Name of the Student: Abdul Aseem Gunaje Abbas – GUN0043

Supervisor: Ing. Marek Jašek, Ph.D.

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Diploma Thesis Assignment

Student: **Abdul Aseem Gunaje Abbas**

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Title: The Preparation of project documentation in the BIM method
Vypracování projektové dokumentace v metodě BIM

The thesis language: English

Description:

A. Text part:
- the engineering report: the structure of the Engineering report will be based on Decree No. 499/2006 Coll.
- Level of Development LOD 4

B. Drawing part:
- the block plan drawing (scale 1:500, 1: 1 000),
- the plans of each storey (scale 1:50),
- the groundwork drawing (scale 1:50),
- the foundations drawing (scale 1:50),
- the drawing of trussed roof load-bearing construction (scale 1:50),
- the plan of the roof (scale 1:50),
- the ceiling drawing (scale 1:50),
- the section drawings (cross-section and longitudinal-section) (scale 1:50),
- the elevation views (scale 1:50),
- 2 detail drawings (scale 1:5, 1:10).

C. Preparation of 3D building model

D. Submission of the model and drawings to the common CDE data environment

References:

Standards:
ČSN EN 1990 Basis of structural design
ČSN EN 1991-1-1 Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings
ČSN EN 1995-1-1 Design of timber structures - Part 1-1: General - Common rules and rules for buildings
ČSN EN ISO 16739 Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries), 2020. Praha: Úřad pro technickou normalizaci, metrologii a státní zkušebnictví.
ČSN ISO 12006-2 Building construction - Organization of information about construction works - Part 2: Framework for classification, 2017. Praha: Úřad pro technickou normalizaci, metrologii a státní zkušebnictví, 2020.
ČSN EN ISO 12006-3 Building construction - Organization of information about construction works - Part 3: Framework for objectoriented information, 2020. Praha: Úřad pro technickou normalizaci, metrologii a státní zkušebnictví.
ČSN ISO 22263 (Organization of information about construction works - Framework for management of

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[5] ČSN ISO 16354 Obecné zásady pro znalostní a objektové knihovny (Guidelines for knowledge libraries and object libraries), 2014. Praha: Úřad pro technickou normalizaci, metrologii a státní zkušebnictví, 2014. (vydána převzetím originálu AJ verze ISO normy)
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Technical standards and decree as amended

Books:
Bryan, T. Construction Technology: Analysis and Choice. John Wiley and Sons Ltd. 2010. ISBN101405158743.
Allen, E. Iano, J. Fundamentals of Building Construction: Materials and Methods, Sixth Edition. John Wiley & Sons Inc. 2013. ISBN10 1118138910
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HOLZER, Dominik. The BIM Manager's Handbook: Guidance for Professionals in Architecture, Engineering, and Construction.2016. ISBN-10: 1118982428.

Extent and terms of a thesis are specified in directions for its elaboration that are opened to the public on the web sites of the faculty.

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Ludvíka Podéště 1875/17
708 00 Ostrava-Poruba
Czech Republic

spojovatelka: +420 597 321 111
epodatelna: epodatelna@vsb.cz
ID datové schránky: d3kj88v

IČ: 61989100
DIČ: CZ61989100

email: studijni.fast@vsb.cz
www.fast.vsb.cz

STUDENT DECLARATION

I declare that I have prepared the entire diploma thesis, including the appendices, independently under the supervision of the supervisor of the diploma thesis and I have listed all the documents and literature used.

In Ostrava on ....

Student signature

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Abdul Aseem Gunaje Abbas

Ostrava

Abstract

The thesis aims to plan and designing of a two-story building and submission the model And drawings to the common CDE data environment. Also, prepare the engineering report based on Decree No. 499/2006 Coll. - Level of Development LOD 4.

The first part of the thesis consists of general information about BIM.BIM in the Czech Republic, Roles and responsibilities, Software for designing building information model and advantages and disadvantages of BIM

The general part consists of details of the plans of each story, groundwork, foundation, roof, ceiling, section, and elevation of the building I have designed.

The technical task was developed for the designing of the BIM model for all project stages and parts and contains requirements to levels of development for each stage of a construction project.

In the process of writing the thesis, a conclusion was made on how to use BIM more effectively in future projects. And how I implemented the BIM method in my construction design.

For Using the Building information model more effectively the company should start to implement the technology in all phases of construction. Such as planning, Designing,Construction, maintenance, and demolition of the infrastructure. These processes will enable the utilization of Building Information Modelling's benefits at all phases of the object's life cycle.

CONTENT

1. Introduction

Building information modeling (BIM) is a process supported by various tools, technologies, and contracts involving the generation and management of digital representations of physical and functional characteristics of places.

In other words Building Information Modelling (BIM) is a digital approach to designing, constructing and managing buildings and infrastructure. This process involves creating intelligent 3D models of physical structures containing information about their physical and functional characteristics that is stored on these models. BIM has quickly been adopted by architecture engineering construction (AEC) industry as an efficient way of improving collaboration, cutting costs, and increasing efficiency - this comprehensive guide offers an in-depth exploration of BIM from its history through implementation in design construction management (DCFM) practices and beyond.

The problem of effective designing and construction without mistakes is very actual at present. There are numerous instances where the construction timetable is extended and the ultimate cost is higher. BIM technologies can aid in avoiding these errors and enhancing the efficiency of the construction project.

The implementation of BIM is not a transition to a new program, this is the implementation of new technologies to work with objects, including a new approach to design, a new level of organization of construction, and completely different ways to manage the exploitation.

The thesis aims to plan and design a three-story building and submit the model And drawings to the common CDE data environment.

2. BIM

In this Project, I will introduce Building Information Modelling (BIM) and its fundamental principles. We will define BIM and explain its importance in the AEC industry; discuss its origins and evolution over time; as well as examine key benefits associated with using BIM within AEC projects.

The concept behind Building Information Modelling (BIM), utilized within the architecture, engineering, and construction industry is founded upon digital processes. In short, it involves producing a comprehensive 3D model that caters to varied dimensions including designing. As opposed to other methods- BIM is capable of fulfilling requirements relating to the construction phase as well as operational aspects by allowing complete virtual representations- comprising of physical elements such as walls & doors along with electrical systems such that it can be implemented accordingly post analysis. Such objects have their own unique set of properties outlined via specific parameters, and colored lines amongst others.

Implementation of BIM has become increasingly popular because not only does it significantly reduce errors but also goes far beyond being simply collaborative aiding in shaping proper decision-making protocols and aiding coordination among team members.

The origins of BIM can be traced back to the 1970s when the term "building model" was first used to describe computer-generated 3D models of buildings. By the 1990s however, BIM started taking shape as an effective approach to design and construction; as new technologies and software emerged it allowed designers and builders to create detailed 3D models with information regarding systems, materials, and construction sequencing.

BIM can bring many advantages to project stakeholders. One key advantage is increased collaboration and coordination; by creating one model accessible by all, BIM eliminates separate drawings and models which could lead to errors and inconsistencies; also, all project information is now readily available in real-time enabling faster decision-making, better communication, and decision making processes, plus potentially reduce costs by identifying potential conflicts before construction begins and helping avoid costly change orders or delays.

Building Information Modelling, or BIM, is a valuable asset that can assist the AEC industry with streamlining processes, improving collaboration, lowering costs, and streamlining operations. BIM will only become increasingly critical as time goes on to design, construct, manage, and oversee building and infrastructure management - this Project explores this revolutionary field in depth so we may stay abreast of this evolving and ever-evolving field of technology.

2.1 The Evolution of Building Information Modelling

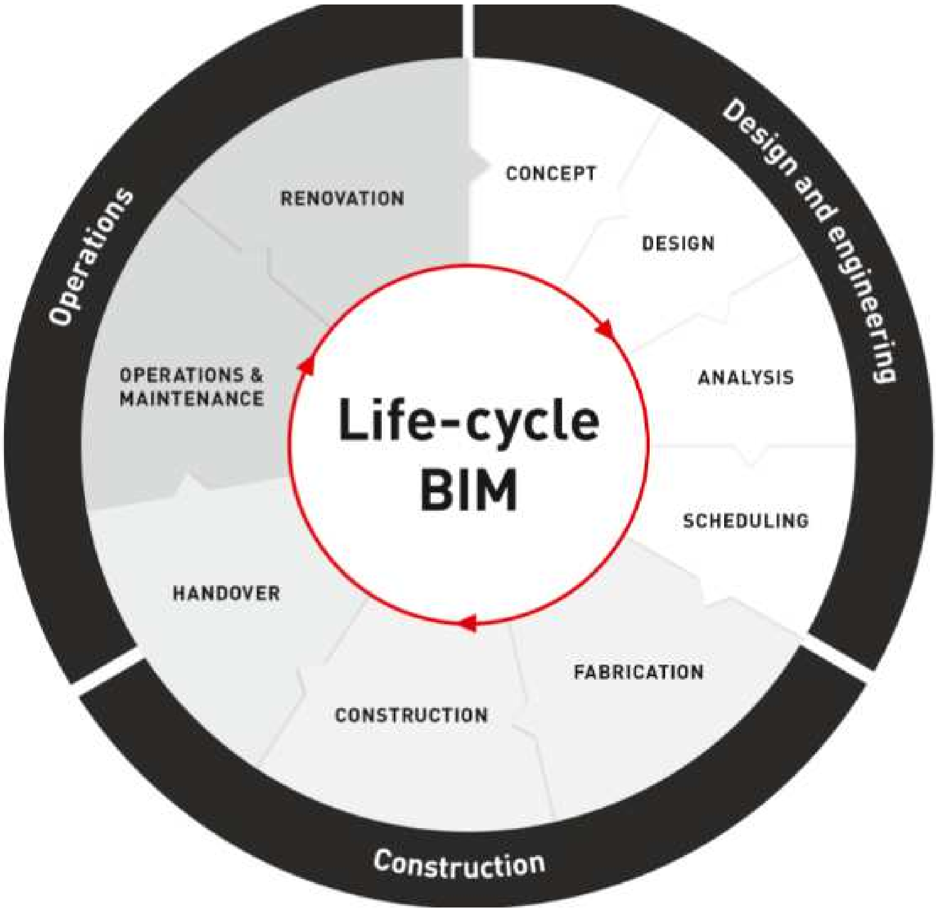
I will examine the historical development and progress of Building Information Modelling (BIM). I will highlight key milestones and innovations which have played an integral part in its rise over the decades from the early days of computer-aided design (CAD) to modern-day day BIM implementation.

BIM can be traced back to its roots in the 1960s and 70s when architects and engineers began exploring computer-aided design (CAD) software. Early systems allowed designers to produce two-dimensional drawings of buildings or structures but lacked storage/manipulation of data. While 3D modeling software was introduced during this era, its full potential wasn't realized until the 1990s with BIM as an integrated approach towards building design/construction.

One key innovation which led to BIM was object-oriented programming (OOP) during the 1990s. OOP enabled designers and builders to easily create 3D models containing information regarding building systems, materials, and construction sequencing; this allowed for simulation and analysis of building performance as well as identification of potential conflicts, inning in the early 2000s, several large construction projects, such as Sydney Opera House and Taipei 101 tower projects adopted BIM to improve coordination and cut costs, which in turn inspired BIM standards and guidelines like National BIM Standard-United States (NBIMS-US), first published in 2007.

Today, BIM has become an essential tool in the AEC industry with rapidly rising adoption rates. Cloud-based BIM platforms make collaboration between project stakeholders simpler while advances in virtual and augmented reality (VR/AR) technology help designers experience buildings in innovative new ways. coordination between construction crews and coordinated schedules for building completion.

Building Information Modelling's development has been an arduous, multi-stage journey driven by the innovation and collaboration needs of AEC industry players. BIM will become increasingly crucial as time progresses for its use in the design, construction, and management of buildings and infrastructure projects.



2.3 BIM the in Czech republic

BIM (Building Information Modeling) has quickly become one of the growing trends in the construction industry worldwide and the Czech Republic is no different. BIM is becoming an increasingly popular way for architects, engineers, and construction professionals to improve the design, construction, and maintenance processes in buildings.

Recently, demand for BIM services in the Czech Republic has seen an increased upsurge, and many construction firms are starting to use BIM as part of their daily practice. Furthermore, government initiatives to implement it on public sector construction projects have further legitimized BIM usage in that region.

