VŠB – Technická univerzita Ostrava
Fakulta stavební
Katedra pozemního stavitelství

Projekt pro provedení stavby bytového domu
The Detailed Design Documentation of Apartment Building

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Ostrava 2018

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ANNOTATION

Hanh Pham Thi Hong. The Detailed Design Documentation of Apartment Building.

VŠB-TUO, 2018, 60 p + Contruction drawings.

This thesis focus on detailing design for an apartment building in terms of primary architectural designs, main support structures, civil works. In addition, the mission includes:

- Making BOQ – The bill of quantities of joinery elements, locksmith elements and plumbing elements,
- Designing reinforced concrete foundations – Strip foundations

The apartment building is supposed locating in Poruba, Ostrava, Czech Republic. It should take a long period of time to complete designing a building with all construction stages in fact. Thus, in this design document, all done works are considered at the prelimary approach. However, the primary stages during contruction process are mentioned and discussed in detailed ways in this thesis.

Key words:

Detailed design, aprtment building, assessmment, bill of quantities, elements, strip foundations.

CONTENTS OF THE DIPLOMA THESIS

LIST OF USED MARKING

FAST	Fakulta stavební
kg	Kilogram
kPa	Kilopascal
MPa	Megapascal
m	Meter
$\mathbf{m^2}$	Square Meter
$\mathbf{m^3}$	Cubic Meter
mm	Milimeter
BOQ	The bill of quantities
$\boldsymbol{\delta}$	Thickness
$\boldsymbol{\gamma}$	Partial factor
°	Degree
$\boldsymbol{\varphi}$	Internal friction angle of soil
$\boldsymbol{\rho}$	Density
$\boldsymbol{\sigma}$	Stress
E	Soil deformation module

A – COVER REPORT

A. 1 Identification data

A. 1.1

a) the name of the building

Facade Building

b) place of construction

N0. 01, Moravanska street, Poruba-Ostrava, Czech Republic.

c) subjects of project documentation

SO 01 Apartment houses
SO 02 Infrastructure systems

A. 1.2 Builder data

a) name, surname and place of residence

Bc. ...

b) name, surname, business name, company ID, if assigned, place of business (physical person) ...

c) business name or company name, if applicable, address, registered office (legal entity) …

A. 1.3 Data on the Joint Documentation Processor

a) name, surname, business name, company name, if assigned, place of business

(natural person doing business) or business name or name, company ID, address of the registered office)

Hanh Pham Thi Hong (processor DT)

Student FAST VŠB-TU Ostrava, Faculty of Civil Engineering, field of study 3607T016 Industrial and Building Constructions.

e-mail: hanhpham101287@gmail.com

tel: 777 326 967

Ing. Jiří Teslík, Ph.D. (Head of the diploma thesis)

b) name, surname of the principal designer, including the number under which he / she is enrolled in the register of authorized persons led by ČKAIT with marked field, or authorization specialization

This part is not included in this thesis‘s mission

c) names and surnames of designers of individual parts of project documentation incl. the number under which it is kept in the CKAIT record with the marked field, specializing in their authorization.

This part is not included in this thesis‘s mission

A.2 The division of buildings into buildings and technical and technological facilities

Classification of diploma thesis on individual building objects:

SO 01 - Apartment houses

SO 02 - Infrastructure systems

The subject of the thesis is only building objects SO 01 and SO 02.
Technological facilities are not subject of the diploma thesis.

A.3 List of inputs

The input for the thesis:

- Diploma Thesis Assignment

- Requirements of the master's thesis Ing. Jiří Teslíka, Ph.D.

B – SUMMARY TECHNICAL REPORT

B. 1 Description of the construction area

a) characteristics of the territory and building plot, built-up areas and unconstructed areas, conformity of the proposed building with the nature territory, the existing utilization and the built-up areas,

The building plot 636.84 m2 locates at the T-junction of Moravanska and Komarov street in Poruba-Ostrava, Czech Republic with neighboring sites around west-south.

The new building addresses both streets with the frontage to the main street Moravanska for pedestrian access, the drive way to parking place underground is at the left side head to Komarov street. Also, there is a back door, private ways and a small area for garbage at behind. This apartment block is built up directly next to the public space to create a strong streetscape that run east-west, with front and side lawns, the mature trees on site is deliberately offset from this so that the trees can then act as feature for the development.