BIM software and services can be readily found throughout the Czech Republic, from international to domestic companies offering solutions to the construction industry. Furthermore, numerous universities and educational institutions in the Czech Republic provide courses and training programs on BIM to equip professionals and students alike with skills necessary for its successful use within their work settings.

The Czech government has also recognized the importance of BIM and has been promoting its use in the public sector. In 2016, the Ministry of Regional Development launched a BIM Strategy for the Czech Republic, which aims to implement BIM in all public construction projects by 2020.

2.4 The Benefits of Building Information Modelling

Building Information Modelling (BIM) offers numerous advantages to AEC industry professionals and projects alike, from improved collaboration and communication, more efficient workflows, and reduced costs, to enhanced collaboration opportunities. Here we explore what this type of modeling has to offer AEC professionals.

One of the greatest strengths of BIM lies in its capacity to generate detailed three-dimensional models of buildings and infrastructure, used for purposes such as simulating building performance analysis, identifying conflicts or delays during construction sequencing, and visualizing these models in 3D for decision-makers and builders to make more informed choices and reduce errors or delays.

BIM can also benefit collaboration and communication among project stakeholders, helping designers, builders, engineers, and other project partners work more collaboratively from different locations - regardless of time zones - without miscommunication occurring; leading to more efficient workflows with lower costs overall.

BIM also presents tremendous advantages in facility management and maintenance. By creating digital models of buildings, facility managers are easily able to gain access to information regarding systems, equipment, and materials located therein, making maintenance planning and repairs much simpler while decreasing downtime and prolonging the lifespans of structures.

BIM can not only reduce costs and enhance sustainability but can also save significant costs over the lifespan of a building through simulation and analysis of building performance, helping designers optimize energy use while cutting waste, leading to substantial long-term cost savings as well as enhanced environmental performance.

Overall, BIM benefits can be seen clearly: from enhanced collaboration and communication to more efficient workflows and reduced costs; BIM has transformed the AEC industry and is helping create more eco-friendly buildings and infrastructure projects.

2.5 Software for designing building information model

There are a lot of programs for BIM design. For example:

- There are various programs for BIM design. ArchiCAD was initially known as Radar CH and used primarily to design water systems before evolving into one of the more widely-used architectural design software today.
- Revit was initially released for commercial construction use in April 2000 by Autodesk's acquisition of Revit Technology Corporation on April 4, 2002; Revit Building was then rebranded to Revit Architecture on April 27, 2007.
- Revit Structures was released for structural design on 7 June 2006 while Revit MEP, commonly used by structural engineers for designing MEP systems was launched as Tekla Structures on April 2006. Both programs serve the design needs of modern projects with architectural, mechanical, electrical, and plumbing elements (MEP).

- Tekla Structures – a modern tool for structural engineers, used for designing - Tekla BIMsight – software for viewing building information models in native Tekla format.IFC (Industry Foundation Classes It is an object-based file format with a data model developed by buildingSMART)

- Tekla BIMsight – software for viewing building information model in native Tekla format or in .ifc (Industry Foundation Classes It is an object-based file format with a data model developed by buildingSMART)

Some programs also can be used in a mobile version that helps to visualize building structures and improve the quality of work on site. (https://en.wikipedia.org)

2.6 Roles and responsibilities.

Building Information Modeling, or BIM, engineers are responsible for designing and managing digital models of buildings or infrastructure projects. Their primary responsibility lies with developing comprehensive representations of each physical structure that will be constructed - thus helping ensure accurate representations are built digitally as planned.

Below are the roles and responsibilities of a BIM engineer:

- Model Creation and Administration: BIM engineers are accountable for creating digital models of buildings or infrastructure projects with BIM software tools, using 3D modelling capabilities. Their models are then utilized by architects, engineers, contractors and other stakeholders as they facilitate design decisions.

- Collaboration With Design and Construction Teams: BIM engineers collaborate closely with architects, engineers, and construction teams to ensure that the digital model accurately represents design intent while remaining feasible for construction.

- Quality Control and Assurance: BIM engineers are responsible for assuring that digital models created are up-to-date and error free; quality assurance checks should also be completed to make certain project requirements are being fulfilled.

- Clash detection and coordination: BIM engineers use clash detection tools to identify conflicts among different systems or components in their digital model, then work collaboratively with other teams in resolving them before construction starts.

- Documentation and reporting: BIM engineers keep accurate records of digital models they create for clients and update as necessary, producing reports and documentation used by project stakeholders for stakeholders' review and use.

- Training and Support: BIM engineers may offer instruction and support to other team members on using BIM software and processes.

Overall, BIM engineers play an invaluable role in the construction process by ensuring that digital models accurately represent what will eventually be built physically, as well as making sure it runs efficiently and on schedule.

9 Responsibilities of the BIM Manager, BIM Coordinator and BIM Modeler:

	Strategic						Management				Production	
Role	Corporate Objectives	Research	Process + Workflow	Standards	Implementation	Training	Exceution Plan	Model Audit	Model Coordination	Content Creation	Modelling	Drawing Production
BIM Manager	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N
BIM Coordinator	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N
BIM Modeler	N	N	N	N	N	N	N	N	N	Y	Y	Y

2.7 Advantages and disadvantages of BIM

Building Information Modeling (BIM) is a digital process that enables stakeholders to design, build, and manage buildings and infrastructure projects collaboratively. Like any technology, BIM has both advantages and disadvantages. Here are some of the key advantages and disadvantages of BIM:

Advantages:

- Improved Collaboration: BIM can improve collaboration among different stakeholders such as architects, engineers, contractors and clients by encouraging communication among these groups as well as sharing of information to reduce errors or miscommunication. It provides for smoother processes as it reduces error risk through sharing knowledge.

- Enhanced Visualization: BIM allows stakeholders to view a building or infrastructure project in three dimensions, providing enhanced visualization that allows for early identification of any issues or conflicts as well as streamlining design and construction processes.

- Reducing Costs: BIM can assist in cutting costs by early identification of issues and conflicts which might impact design decisions and construction execution, thus helping prevent expensive mistakes on-site while saving both materials and labor expenses.

- Improved Sustainability: BIM can assist stakeholders with improving sustainability by helping them assess the environmental impacts of building or infrastructure projects, helping identify ways to decrease energy usage and cut waste production.

- Increased Productivity: Building Information Modeling can aid productivity by helping stakeholders work more efficiently and accurately, ultimately shortening project timelines and producing improved project outcomes.

Disadvantages:

- Learning Curve: BIM requires special software and extensive training, which may present stakeholders with steep learning curves as they adapt to this new technology.

- Complexity Increase: BIM can significantly complicate the design and construction process, becoming challenging to oversee without additional resources and support.

- Data Management: BIM generates massive quantities of information. Organising it effectively can be dauntingly complex; making mistakes could result in errors and delays that have severe ramifications for project outcomes.

- Cost: Implementing BIM can be expensive and present an entry barrier for smaller companies or projects.

- Reliance on Technology: BIM heavily relies on technology; any software glitches or hardware malfunctions that arise could significantly delay completion or have detrimental impacts on project outcomes.

BIM can bring many advantages, including increased collaboration and lower costs, but can also have drawbacks like steep learning curves and increased complexity. It all boils down to personal needs of each project as well as those involved determining whether BIM will be suitable.

2.8 BIM Implementation Strategies

In this Topic, we will look at key strategies for successfully implementing Building Information Modelling (BIM) within Architecture Engineering and Construction (AEC) organizations. Successful BIM implementation requires careful planning, stakeholder involvement, and in-depth knowledge of an organization's goals and needs.

Step one in BIM implementation involves setting clear organizational goals and objectives. This involves understanding its advantages - improved collaboration, more efficient workflows, and reduced costs are some of them - in order to establish clear BIM goals aligning with overall business strategies. By outlining goals explicitly enough, organizations can ensure their BIM strategy aligns perfectly with overall corporate strategies.

One key strategy of BIM implementation is engaging stakeholders at every level in your organization - this includes management, designers, engineers, and builders as well as any others that will play an integral part in the implementation process. Engaging these key participants helps build buy-in from everyone involved so everyone is invested in its success and committed to its successful execution.

Establish a detailed implementation plan outlining all steps and milestones involved with BIM implementation, with specific timelines, budgets, and key performance indicators (KPIs) that help track progress and measure success.

Training and education are integral parts of a successful BIM implementation strategy. Organizations should invest in staff education so they become adept at using BIM tools and workflows; this may involve both internal training and external services from BIM specialists or consultants.

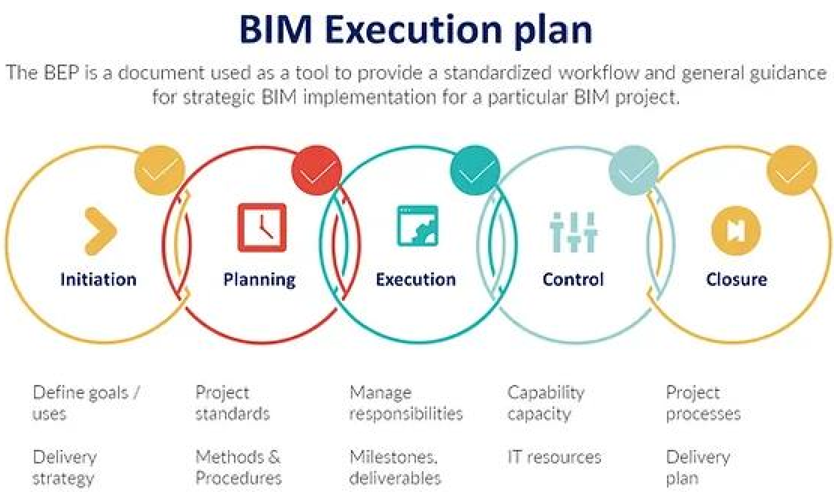
Finally, ongoing support and maintenance are integral in ensuring the long-term success of BIM implementation. This involves offering continued education courses as well as technical assistance when needed and troubleshooting any technical problems or glitches that arise during implementation. It is also critical that evaluation and improvement processes for implementation be regularly assessed so they meet an organization's goals and needs effectively.

Implementation of BIM requires careful planning, stakeholder involvement, and ongoing support and maintenance in order to be successfully realized by organizations and transform their design and construction workflows with this tool. By following these strategies organizations will reap all its advantages while revolutionizing design and construction workflows.

2.9 BIM Execution Plan

The BIM Execution Plan (BEP) can take many forms depending on its context; there may be different definitions and interpretations, yet all forms agree it forms part of any BIM construction project and should therefore be adopted and utilized accordingly. Regardless of any differences in individual case requirements for BEP implementation; all agree on its central role.

BEP serve as tools that outline a standardized workflow and general guidance for strategic BIM implementation for any given BIM project. A BEP often details standards, responsibilities, and protocols that guide their use during BIM project implementation as a basis of model creation, management, project collaboration, information exchange and BIM deliverable delivery until their closeout and closure.



A BIM Execution Plan should be created during the early design phases of any project and amended or refined as necessary through implementation and beyond. It should define scope, process flow, BIM tasks performed during implementation as well as any information exchange between parties involved and define infrastructure needed for project implementation.

The BIM Execution Plan has been acknowledged as a living document that usually includes:

- the project scope
- details about the delivery strategy
- definition of the BIM roles and responsibilities
- the project milestones
- the summary of the delivery team's capability and capacity
- the use of the IT resources
- collaboration / data generation / information exchange
- the project's Standard
- the project's Methods and Procedures
- data ownership
- deliverables/project close down

2.10 BIM and Facility Management

Building Information Modelling (BIM) plays an integral part in facility management - which involves overseeing buildings throughout their lifecycle and their caretaking - including ongoing maintenance, repair, renovation and management activities. We will explore some ways BIM can assist facility managers.

BIM can make facility management much simpler by centralizing building information such as building systems, components and equipment; warranties; maintenance schedules and repairs information in one central place. By maintaining accurate and up-to-date records in BIM models, facility managers can make informed decisions regarding repairs while also making sure building systems function optimally.

BIM can also assist facility managers with preventative maintenance by using its data analysis capabilities to spot potential maintenance issues before they become major concerns. A BIM model could track equipment lifecycles to predict when new pieces need to be bought; thus enabling proactive replacement to reduce risks related to equipment failure.

BIM can also serve to assist energy management. By using BIM software to analyze building systems and components, facility managers can utilize energy savings opportunities and optimize building performance - this may involve improving insulation levels or upgrading HVAC systems as part of an energy reduction initiative or changing lighting fixtures to cut energy use.