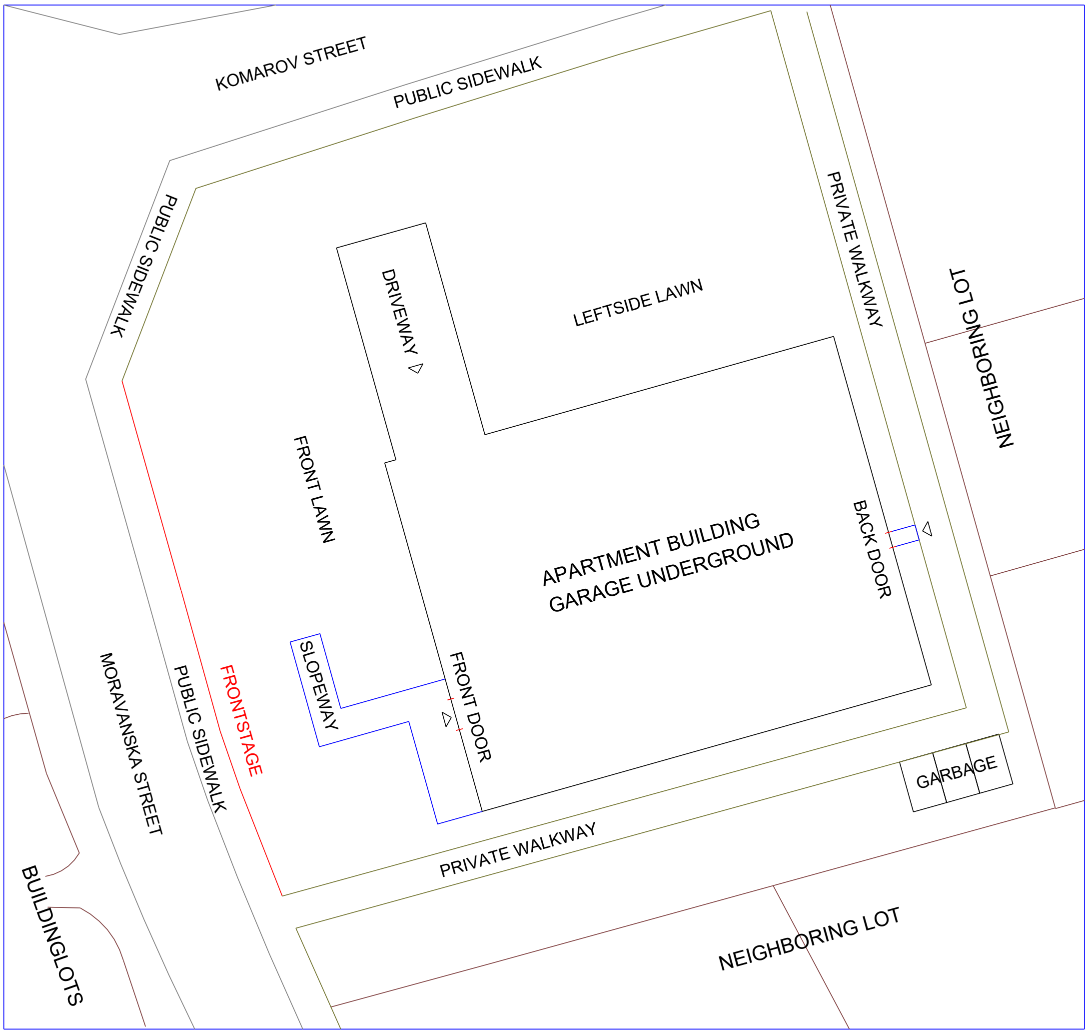


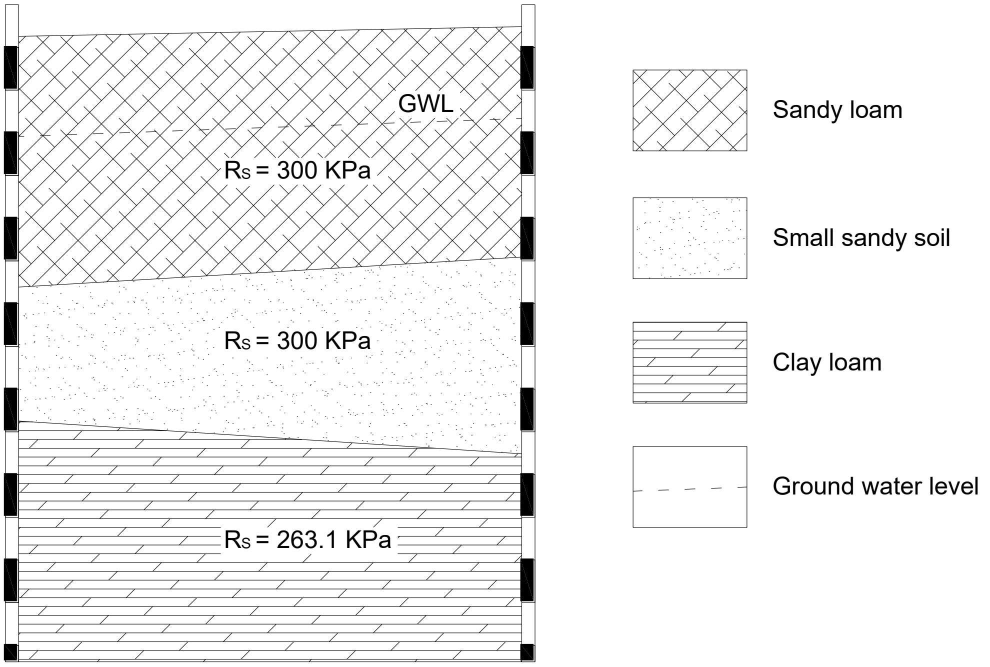
Diagram building lot as seen from above

b) list and conclusions of completed surveys and analysis (geological survey, hydrogeological survey, building-historical survey etc.),

- To design the shallow foundation and to meet the assigned requirements, the geotechnical model of the bearing soil has to be defined. This is obtained by assembling data and information from geotechnical investigations as summarized for this example through the following steps:

1. The soil profile is taken from the borehole log;
2. CPTu soil in situ testing gives cone and frictional resistances and the pore pressures with depth;
3. Normalized cone resistance Qt and Friction Ratio Fr are used to classify the different soil deposits.

- Soil profile:



- Groundwater level: 2.5m from the ground's surface.
- Radon: In the design and construction work, radon risks at the construction site shall be taken into account. See part **B.2.10** – a) protection against penetration of radon from the subsoil.

- Surveys of structures and surroundings:

Before the construction work is started, it shall be verified that construction work does not cause harmful changes in the natural conditions of the surroundings, in the subgrade or bedrock, in groundwater or in the buildings and structures located in the construction area or in the surroundings. This part is not included in this thesis's mission.

- Traffic vibration:

Before the construction work is started, vibration caused by traffic shall be analyzed, if necessary. It must not cause damage to the building nor excessive disturbance to the people inside the building. This part is not included in this thesis's mission.

- Quality test of foundations:

The stability of the foundations and structures resting against the ground against moisture and temperature shall be investigated. This part is not included in this thesis's mission.

c) existing protection and safety zones

The building is not located in existing protection and safety zones.

d) position relative to flood area, undermined area etc.,

The building is not located in position relative to flood area, undermined area etc.,

e) effect of the construction on surrounding buildings and lands, surroundings protection, the effect of the construction on the drainage conditions in the area,

The building construction has some certain effects on surrounding buildings and lands, surroundings protection, on the drainage conditions in the area. However, this part is not included in this thesis's mission.

f) requirements for sanitation, demolition, tree felling,

No demolition and tree felling works required.

g) requirements for maximum appropriation of the agricultural land fund or land intended for forestry purposes (temporary / permanent),

This part is not included in this thesis's mission.

h) territorial technical conditions (especially the possibility of connecting to the existing transport and technical infrastructure),

No. 146/2008 – relating to the scope and content of transport infrastructure project documentation.

Subordinate legislation – ministerial decrees:

No. 268/2009 – relating to technical requirements for construction

See part **D.1.1** – a) Technical report

B. 2 General description of the building

B. 2.1 Purpose of building use, basic capacities of functional units

a) new construction or change of completed building; in the case of a change of the building, the data on their current state, the conclusions of the construction technical, eventually the structural-historical survey and the results of the static assessment of the supporting structures,

This is a new apartment building with multifuntions, which is constructively devided into two parts:

- Underground part: Besement and ground floor are framed by reinforced concrete elements (foundations, columns, beams, floors, diaphram walls).

- 1st, 2rd, 3th floors and the sloped roof are timber structures with wooden columns, beams, composite walls, floors and ceilings.

The main support structures are made of reinforced concrete and wooden frame.

All elements such as wall, ceiling, and floor contructions are designed according to production parameters from manufacture.

Static assessment for reinforced concrete foundation is conducted in this thesis. Also, there are some Teplo assessments are included.

b) Purpose of building use, basic capacities of functional units,

- Plan purpose: The apartment building locates at the cross street, the location is near with some companies and schools. The building is a long-term strategy for solving accommodation issues and bringing utilities to the neighborhood.
- Basic fountions:

+ Basement: Parking lots and Technical room
+ First floor: Shopping stores, Gym, Laundry room, Storage room.
+ Second and third floor: Living place with 3 apartments each story.

Built-up area: 636.84 m^2

Total using floor area of the building: 1654.84 m^2

Where:

• Technical part (parking, technical room) – 542.93 m^2

• Commercial area (Gym, shop) – 401.25 m^2

• Apartments – 710.66 m^2

The multifunctional object is divided into small units with different types of utilization.

• Garages - Underground floor

• Gym No.1.05 - Ground floor

• Mini market No.1.09 - Ground floor

• Theather No. 1.03 - Ground floor

• Laundry No.1.08 - Ground floor

• Store No.1.04; 1.07 - Ground floor

• Apartment No. 2.1 to 2.3 – 2NP

• Apartment No. 3.1 to 3.3 – 3NP

B. 2.2 General urban and architectural solution

a) urbanism – territorial regulation, composition of the spatial solution,

This part is not included in this thesis's mission.

b) architectural solution – composition of the shape solution, material and color solution.

See part **D.1.1** – a) Technical report

B. 2.3 General operational solution, production technology

The apartment building is used for living and does not contain operation solution and production technology.

B. 2.4 Barrier-free building use

A seperated way at the main entrance with slope 4% , two parking lots at the basement and the lift as well are designed for guests, who are disabled people.

B. 2.5 Safety in use of the building

a) Building solution,

- Fire protection: This part is not included in this thesis's mission.

- Occupant safety and heath:

Hazard recognition to develop solutions that provide healthy built environments, analysis the potential for indoor air quality problems, occupational illnesses and injuries, exposure to hazardous materials, and accidental falls beckons architects, engineers, and facility managers to design and maintain buildings and processes that ensure occupant safety and health. This part is not included in this thesis's mission.

b) Structural and material solution,

See part **D.1.1** – a) Technical report

c) Mechanical resistance and stability.

This part is not included in this Thesis's mission.

B. 2.6 Basic characteristics of technical and technological equipment

a) technical solution,

See part **D.1.1** – a) Technical report

b) List of technical and technological equipment.

Heating units; Evaporative cooling units; Solar panels… See part **B. 2.9**

B. 2.7 Fire safety solution

a) Division of buildings and objects into fire cells,

This part is not included in this Thesis's mission.

b) Calculation of fire risk and determination of the degree of fire safety, Fire resistance of external wall, ceilings, roof, internal walls

This part is not included in this Thesis's mission.

c) Evaluation of proposed building structures and building products including requirements for increasing fire resistance of building structures,

This part is not included in this Thesis's mission.

d) Evaluation of evacuation of persons including evaluation of escape routes,

This part is not included in this Thesis's mission.

e) Evaluation of standoff distances and definition of fire hazard area,

This part is not included in this Thesis's mission.

f) Provision of required amount of fire water or other extinguishing agent including the distribution of internal and external supply points,

This part is not included in this Thesis's mission.

g) Evaluation of the possibility of fire fighting (access roads, fire fighting roads),

This part is not included in this Thesis's mission.

h) Evaluation of the technical and technological equipment of the building (distribution pipelines, air-conditioning equipment),

This part is not included in this Thesis's mission.

i) Assessment of the requirements for securing the building by fire safety devices,

This part is not included in this Thesis's mission.

h) Scope and manner of deployment of alert and safety signs and tables.

This part is not included in this Thesis's mission.

B. 2.8 Principles of energy management

a) Criteria for the thermal technical assessment,

- Internal temperature: 21°C, humidity 50%,
- External temperature: -15°c, humidity 85%.

b) Energy performance of the building,

- Heat transfer coefficient of the structure:

+ Ceiling: U = 0.242 W/m^2K
+ External walls: U = 0.192 W/m^2K
+ Ground Floor: U = 0.254 W/m^2K

c) Assessing the use of alternative energy sources.

- Solar panel:

+ Lowering the energy consumption,
+ Reducing the dependency on traditional power sources,

B. 2.9 Hygienic requirements for buildings, requirements for work and communal environment

The main regulations relating to health and safety on construction sites are the following:

Act No. 183/2006, the Building Act

Act No. 262/2006, the Labour Code

Act No. 309/2006, the Ensuring Further Health and Safety at Work Act

Act No. 258/2000, the Public Health Protection Act

Regulation No. 591/2006, providing for Requirements for the Protection of Health and Safety on construction sites.

Legislation also regulates the conditions (relating to health and safety) for employees that work in the premises after the completion of construction.

a) Water supply:

The indoor water supply system is connected with public water network through pipes. An isolating valve must be fitted at the point of connection to allow for maintenance and repair of the building's water supply system if required.