BIM can assist facility management by providing data for compliance and reporting purposes. Many buildings must meet regulations related to safety, health and environmental compliance; by keeping accurate and up-to-date information stored within a BIM model, facility managers can rapidly produce reports and documents to meet these demands.

At its core, BIM can play an indispensable role in facility management by serving as an integral tool to accessing building data in one centralized place, supporting preventative maintenance activities, optimizing energy performance, providing compliance and reporting data and reporting data, and ultimately creating a healthier building for occupants and boosting performance. By harnessing its potential power facility managers can improve building performance while decreasing costs significantly while creating safer workplace environments for building users.

The Facility Management services are focused on providing a complete range of services that can facilitate the clients in doing business.

2.11 The Future of BIM

As has been documented throughout about BIM, BIM has transformed how buildings are designed, constructed, and managed. But what lies in store for BIM in its future? In this final chapter we'll take a look at trends and developments shaping this sector's trajectory.

One trend likely to have an enormous effect on BIM is artificial intelligence (AI). As AI technologies advance further, they could soon be included into BIM software and help designers and engineers automate many manual tasks currently performed manually - for instance optimizing building designs, analyzing sensor data to detect issues more rapidly, creating reports or documents more efficiently etc.

Another trend expected to radically transform BIM is virtual and augmented reality (VR/AR) technologies. VR/AR solutions have already proven invaluable when creating immersive walkthroughs of buildings for designers and clients; in future they could become integrated with BIM software allowing more natural interaction with building models for engineers and architects.

An additional trend that could influence the future of BIM is cloud computing's increasing use. By employing cloud-based BIM software, designers and engineers can collaborate more easily, access building models from any location around the globe more readily, as well as support new workflows or processes which would otherwise be challenging or impossible with traditional desktop programs.

BIM can become even more integrated with other technologies and systems, including building automation systems, energy management systems and smart home technologies. Integrating it into these systems could allow buildings to become more energy-efficient, environmentally sustainable and responsive to occupant needs - creating sustainable buildings which respond accordingly.

As is apparent from these discussions, BIM looks set for an exciting future with numerous exciting innovations and trends likely to shape how buildings are designed, constructed, and maintained in years ahead. BIM will likely play an even larger part in shaping building projects by helping architects and engineers design buildings which are safer, more energy-efficient, and sustainable in design and maintenance processes.

Finally, BIM could become even more accessible and user-friendly in the future as technology progresses further. As software becomes easier to use with more intuitive interfaces and advanced features incorporated, making BIM available to more professionals and organizations, including small businesses or independent designers who may wish to leverage its power for their projects.

Conclusion Ultimately, BIM represents an exciting and promising future with great promise of innovation and expansion. By keeping abreast of developments and trends within this field, professionals in BIM industry can position themselves to take full advantage of all available opportunities and play an instrumental role in shaping its development in shaping its future development.

2.12 Leading countries with BIM adoption

Building Information Modeling (BIM) has rapidly been adopted across countries to aid with the design, construction and operation of buildings and infrastructure worldwide. Many countries use some degree of BIM already while some nations have made greater strides than others when integrating it across their construction industries.

At present, leading countries for BIM adoption and implementation include:

United Kingdom (UK): Since 2011, when its government unveiled the BIM Level 2 mandate, Britain has been at the forefront of BIM implementation worldwide. Widespread adoption across construction industry projects throughout UK has helped position UK as an industry leader when it comes to BIM technology and global leadership status in BIM has also contributed towards global recognition for this advancing approach to construction project delivery.

United States of America: While BIM adoption in the US was initially slower, significant strides are being taken toward its implementation across its construction industry. Many state and local governments now mandate its use for public projects in America.

Singapore: Singapore has long been considered an innovator when it comes to BIM implementation, having mandated its use on public projects since 2015. Furthermore, they've established an academy providing training and certification services to BIM specialists.

Japan: Since the early 2000s, Japan has actively fostered BIM adoption; many major construction firms in Japan now utilise BIM extensively while its government supports this with infrastructure projects to promote BIM adoption.

Nordic countries such as Norway, Finland and Sweden lead in BIM adoption rates. Their governments emphasize sustainability by using BIM software to maximize energy efficiency while decreasing environmental impacts of buildings and infrastructure projects.

BIM adoption continues to expand globally as more nations join its ranks as adopters.

3 Building project

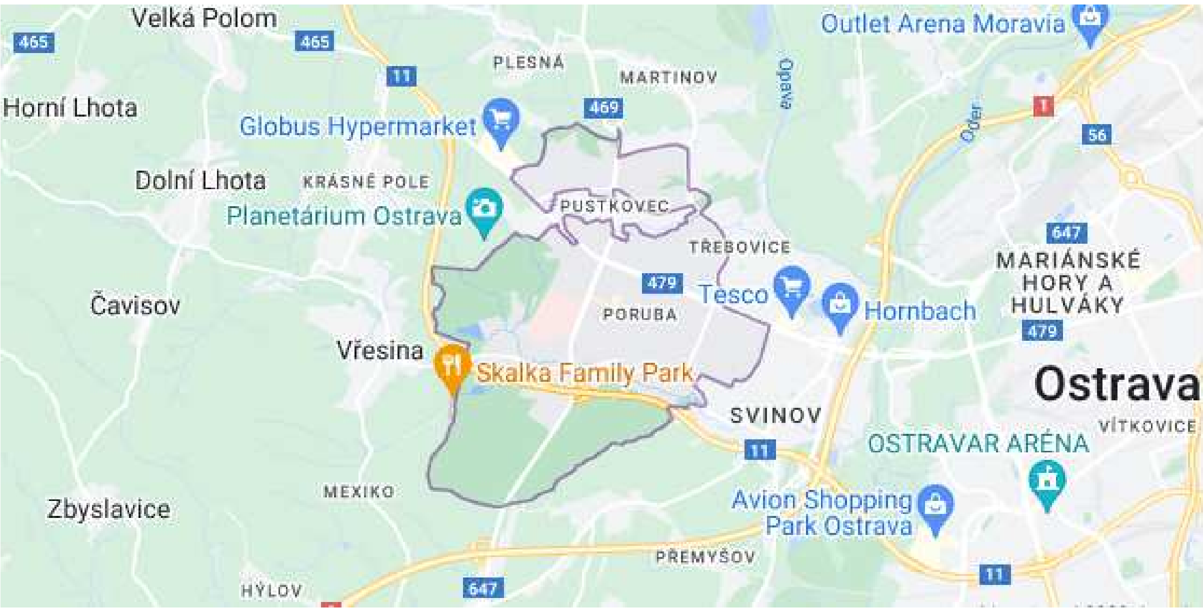
3.1 City Introduction

Poruba is a district located in the city of Ostrava, in the Moravian-Silesian Region of the Czech Republic. It is situated in the northeastern part of the city and is known for its large residential areas, industrial complexes, and green spaces.

Poruba was founded in the 1950s as a planned socialist city and was built to house workers for the nearby industrial complexes. It has since grown to become a major district of Ostrava, with a population of around 70,000 people.

Despite its industrial character, Poruba also boasts several parks and green spaces, including the popular Poruba Forest Park, which offers opportunities for hiking, biking, and other outdoor activities.

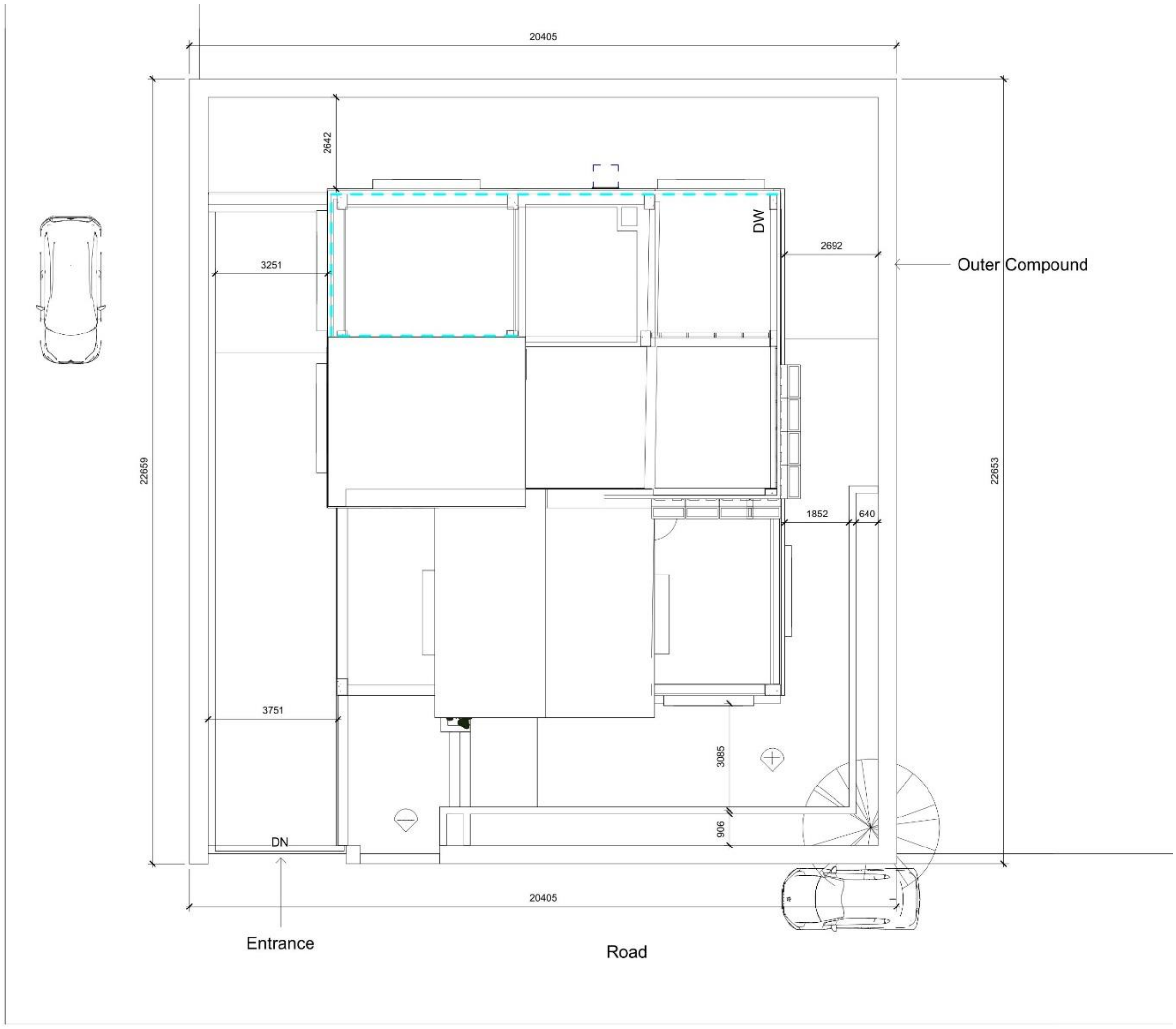
Poruba is well-connected to the rest of Ostrava, with several tram and bus lines running through the district. It is also home to several educational institutions, including the Poruba campus of the VŠB-Technical University of Ostrava.