Pass pipes close to fixtures to minimise the number of branches and unnecessary elbows, tees and joints. Pipework is installed: In a roof space, under a timber floor, below a concrete slab.

Point of entry into the building: Garage and laundry and include an accessible isolating valve, line strainer and pressure limiting valve.

Water heating system: Using electrical and solar heat source; Locating centrally to reduce the length of pipe runs to fixtures because longer pipe runs require more water to be drawn off before hot water is discharged. Install a separate point-of-use water heater for fixtures that are more than 10 m from the main water heater.

Noise prevention: Avoid running pipes over or near bedrooms and living areas.

Pipe materials and specifications: Copper, polyethylene (PE), and cross-linked polyethylene (PEX). The pipes used in a building must not contaminate potable water supply, and must be suitable for the water pressure, flow rate and temperature of water they will be carrying.

b) Wastewater:

Wastewater system connects to the city sewerage system through pipes.
Pipe sizing and gradient: Diameter for a drain is 250 mm with 1:60 gradient.

<u>Access for maintenance</u>: In specified places to allow drains to be cleaned.

Position of access points:

+ Immediately inside the boundary

+ At every change in gradient over 45°

+ At every horizontal change in direction more than 45°

+ At every junction that serves a soil fixture or any branch drain longer than 2 m

+ Every 50 m on straight drains if rodding points are used, or every 100 m if inspection chambers, access chambers or inspection points are used

+ At both ends of the building where a drain passes under a building.

<u>Materials for drains</u>: Polyethylene (PE), and cross-linked polyethylene (PEX)

<u>Gully traps</u>: Receiving discharge from wastewater fixtures. If a drainage system becomes blocked, the gully trap provides the point where sewage can overflow outside the building, instead of building up inside the pipe and overflowing inside the building.

+ Have an overflow rim at least 150 mm below the overflow level of the lowest fixture served by the system,

+ Located within the legal boundary of the land on which the building stands,

+ Prevent surface water from entering the trap,

+ Be constructed so the grate will lift to allow surcharge

+ Have at least one discharge pipe feeding into it to maintain the water seal.

<u>Ventilation of drains</u>:

Drainage systems must be ventilated to reduce the build-up of foul air within the drains.

A discharge stack that is within 10 m of the head of the drain may be used as the drain vent pipe.

c) Lighting:

The building is designed to make the most of natural light during daylight hours. However, artificial lighting is necessary for times when natural lighting is not available or adequate and for specific tasks. Artificial lighting – especially using LED fixtures are designed to provide appropriate lighting levels while using energy efficiently.

d) Heating:

The type of heat: radiant

The type of heating source: electricity and solar

The location, number and capacity of heating units: including whether to use central or room-by-room heating, and whether to use portable or built-in heaters

The control systems used: Heating is controlled either manually or by thermostat to ensure that heat is only provided where and when it is needed

How heat is distributed around the building: Through natural convection or an active system such as fans or ducts – to ensure spaces are warmed when needed.

e) Ventilation:

- Active ventilation:

+ Evaporative air conditioning unit: removing moisture and contaminants from kitchens, bathrooms and laundries

- Passive ventilation: a natural ventilation system that makes use of natural forces, such as wind and thermal buoyancy, to circulate air to and from an indoor space through the net open area of windows and other openings.

B. 2.10 Protection of the building against the negative effects of the external environment

a) protection against penetration of radon from the subsoil,

Design the insulation against random from subsoil for this new building:
Type of membrane: Rubber membrane made of EPDM
Diffusion coefficient of the membrane: $D = 220*10^{-12}$ m^2/s
The production thickness: d = 1.5mm
Low permeability of soil $\alpha_1 = 2.1$ (Only randon-roof membrane)
The radon concentration in subsoil: $C_S = 50$ kBq/m^3
The fraction of the reference level for indoor radon concentration caused by diffusion: $C_{dif} = 20$ Bq/m^3 for new building.
- The calculation room is Technical room R0.10_undergound:
+ Height: H = 2890mm
+ Width: B = 3770mm
+ Length: L = 7070mm

The room volume: $V = 77.03$ mm^3

The total contact area: $A = 55.92$ m^2

The air exchange rate: $n = 0.73$ h^{-1}

The highest permissible radon exhalation rate: $E_{lim} = 20.11$ Bq/m^2h

b) Protection against stray currents,

The building is not on the location with stray currents danger.

c) Protection against technical seismicity,

The building is not at the location with technical seismicity danger.

d) Protection against noise,

Sources of noise:

+ Transport vehicles: Cars, motorbikes, tram…

+ Household sources: Air conditioners, washing machines, vacuum cleaner, ventilation…

+ Social events: Parties, loud speakers…

Airbone sound insulation: $R_W \geq 53$ dB (ČSN 730532)

+ External construction: $R_W = 57$dB

e) Flood protection precautions.

The building is not in flood area.

B. 3 Connection to technical infrastructure

a) technical infrastructure connecting places,

See part **D.1.1** – a) Technical report

b) connecting dimensions, power capacities and lengths.

See part **D.1.1** – a) Technical report

B. 4 Transport solutions

a) Description of the transport solution,

This part is not included in this Thesis's mission.

b) Connection of the area to the existing transport infrastructure,

The new building addresses both streets with the frontage to the main street Moravanska for pedestrian access, the drive way to parking place underground is at the left side head to Komarov street. Also, there is a back door, private ways at behind. The area connects to the existing transport infrastructure through ways with specific surface's material – Herringbone street and pavement.

c) Transport at rest,

Parking places underground with 2 lots for disabled people, 6 lots for cars. The average sizes are 2.4x4.8m and 3x4.8m, respectively.

d) Walking and cycling trails.

Two private ways are planned as walking and cycling trails on the right side and at behind the building with 2 meters of width.

B. 5 Vegetation solutions and related landscaping

a) Landscaping,

This part is not included in this Thesis's mission.

b) Used vegetation elements,

This part is not included in this Thesis's mission.

c) Biotechnological precautions.

This part is not included in this Thesis's mission.

B. 6 Description of the effects of construction on the environment and its protection

a) effect of the construction on the environment – air, noise, water, waste and soil,

The construction does not have bad effects to the environment.

b) effect of the construction on nature and landscape (tree protection, protection of memorable trees, protection of plants and animals etc.), preservation of ecological functions and links in the landscape,

The construction does not have bad effects to nature and landscape, preservation of ecological functions and links in the landscape.

c) effect of the construction on the Natura 2000 system of protected areas,

The construction does not have bad effects to effect of the construction on the Natura 2000 system of protected areas.

d) proposal taking into account the conditions of the conclusion of the detective procedure or EIA opinion,

The construction does not require an Environment Impact Assessment – EIA.

e) proposed protection and safety zones, range of restrictions and conditions of protection under other legislation.

The construction is not in protection and safety zones.

B. 7 Protection of the population

Fulfillment of basic requirements in terms of fulfilling the tasks of protecting the population.

This part is not included in this thesis's misson.

B. 8 Principles of construction organization

a) needs and consumption of decisive media and masses, their ensuring,

This part is not included in this thesis's misson.

b) site drainage,

This item is not necessarry because soil is permeable.

c) connecting the site to the existing transport and technical infrastructure,

The site does not need specific ways to connect to the existing transport and technical infrastructure.

d) effect of the construction on surrounding buildings and lands,

The construction does not have bad effects to surrounding buildings and lands.

e) protection of the surroundings of the building and requirements for related sanitation, demolition, tree felling,

No demolition and tree felling works required.

f) maximum appropriation of land for the site (temporary / permanent),

This part is not included in this thesis's misson.

g) maximum quantities produced and types of waste and emissions during construction, their disposal,

This part is not included in this thesis's misson.

h) balance of earthworks, requirements for the supply or deposition of soils,

The process of earthworks is to excavate the existing land to a suitable level so that foundations construction may begin.

Earthworks balance: Balancing Cut-Fill which may significantly decrease construction costs. This part is not included in this thesis's mission.

i) environmental protection during construction,

This part is not included in this thesis's misson.

j) principles of safety and health at work on site, assessing the need for job and safety superintendent under other legislation,

Requirements for sanitation:

- There is enough lighting and ventilation for workers to carry out work safely.
- Workers doing their job in extreme heat or cold can do so safely.
- Adequate facilities are provided for workers, including:
  + Toilets
  + Drinking water
  + Hand-washing facilities
  + A place where workers can eat and take breaks
  + Adequate and accessible first aid equipment
  + Facilities where workers who become unwell can rest if it is not reasonable for them to leave the site.
- An adequate number of workers on site are trained in first aid, or workers have access to other people trained to give first aid.
- All these facilities must be clean, safe, accessible and kept in good working order.

k) arrangements for the barrier-free use of the affected buildings,

The building is not designed for disabled people.

l) principles for transport engineering precautions,

This part is not included in this thesis's misson.

m) determination of special conditions for construction (construction work in operation, precautions against the effects of the external environment during construction etc.),

This part is not included in this thesis's misson.

n) process of construction, decisive partial deadlines.

This part is not included in this thesis's misson.

C. Layout drawings

Attached drawings.

D. Documentation of objects and technical and technological equipment

D1 Documentation of building or engineering object

D1.1 Architectural-construction solutions

a) Technical report

➢ **Plan purpose:** The apartment building locates at the cross street, the location is near with lots of companies and schools. The building is a long-term strategy for solving accommodation issues and bringing utilities to the neighborhood.

- **Basic functions:**

+ Basement: Parking lots and Technical room
+ First floor: Shopping stores, Gym, Laundry room, Storage room.
+ Second and third floor: Living place with 3 apartments each story.

- **Apartment building type:**

A block apartment with two storey above commercial units that activate the street below and good frontage to the street.

- **Building façade:**

The building is exposed to public view on two sides and addresses the adjacent street. The façade is emphasized by elements, such as eaves, stainless steel gutters, plastic windows, paint color and circle balcony by using good materials and treatments, especially balustrades at outdoor spaces.

- **Apartment access arrangement:**

Accesses are organised as a combination of

+ Vertically: a shared lift and stair with double height glazing provides a good quality of natural light and passive survillance in the communal stair.

+ Horizontally: The double-loaded arrangement locates the corridor within the building. Apartments are accessed off both sides of the corridor.

The accessible ramp is well integrated into the entrance area

Individual apartment type:

Single storey apartments have three closed sides

Location for pedestrian, car and cycle access into the site: Pedestrian and vehicle access is separated so that the pedestrian access will be safe and pleasant for residents and visitors.

+ Individual and communal entrances to the apartment are provided directly from the street,

+ Vehicular access from the street to the basement car park is supported by attractive and well-designed pedestrian access for those entering the site on foot or bicycle.

- **Designing for light and sun:**

The main living spaces such as living, family and dining rooms will be north facing where possible.

East facing rooms are most suited as kitchen and breakfast areas as they can benefit from early morning solar gain throughout the year and will be cooler in the late afternoon when evening meal preparation takes place.

Outdoor living areas are north-facing so they receive the sun when they are in use.

Within an apartment, natural daylight reduces the reliance on artificial light, improving energy efficiency and amenity for residents.

- **Solar access** (skylight and sunlight): Ostrava is in the Northern Hemisphere so that Solar panels are placed on a southern-facing roof to get as much light as possible.

Daylights access to habitable rooms and private open space, particularly in winter.

Using skylights, clerestory windows and fanlights to supplement daylight access

- **Design for summer shading and glare control by**:

Using shading devices, such as eaves, awnings, balconies, pergolas, external louvres and planting

Providing external horizontal shading to north-facing windows

Providing vertical shading to west windows

- **Architectural solutions:**

This apartment building has been massed in a way that allows it to sit comfortably with its residential neighbors:

- This building has been designed with a large block broken up into smaller secondary, and predominantly vertical elements to reduce the overall scale.