3.2 Project Details

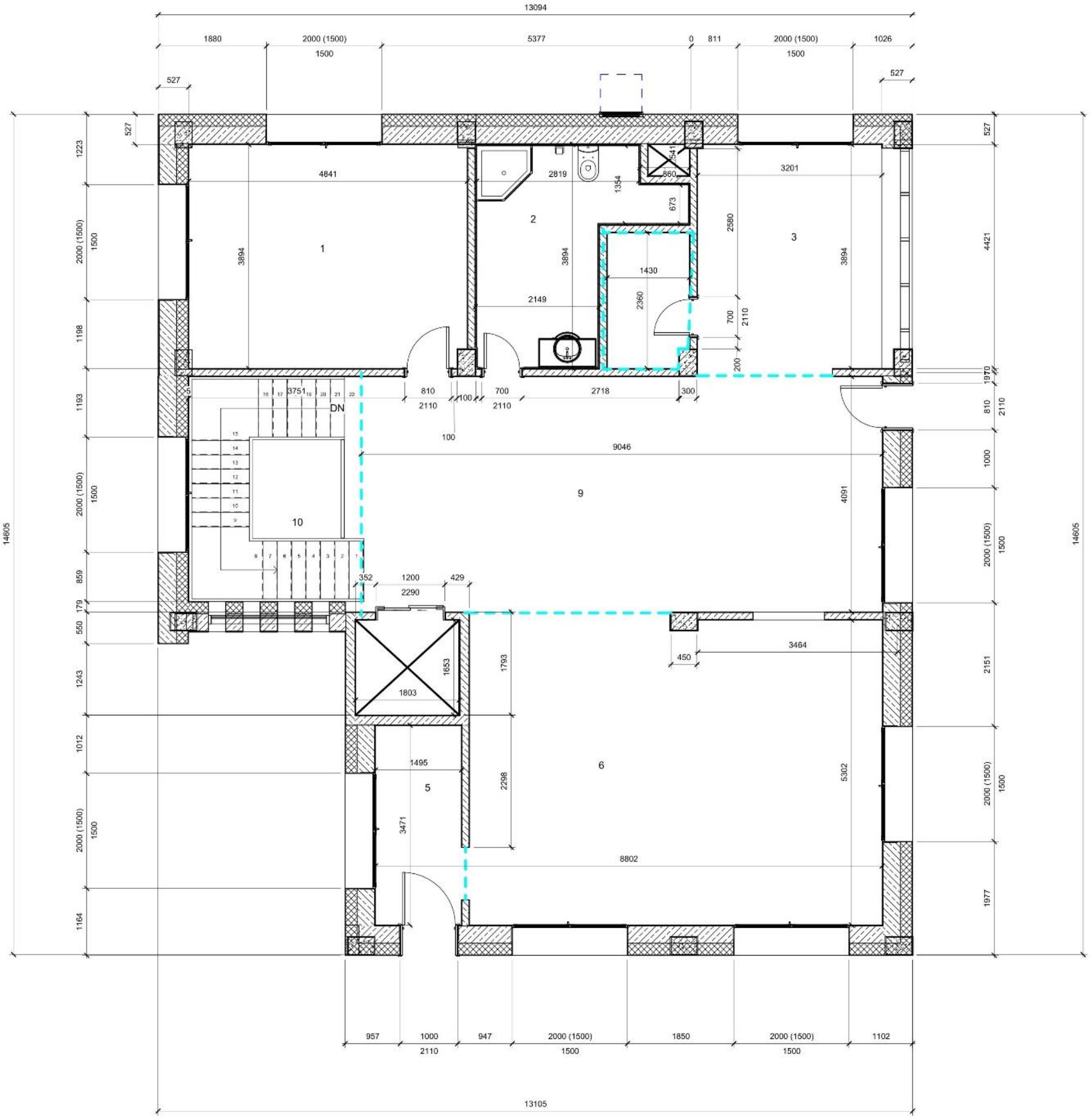
- Project of a Family House for a couple and 2 children
- The building is located on a rectangular plot of 20x23m.
- Three-storey volume, which practically reaches the maximum occupancy and buildability of the plot.
- The house contains basement, First floor and second floor.
- In the basement there is only room for stairs and elevator.
- First floor contains a bedroom, Bathroom, Kitchen, Living hall and dining hall. the design and layout of the first floor can have a significant impact on the functionality and comfort of a building or house, and should be carefully planned and executed to meet the needs and preferences of its occupants.
- The two bedrooms on the second floor suggest that this floor may be designed for more private and personal use, such as for family members or guests. The presence of a bathroom on this floor provides convenience and privacy for those using the bedrooms.
- The hall on the second floor may serve as a common area for socializing or as a place for relaxation or entertainment. The two balconies offer additional outdoor space and may provide scenic views or natural light to the bedrooms and hall.
- The second floor of the house has a large, glass wall that is intended to provide natural light and scenic views. This type of design can have several benefits, including creating a sense of openness and spaciousness in the hall and providing a connection to the outdoors. The glass wall can also enhance the aesthetic appeal of the space and allow for more natural light, which can improve the mood and well-being of the occupants.
- 3D View of the house is shown below.

Block Plan Drawing

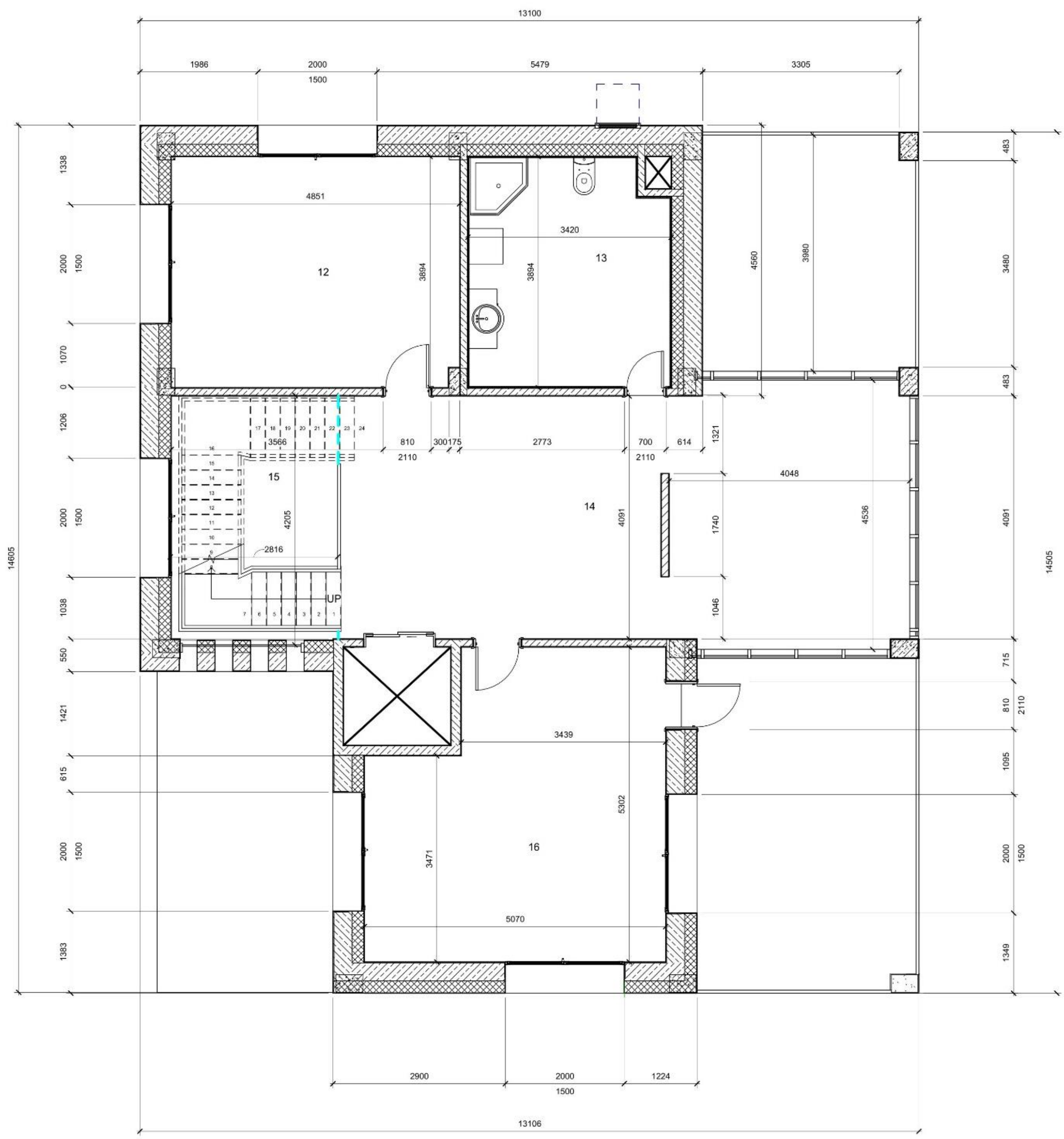


In the block plan drawing its clearly mentioning the road and place of the building located. Also the dimensions are given.

First Floor Plan



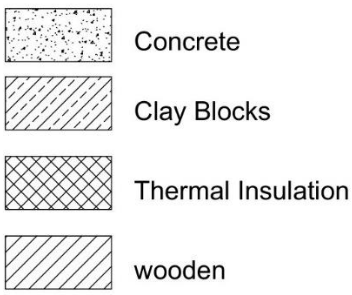
Second Floor



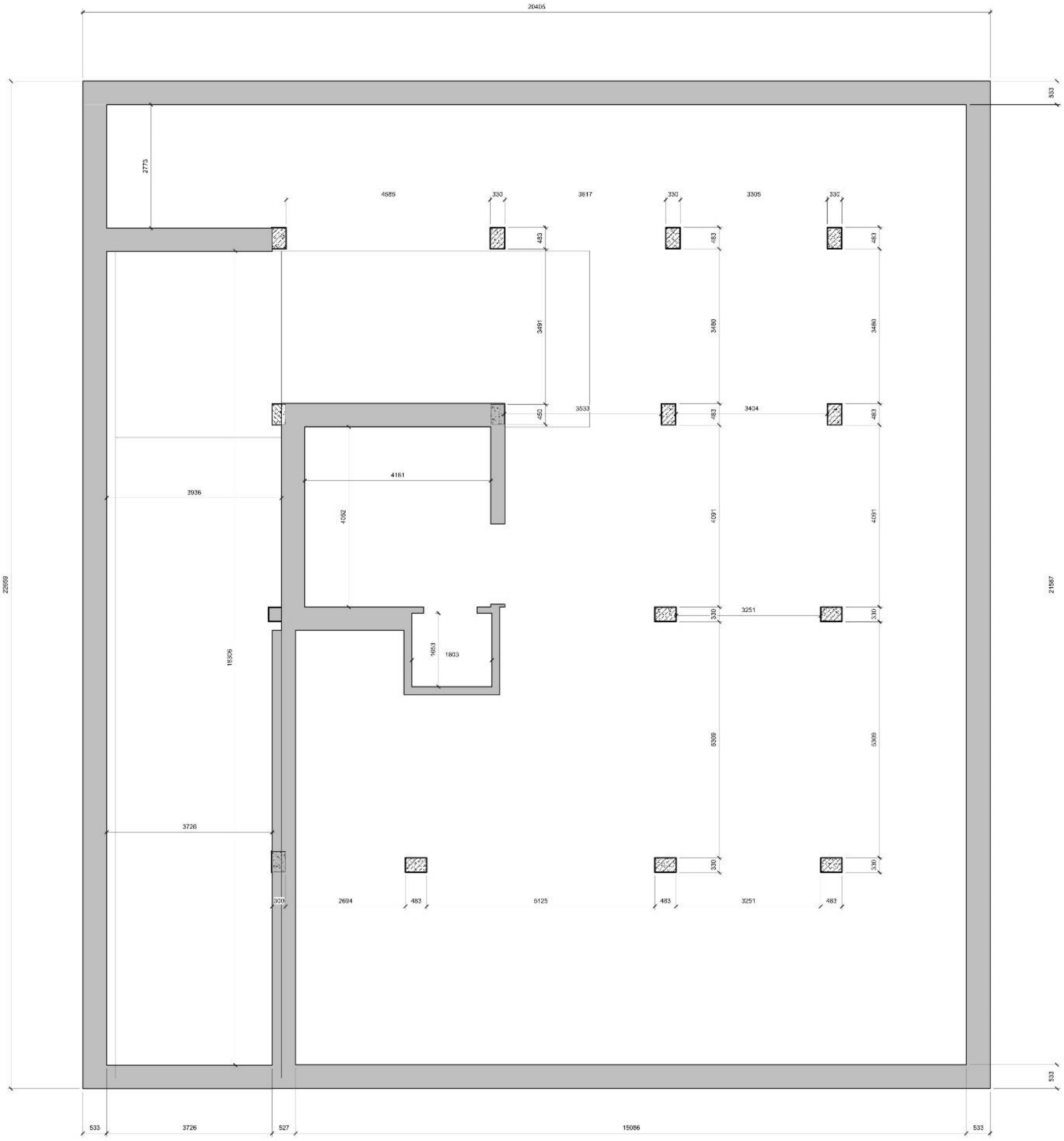
Legend of rooms

Legend of Rooms				
Number	Name	Area	Floor Finish	Wall Finish
1	BED ROOM 1	19 m²	floating vinyl floor	Lime Cement Plaster
2	BATHROOM 1	10 m²	Ceramic tile	Bathroom wall tile
3	KITCHEN	13 m²	floating vinyl floor	Lime Cement Plaster
5	ENTRANCE	5 m²	floating vinyl floor	Lime Cement Plaster
6	LIVING ROOM 1	38 m²	floating vinyl floor	Lime Cement Plaster
9	DINING HALL	37 m²	floating vinyl floor	Lime Cement Plaster
10	Room	12 m²	floating vinyl floor	Lime Cement Plaster
22	STORE ROOM	3 m²	floating vinyl floor	Lime Cement Plaster
12	BED ROOM 2	19 m²	floating vinyl floor	Lime Cement Plaster
13	BATH ROOM 2	13 m²	Ceramic tile 3000 mm Height	Bathroom wall tile
14	LIVING HALL 2	41 m²	floating vinyl floor	Lime Cement Plaster
15	STAIR ROOM	12 m²	floating vinyl floor	Lime Cement Plaster
16	BED ROOM 3	24 m²	floating vinyl floor	Lime Cement Plaster
17	STAIR ROOM	18 m²	floating vinyl floor	Lime Cement Plaster
23	Room	85 m²	paving slabs	N/A