- The building places on podium structures to help maintain a continuous, positive street edge. Also, setting back the upper floor to prevent visual dominance at the street edge

- The building is maximized access to daylight and sunlight for the apartments by large windows and outdoor spaces by glazing balustrade.

- Using sloped tiled roof form to create visual interest and help users to understand how the building is occupied.

- Organizing the building's mass to express different vertical elements (e.g. a 'base' and a 'top') by different outside material and color layers.

- North orientation allows to easily shade northern façades and the ground near them in summertime with simple horizontal devices such as eaves, while allowing full sun penetration in winter.

- Having the longer walls of a house facing north to minimise exposure to the sun in summer and maximize it in winter.

- Passive heating, passive cooling units

- Using lightweight construction: timber, plastic elements,…

- Eaves overhangs run around the building with appropriate width to shade the openings.

- **Apartment space:**

All bedrooms have external windows and designed as two people per bedroom. Bedrooms are large enough to allow for a wide range of other activities - studying, reading, and furniture can all be accommodated comfortably.

Living and dining:
Apartments combine dining, kitchen and living areas into open-plan layouts.

- **Living room:**

All living spaces have external windows, and the windows in living areas are minimum 1200mm of width, 1750mm of height, with 850mm of sill height above floor level.

Providing a clear, at least 800mm wide area for circulation allows more flexibility for laying out furniture, and makes the spaces more usable.

- **Dining Rooms:**

Access around a dining table is minimum 600-700mm where the space adjoins a bench or other furniture.

- **Kitchen:**

Kitchen and cooking space, fittings and furniture are provided in each apartment with minimum 1.2m access space in front of the base kitchen units so that two people can circulate safely and carry out activities hygienically and conveniently.

- **Storage and utility space:**

An adequate storage is provided for everyday household items within the apartment in living space, is a suitable space for a washing machine and for drying clothes within the home. Also, there is an accessible space for equipment associated with children such as pushchairs and bicycles, at the ground floor.

- **Sustainable construction:**

A largest part of the building is built from timber elements, which is the most sustainable material in construction.

The design of the building reduces the need for mechanical heating and cooling by installing passive heating and cooling, such as solar panels, evaporation air conditioning units on roof top. Also, combining the natural and artificial light lead to efficiencies for occupants by reducing the cost of supplying energy and encourage greater resident responsibility.

Recommend occupants using smart appliances for saving energy and simplify their lives by installing high efficiency refrigerators, freezers, clothes washers, dryers and dishwashers.

Optimize Thermal Insulation—optimize the insulation performance of the envelope opaque elements for both heating and cooling seasons.

The openable window and door allows for natural ventilation into the living area.

Using recycled material

- **Material Selection:**

- _Fermacell for internal wall and floor structures. Fermacell is made from gypsum and recycled paper fibres, because of their material composition, fermacell boards are suitable for general construction, fire protection, and wet rooms.

- Fermacell Powerpanel H2O is the water resistant construction board for walls, and floors, used in rooms where there are damp conditions, such as wet rooms, bathrooms, showers.

- Gypsum board is used for ceiling, floors and partition systems to provide a monolithic surface when joints and fastener heads are covered with a joint treatment system.

- Mineral wool is especially designed to improve thermal performance of roofs and acoustic performance of suspended ceilings in the building.

- Earthwool Loft Roll is primarily used for the thermal insulation of pitched roofs at ceiling level, it can also be used to thermally insulate floors. When used at ceiling level it is usually laid in two layers, with the first layer between the joists and the second layer over, and at right angles to the joists.

- PVC folie is used for waterproofing of buildings. The films are manufactured using modern technologies from PVC and TPO (thermoplastic polyolefins).

- DIN Standard stud and track for increased load bearing.

- Timber studs are hold in place the windows, doors, interior finish, exterior sheathing or siding stud wall insulation and utilities and help give shape to a building. Studs run from sill plate to wall plate.

- Impermeable geo-membrane is designed to prevent water passing through.

- Wooden loading frame structure

- Concrete material for basement, diaphragm walls, underground columns and the ground floor.

➢ **Safety, activity and overlooking**:

+ Prevent falls from heights: 1.5 m height balustrades for porch, handrail for stairs, and 0.9m balustrade along slope way for disabled people.

+ Prevent slips, trips, and falls.

+ Ensure electrical safety from turn-over through Operations and Maintenance.

Modifications must be in conformance with life safety codes and standards and be documented.

+ Eliminate exposure to hazardous materials (e.g., volatile organic compounds (VOCs) and formaldehyde, and lead and asbestos in older buildings).

+ Provide good indoor air quality (IAQ) and adequate ventilation.

+ Perform proper building operations and maintenance

- Public and communal open spaces are delineated here by planting and change of ground surface material.

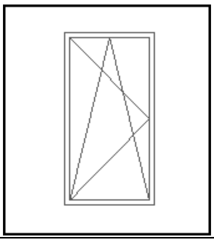
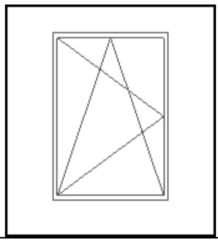
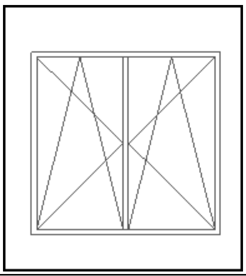
- The more windows overlooking public and communal spaces the better.

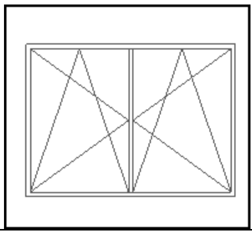
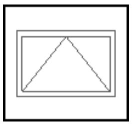
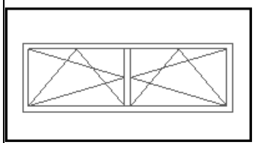
- Front boundary elements, such as planting and changes in level, separate privately owned land from the public streets.

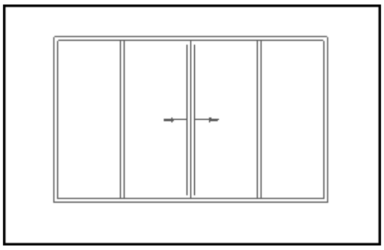
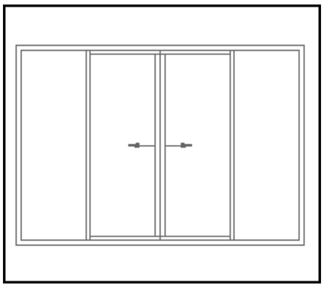
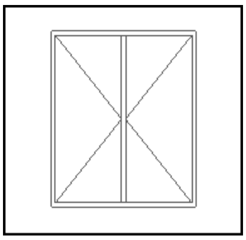
E. Document part

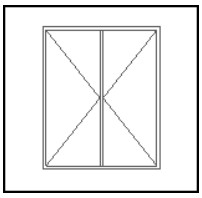
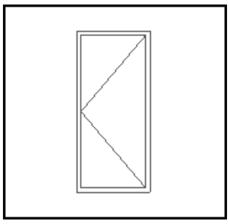
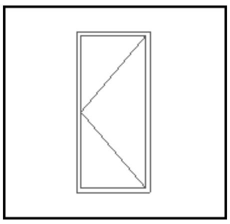
E.1 Bill of Quantities

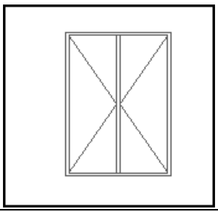
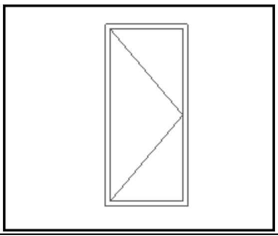
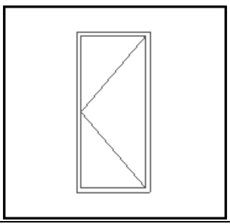
I. JONERY ELEMENTS:

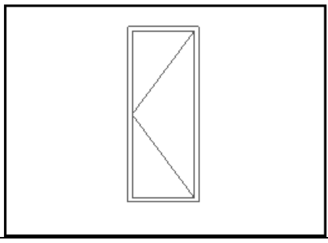
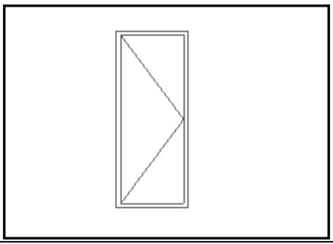
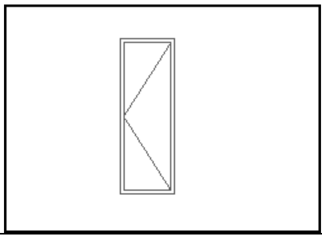
ITEM	DISCRIBE - PICTURES	MATERIAL	DIM.	QTY. (Pcs.)
O1	PRAMOS - HORIZONT PS SPACE 8	Plastic	900x 1750	8
	 	Triple glass		
		Colour: Dark-Red		
		Construction depth: 90mm		
		Heat Transfer coefficient		
		Frame: Uf = 0.90 W / m2K Entire Window: Uw = 0.57 W / m2K *		
O2	PRAMOS - HORIZONT PS SPACE 8	Plastic	1200x 1750	17
	 	Triple glass		
		Colour: Dark-Red		
		Construction depth: 90mm		
		Heat Transfer coefficient		
		Frame: Uf = 0.90 W / m2K		
		Entire Window: Uw = 0.57 W / m2K *		
O3	PRAMOS - HORIZONT PS SPACE 8	Plastic	1800x 1750	18
	 	Triple glass		
		Colour: Dark-Red		
		Construction depth: 90mm		
		Heat Transfer coefficient		
		Frame: Uf = 0.90 W / m2K Entire Window: Uw = 0.57 W / m2K *		

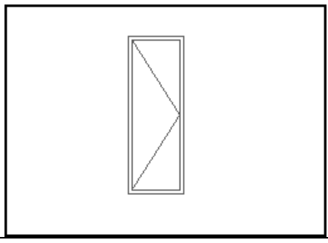
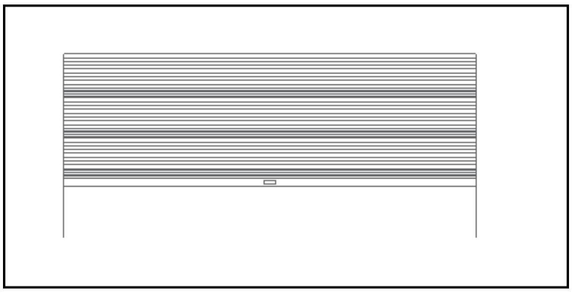
O4	PRAMOS - HORIZONT PS SPACE 8	Plastic	2400x 1750	6
	 	Triple glass		
		Colour: Dark-Red		
		Construction depth: 90mm		
		Heat Transfer coefficient		
		Frame: Uf = 0.90 W / m2K		
		Entire Window: Uw = 0.57 W / m2K *		
O5	PRAMOS - HORIZONT PS SPACE 8	Plastic	900x 600	3
	 	Triple glass		
		Colour: Dark-Red		
		Construction depth: 90mm		
		Heat Transfer coefficient		
		Frame: Uf = 0.90 W / m2K		
		Entire Window: Uw = 0.57 W / m2K *		
O6	PRAMOS - HORIZONT PS SPACE 8	Plastic	1800x 600	3
	 	Triple glass		
		Colour: Dark-Red		
		Construction depth: 90mm		
		Heat Transfer coefficient		
		Frame: Uf = 0.90 W / m2K		
		Entire Window: Uw = 0.57 W / m2K *		