Material Legends for the floor plan



Groundwork


20405
533
2773
4686
330
3817
330
3305
330
483
483
483
3491
3480
3480
450
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3404
483
4161
3936
4092
4091
4091
22659
21587
330
3251
330
1653
1803
18306
5309
5309
3726
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300
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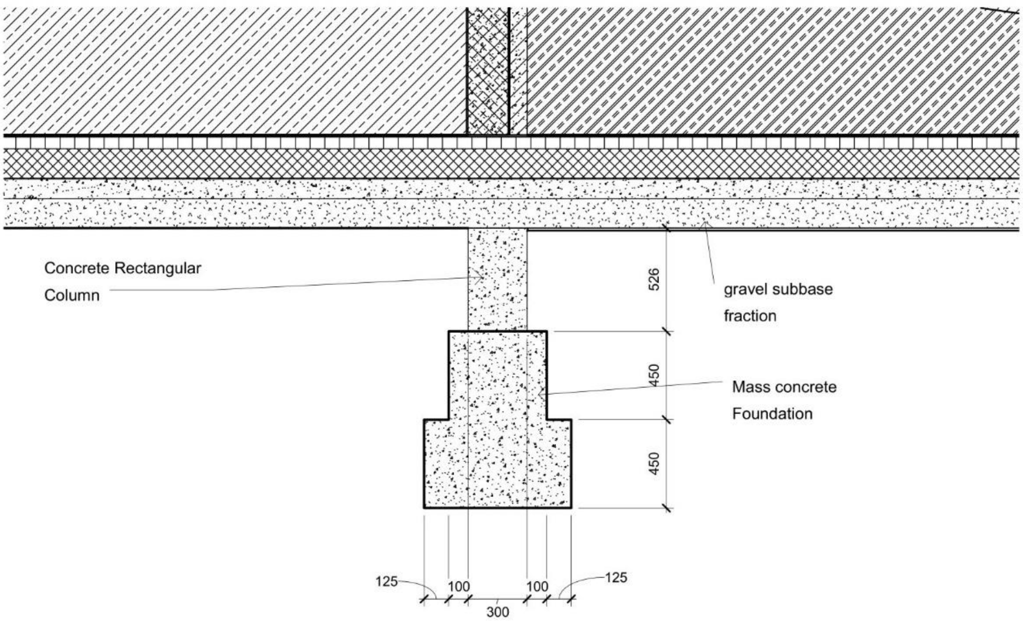
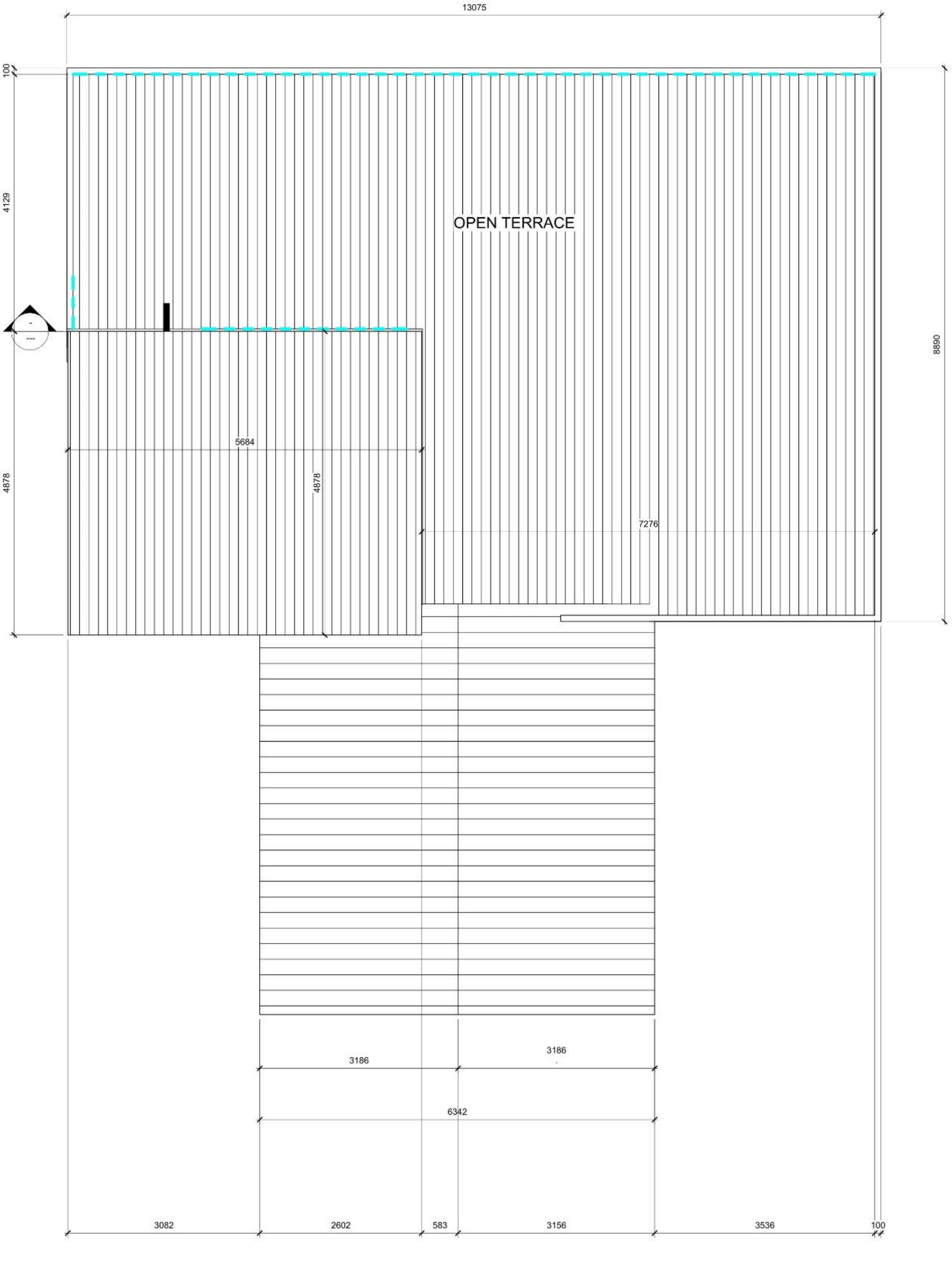
3251
483
533
533
3726
527
15086
533

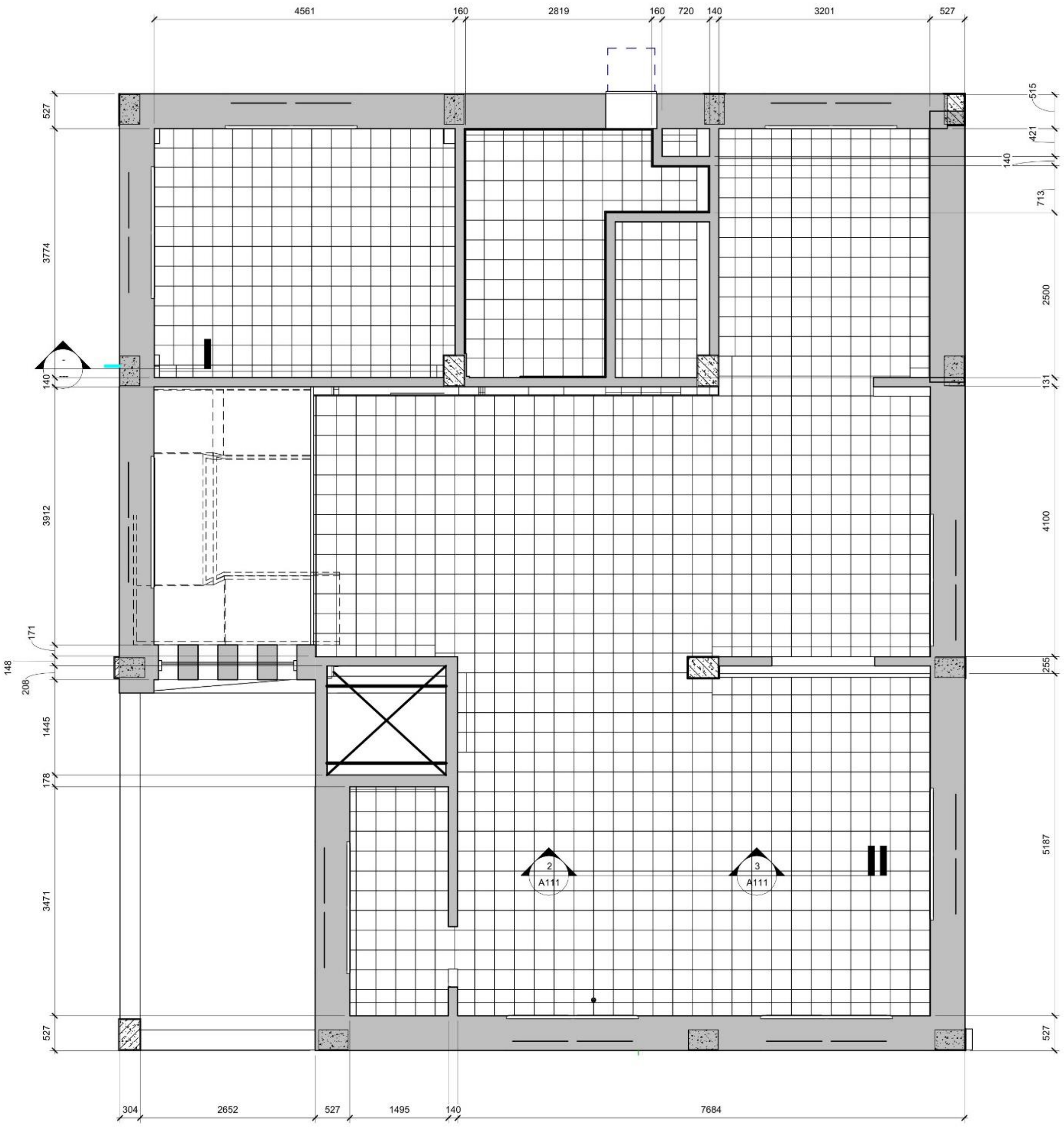
Foundation Section



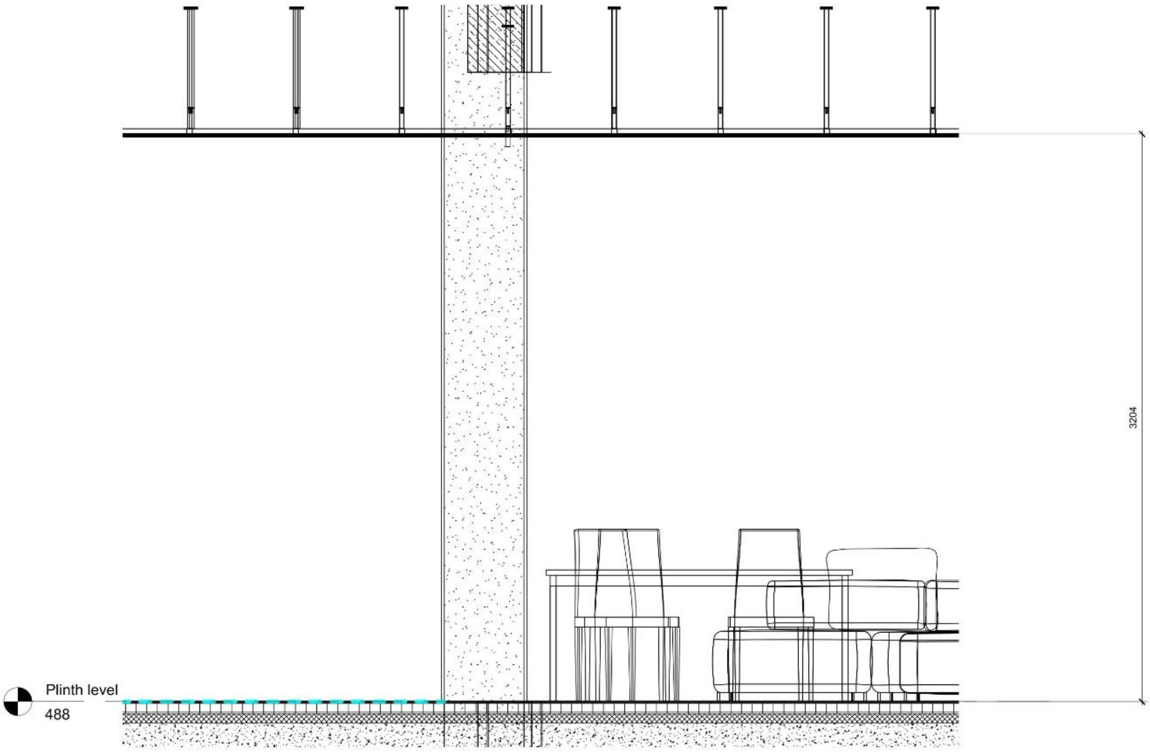
Plan of the roof

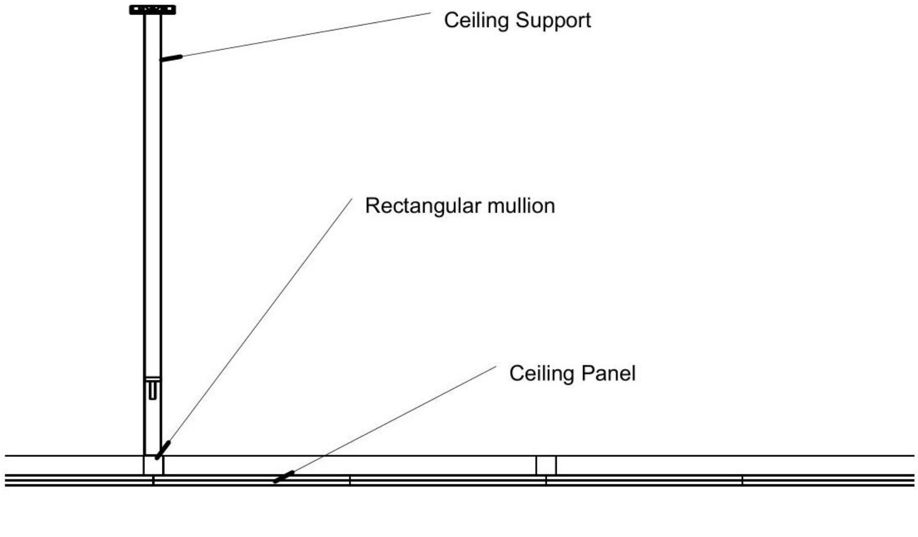


First Floor Ceiling

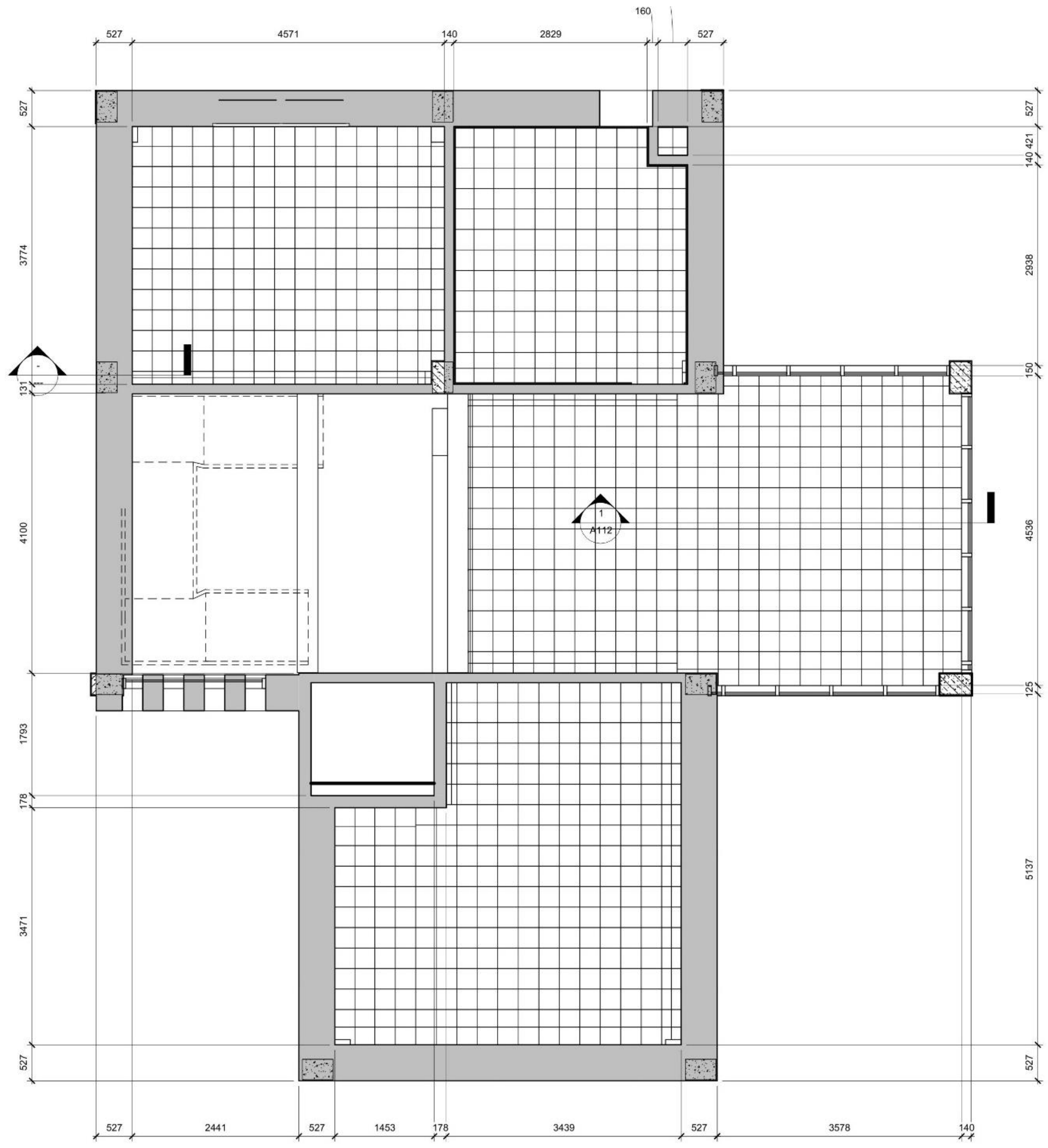


First floor Ceiling Section

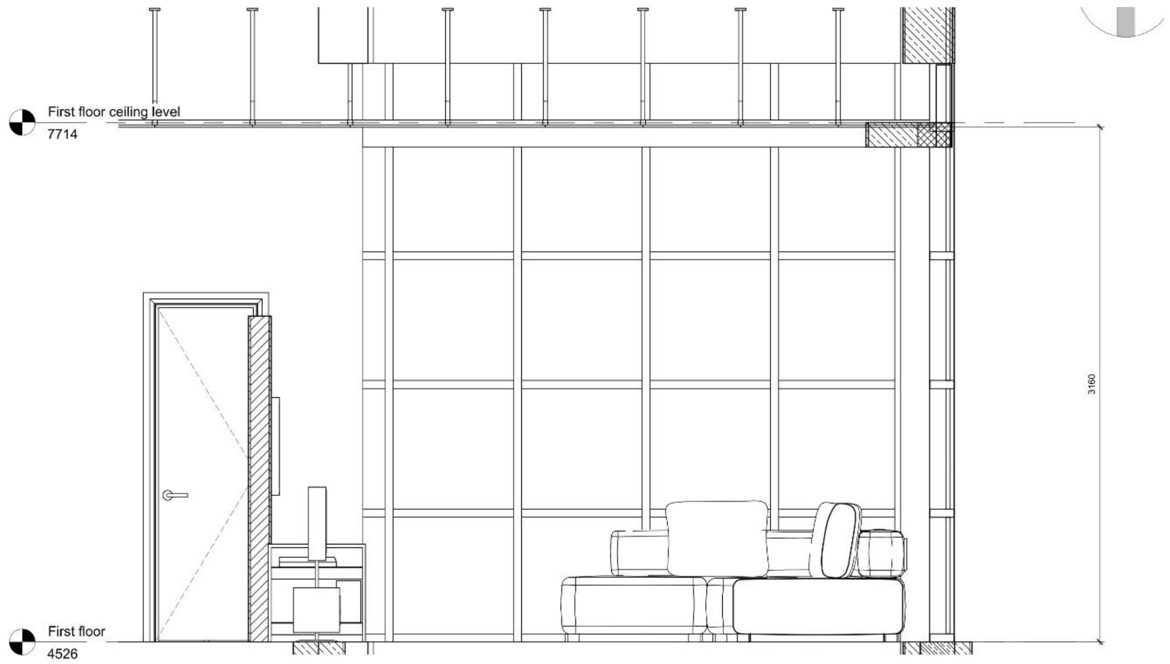


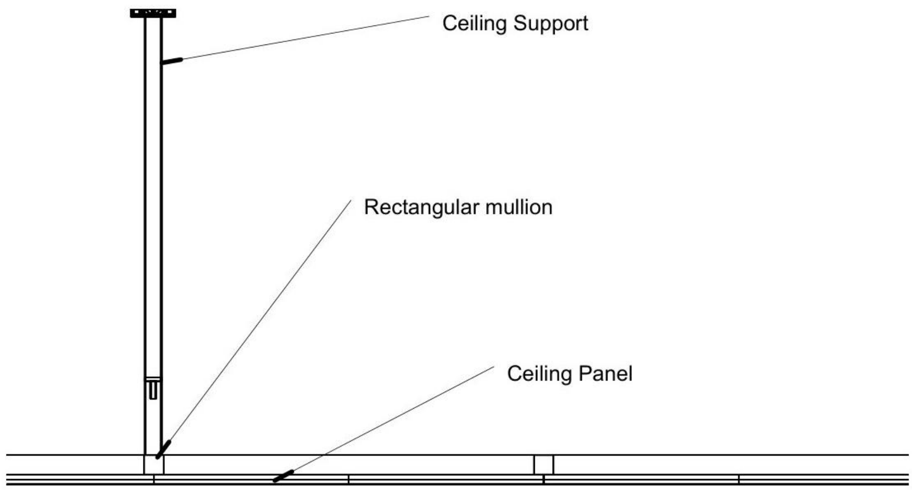


Second floor ceiling

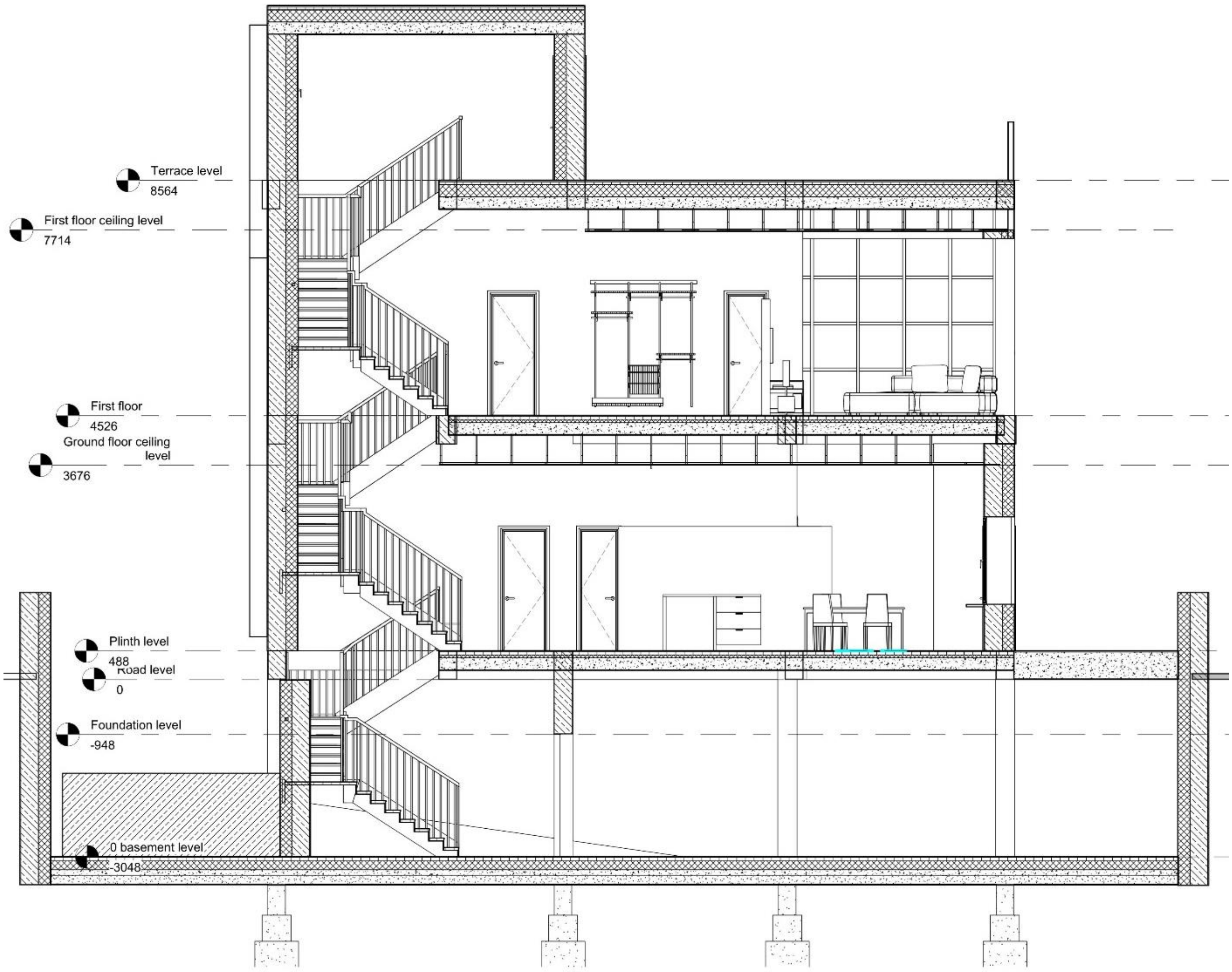


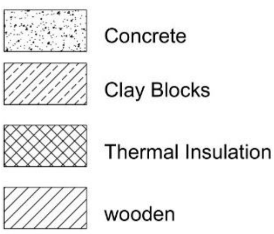
Second Floor Ceilng Section





Crossection

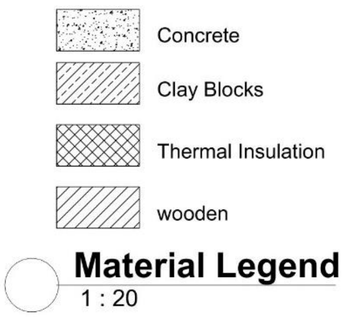




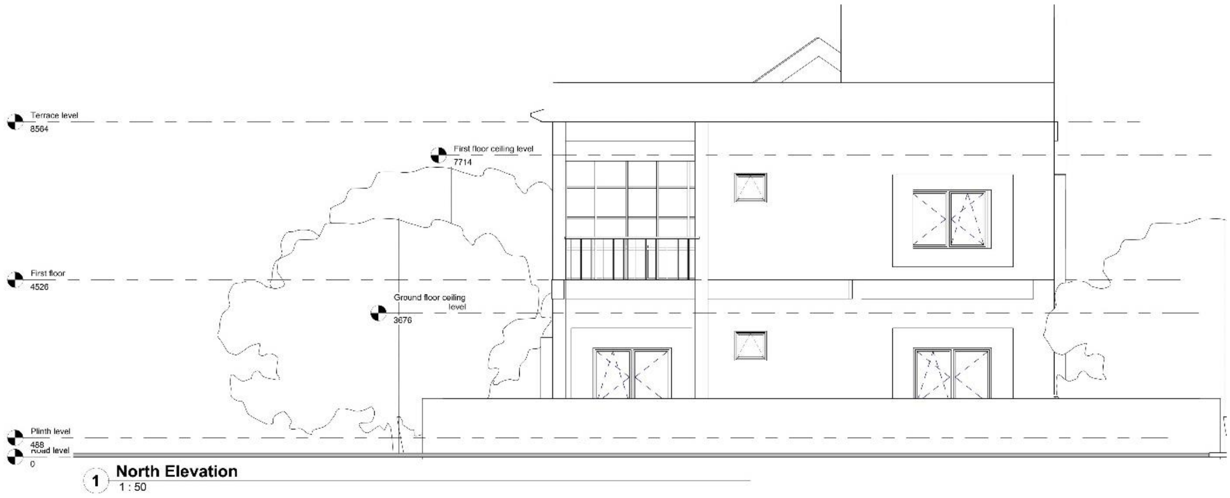
Material Legend

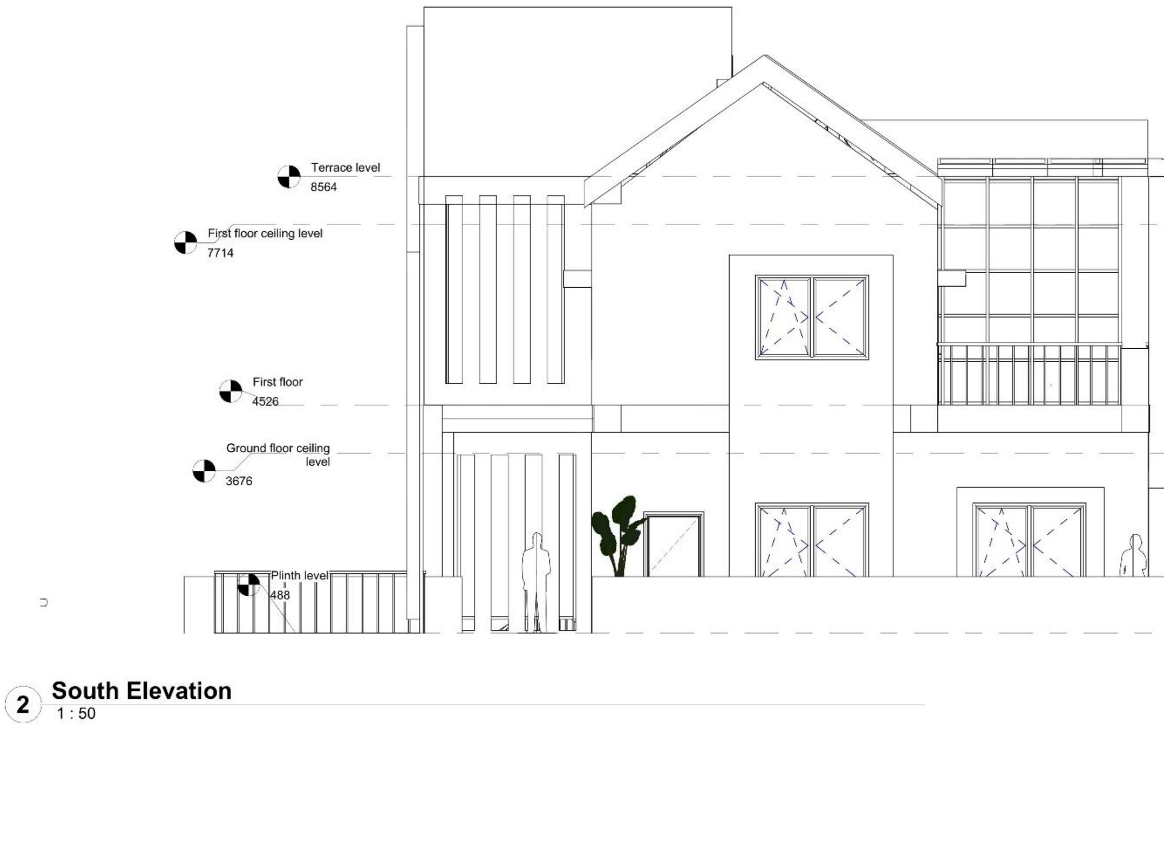
1 : 20

Longitudinal Section

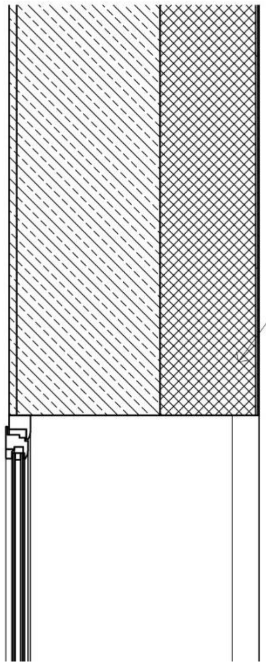


Elevation Views



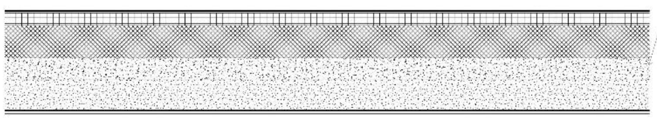


Detailing of the External wall



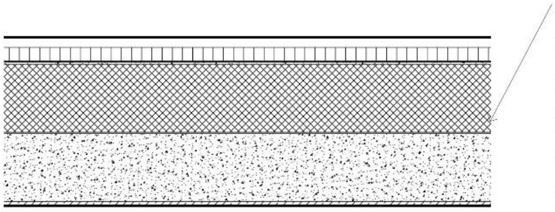
- Lime cement plaster
- Cement spraying
- Masonry clay blocks 300mm
- Adhesive compound1 thermal insulation EPS 70
- Reinforcing glass fiber fabric (leno)
- Adhesive and leveling compound
- Penetration of the base
- Silicone-grained silicate plaster

Detail of the external wall under terrain



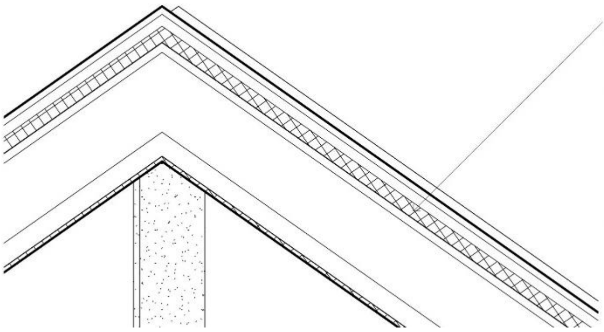
Mosaic plaster 3 mm
Penetration of the base 1 mm
dhesive and leveling compound 3 mm
Reinforcing glass fiber fabric (leno) 1 mm
Thermal insulation type PERIMETR ($\lambda_{d,max}$ = 0,034 W/m·K) 200 mm
Bituminous adhesive compound 2 mm
Waterproofing belt 4 mm
Masonry clay blocks 300 mm
Cement spraying 2 mm
Single-layer inner lime plaster 15 mm

Detail of Flat roof terrace



Paving slabs 30 mm
Pedestals/paving slab supports 40 mm
Waterproofing 1,5 mm
Separating layer - geotextiles 2 mm
Cement board rooftop 6 mm
Thermal insulation λd,max = 0,040 W/m.K (mineral hard) 200 mm
Vapour barrier 4 mm
C16/20 reinforced concrete slab 200 mm
Plaster profile UD, 2 x CD
Gypsum Plasterboard 12,5 mm

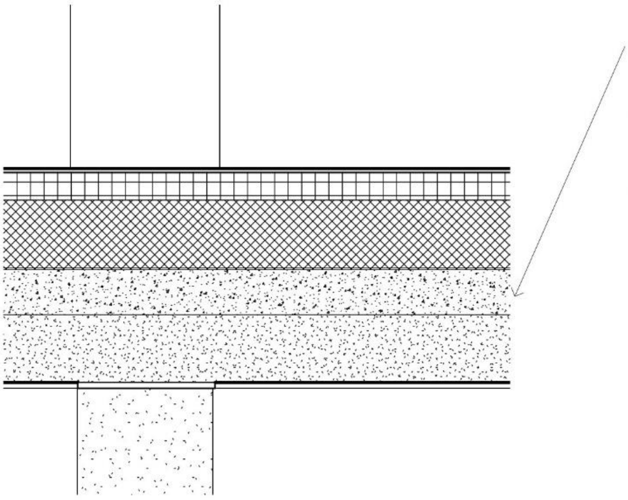
Detail of the Pitched roof



Ceramic roof tile
Wooden batten 30x50 30 mm
Wooden counter batten 40x60 40 mm
Waterproofing 1,5 mm
Wood formwork 24 mm
Thermal insulation λd,max = 0,037 W/m.K + rafters 1 m 200 mm
Thermal insulation λd,max = 0,037 W/m.K 60 mm
Plaster profile UD, 2 x CD
Vapour barrier 1 mm
Gypsum Plasterboard 12,5 mm

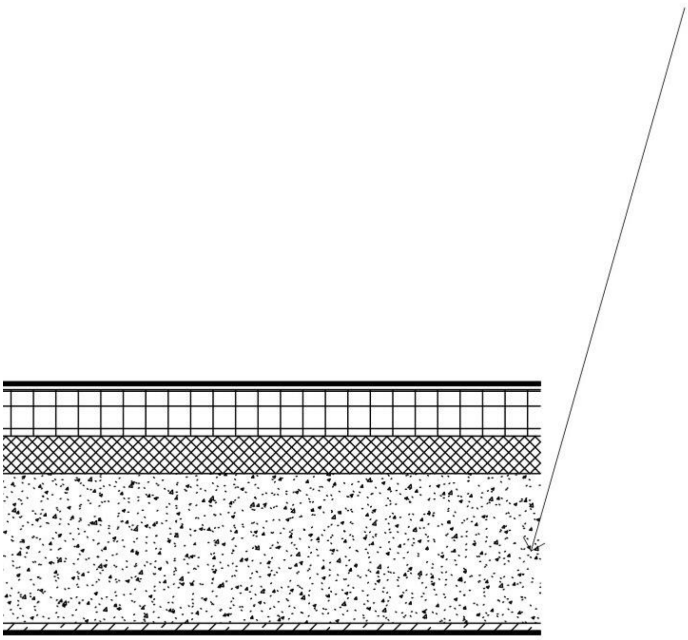
Floor Details

First Floor:



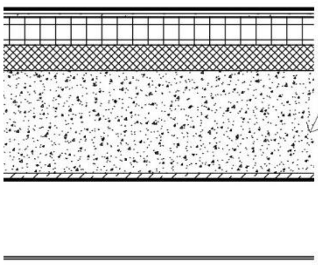
- Floating vinyl floor 8 mm
- Backing 2 mm
- Anhydrite with underfloor heating 60 mm
- Separating layer - PE foil 0,2 mm
- Thermal insulation EPS 150, 150 mm $\lambda_{d,max}$ = 0,035 W/m.K
- Waterproofing asphalt strip 4 mm
- Bbottom concrete C16/20 reinforced concrete slab 100 mm
- Gravel subbase fraction 16-32 mm, 150 mm

Second floor:



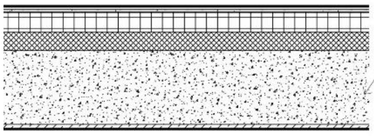
Floating vinyl floor 8 mm
Backing 2 mm
Anhydrite with underfloor heating 60 mm
Separating layer - PE foil 0,2 mm
Acoustic insulation (mineral hard) 50 mm
C16/20 reinforced concrete slab 200 mm
Plaster profile UD, 2 x CD
Ggypsum Plasterboard 12,5 mm

First Floor Bathroom section:



- Ceramic tiles 9 mm
- Adhesive sealant 6 mm
- Waterproofing 2 mm
- Anhydrite with underfloor heating 53 mm
- Separating layer - PE foil 0,2 mm
- Thermal insulation EPS 150, 150 mm $\lambda_{d,max}$ = 0,035 W/m.K
- Waterproofing asphalt strip 4 mm
- Bottom concrete C16/20 reinforced concrete slab 100 mm
- Gravel subbase fraction 16-32 mm 150 mm

Second Floor Bathroom Section:



- Ceramic tiles 9 mm
- Adhesive sealant 6 mm
- Waterproofing 2 mm
- Anhydrite with underfloor heating 53 mm
- Separating layer - PE foil 0,2 mm
- Acoustic insulation (mineral hard) 50 mm
- C16/20 reinforced concrete slab 200 mm
- Plaster profile UD, 2 x CD
- Gypsum Plasterboard 12,5 mm

3.3,4 Preparation 3D model and Submission of the model and drawings to the common CDE data environment.

First, the 3D model is created in Revit using various tools and features to design the structure or building in a virtual environment. The model should be accurate and detailed, including all necessary components such as walls, floors, roofs, doors, and windows.

Once the model is complete, it can be exported in a compatible format and uploaded to a CDE. The CDE is a centralized platform where all project data is stored and shared among stakeholders, including designers, contractors, and clients.

Before submitting the model to the CDE, it is important to ensure that it is properly checked and validated to ensure accuracy and compatibility with other project data. This may involve reviewing the model for errors, such as clashes or missing information, and correcting any issues that are found.

Once the model is ready, it can be uploaded to the CDE and shared with other project stakeholders. The model can then be accessed and reviewed by team members, allowing for collaboration and coordination among the various disciplines involved in the project.

Overall, preparing a 3D model in Revit and submitting it in a CDE is an important step in the construction process, allowing for efficient communication and collaboration among project stakeholders and ensuring a successful outcome for the project.

3.5 LOD(Level Of Details)

BIM (Building Information Modeling) terminology refers to "LOD," or the Level of Development or Detail. LOD refers to how complete or developed 3D models or building elements in BIM processes have become over time.

LOD (Level of Detail) can be divided into different levels, from LOD 100 (conceptual design) to LOD 500 (as-built or facility management). Each level represents an increasing level of information in a BIM model.

As LOD levels increase, more information and detail will be included in a model; an element modeled with LOD 300 would contain more detail than its equivalent model created at LOD 200.

LOD (Level of Detail) in Building Information Modeling is essential in order to ensure all project stakeholders share an understanding of the level of detail included in BIM models at different stages, thus helping reduce misunderstandings or errors and increasing project quality overall.

LOD (Level of Development) not only provides a common language to discuss the level of development in BIM models and elements, but it can also serve to define different project team member responsibilities during different project phases - for instance an architect may be assigned modeling elements at LOD 300 during design while construction may entail modeling elements at LOD 400 during construction phase.

LOD is inextricably tied to BIM maturity level, which measures how effectively BIM implementation occurs within an organization or project. As BIM maturity rises, so too do levels of LOD implementation as well as collaboration and information exchange among project stakeholders.

As it should be noted when assessing the quality and accuracy of BIM models, LOD alone cannot determine their quality and accuracy; other aspects like data source reliability as well as modelers' experience can have an enormous effect on its final result.

Overall, LOD can serve as an invaluable asset when it comes to improving BIM processes, increasing consistency and clarity while simultaneously helping increase quality and accuracy on building design/construction projects.

BIM makes LOD essential in project tracking by helping project stakeholders measure progress during design and construction processes. Simply by specifying desired LOD values for elements or components within their building model, team members can quickly ascertain which parts have been completed while others still need further work.

Construction teams often rely on BIM models during the building phase to reduce errors and rework on site, giving contractors access to accurate, up-to-date models can ensure construction goes smoothly and efficiently. Project managers can help ensure smooth operations by giving contractors access to accurate models from day one of a project's construction process.

BIM LOD can also support various project workflows and delivery methods, from traditional design-bid-build methods such as design-bid-build or IPD to more collaborative approaches like design build or integrated project delivery (IPD).

Finally, it should be mentioned that LOD is constantly shifting as the BIM industry matures and expands. New technologies and workflows could alter its definition or implementation at some point; nonetheless, its core principles will likely remain an essential element of BIM processes for years to come.

3.6 CDE(Common data Environment)

Building Information Modeling (BIM) uses Common Data Environment as its term to refer to an online space where all project-related information and data can be securely stored, managed, and shared among project stakeholders in an organized fashion.

A project's CDE serves as the central repository for all project information - BIM models, drawings, specifications, contracts and any other documents related to construction - at all times, helping ensure team members always have access to accurate, up-to-date knowledge reducing errors, miscommunication and rework risk.

CDEs are typically overseen by an Information Manager who is accountable for setting up, maintaining and overseeing usage by team members of all types. Furthermore, this person may define and enforce data standards such as file naming conventions, formats or exchange protocols in order to promote consistency and interoperability across project stakeholders.

At its heart is a Central Data Environment (CDE). Along with being the single source for project information, CDEs often feature collaboration tools like discussion forums, issue tracking systems and project management software to facilitate communications among project stakeholders and facilitate their coordination and cooperation.

Overall, CDEs play an invaluable role in supporting BIM processes by encouraging collaboration, information exchange and project delivery at every step along the building lifecycle.

Absolutely! A Construction Document Exchange (CDE) can play an invaluable role in complex building projects with numerous stakeholders such as architects, engineers, contractors, subcontractors and facility managers.

By providing one, secure location for project-related data, the CDE can reduce risks related to loss, duplication, and mismanagement, while assuring all team members work from identical information - thus helping boost overall project efficiency while simultaneously cutting costs and improving quality.

One of the key advantages of CDEs is their support of an inclusive and collaborative building design and construction approach. By breaking down traditional silos between stakeholders, it fosters greater communication, coordination and trust within teams resulting in more successful project outcomes.

Furthermore, CDEs can aid sustainable and resilient building projects by offering a central repository to track environmental data, energy use and other key performance indicators.

Overall, a CDE is an indispensable asset to any organization looking to implement an efficient BIM workflow. By offering a secure yet collaborative space for project information storage and sharing purposes, the CDE helps ensure project success while mitigating risk and improving outcomes overall.

4. CONCLUSION

To conclude, Preparing project documentation using BIM (Building Information Modeling) has become an indispensable aspect of modern construction and architecture, providing greater collaboration among project stakeholders through virtual building models created using special programs.

BIM documentation includes an abundance of data that spans architectural, structural and MEP (mechanical, electrical and plumbing) details as well as construction sequencing and scheduling information. Team members can share this real-time knowledge among themselves for faster decision-making and faster problem solving.

BIM methodology offers several advantages over more traditional forms of construction documentation, including enhanced visualization of buildings or structures in their environment to better identify issues and optimize design, more efficient communication among stakeholders, as well as reduced errors or delays due to errors and delays.

Documenting BIM presents its own set of challenges, from software and training requirements, standardized workflow protocols and workflow management processes, time consumption, and meticulous detail required for effective BIM documentation.

Preparing project documentation using BIM is an intricate task requiring extensive planning, collaboration, and attention to detail; when executed effectively it can yield significant advantages for construction projects such as increased efficiency, accuracy and team communication among team members.

5. LIST OF ABBREVIATIONS

- BIM - Building Information Modeling
- LOD - Level of Detail
- LOI - Level of Information
- IFD - Industry Foundation Classes
- IFC - Industry Foundation Classes
- MEP - Mechanical, Electrical, and Plumbing
- FM - Facility Management
- CAD - Computer-Aided Design
- GIS - Geographic Information System
- API - Application Programming Interface
- PIM - Project Information Model
- AIM - Asset Information Model
- CDE - Common Data Environment
- 4D - 4-dimensional
- 5D - 5-dimensional
- RFI - Request for Information
- ROI - Return on Investment
- QA/QC - Quality Assurance/Quality Control.

6. REFERENCE

- Autodesk "What is BIM?" http://www.autodesk.ru/campaigns/aec-building-design-bds-new-seats/landing-page
- http://bimforum.org/wp-content/uploads/2012/12/MHC-Business-Value-of-BIM-in-North America-2007-2012-SMR.
- http://www.autodesk.ru/campaigns/aec-building-design-bds-new-seats/bim-standard english/thank-y
- http://www.yitgroup.com/YIT_GROUP/about-us/YIT-in-brief/history
- http://bimforum.org/lod/
- http://www.consultant.ru/document/cons_doc_LAW_75048/
- http://nnhpe.spbstu.ru/wp-content/uploads/2015/02/GOST_P_-21.1101-2013.pdf
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