D1	PRAMOS - Posuvné hliníkové dveře - HST portál	Aluminum	1800x 2200	1
	 	Triple glass		
		Colour: Dark-Red		
		Construction depth: 160/247mm		
		Heat Transfer coefficient		
		Frame: Up to 2.1 W / m2K		
D2	PRAMOS - Posuvné hliníkové dveře - HST portál	Aluminum	1600x 2200	4
	 	Triple glass		
		Colour: Dark-Red		
		Construction depth: 160/247mm		
		Heat Transfer coefficient		
		Frame: Up to 2.1 W / m2K		
D3	IZOLAČNÍ HLINÍKOVÉ DVEŘE PONZIO PE 78 N	Aluminum	1800x 2200	1
	 	Double glass		
		Colour: Dark-Red		
		Construction depth: 78mm		
		Fillinf width: 23-61mm		
		Heat Transfer coefficient		
		Frame: 2.2 W / m2K		

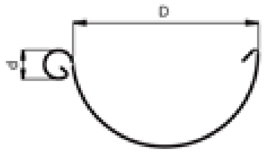
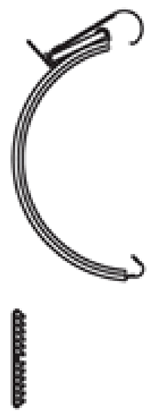
D4	IZOLAČNÍ HLINÍKOVÉ DVEŘE PONZIO PE 78 N  	Aluminum Double glass Colour: Dark-Red Construction depth: 78mm Fillinf width: 23-61mm Heat Transfer coefficient Frame: 2.2 W / m2K	1800x 2200	3
D5	IZOLAČNÍ HLINÍKOVÉ DVEŘE PONZIO PE 78 N  	Aluminum Double glass Colour: Dark-Red Construction depth: 78mm Fillinf width: 23-61mm Heat Transfer coefficient Frame: 2.2 W / m2K	900x 2200	2
D6	PRAMOS - HORIZONT PS PENTA  	Plastic Colour: Dak-Red Construction depth: 75 and 80 mm Heat Transfer coefficient Frame: Uf = 1.24 W / m2K Entire door: UD = 1.20 to 0.87 W / m2K *	900x 2200	1

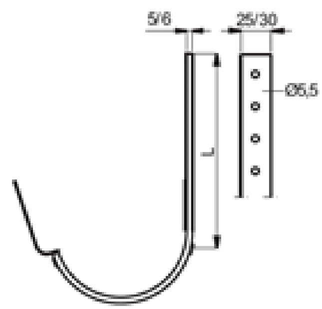
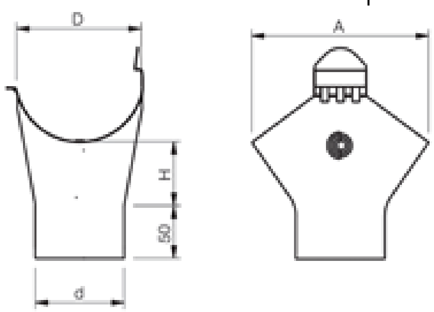
D7	PRAMOS - HORIZONT PS penta	Plastic	1600x 2200	1
	 	Colour: Dak-Red		
		Construction depth: 75 and 80 mm		
		Heat Transfer coefficient		
		Frame: Uf = 1.24 W / m2K		
		Entire door: UD = 1.20 to 0.87 W / m2K *		
D8	DEK - Standard Door	Timber-Spruce	900x 2000	6
		Width: 90cm		
		Height: 197cm		
		Colour: Dark-Red		
		Fire Resistance: EI / EW 30		
		Opening: Left		
		Hinges: 90mm		
D9	DEK - Standard Door	Timber-Spruce	900x 2000	2
		Width: 90cm		
		Height: 197cm		
		Colour: Dark-Red		
		Fire Resistance: EI / EW 30		
		Opening: Right		
		Hinges: 90mm		

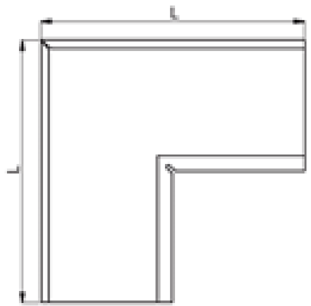
D10	DEK - Standard Door	Timber-Spruce	800x 2000	14
		Width: 80cm		
		Height: 197cm		
		Colour: Dark-Red		
		Fire Resistance: EI / EW 30		
		Opening: Right		
		Hinges: 90mm		
D11	DEK - Standard Door	Timber-Spruce	800x 2000	5
		Width: 80cm		
		Height: 197cm		
		Colour: Dark-Red		
		Fire Resistance: EI / EW 30		
		Opening: Left		
		Hinges: 90mm		
D12	DEK - Standard Door	Timber-Spruce	700x 2000	6
		Width: 80cm		
		Height: 197cm		
		Colour: Dark-Red		
		Opening: Right		
		Hinges: 90mm		

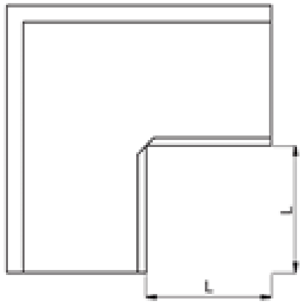
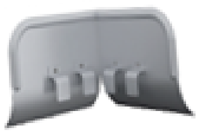
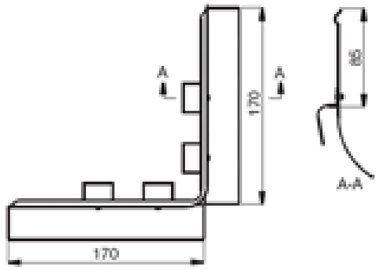
D13	DEK - Standard Door	Timber-Spruce	700x 2000	10
		Width: 80cm		
		Height: 197cm		
		Colour: Dark-Red		
		Opening: Left		
		Hinges: 90mm		
G1	PRAMOS - Sekční garážová vrata	Timber	5000x 2800	1
		Remote Controls		
		Colour: Dark-Red		
		Sections		
		Width: 40mm		
		Height: 500 or 610mm		

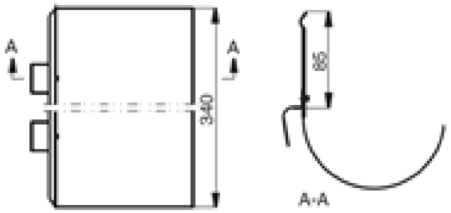
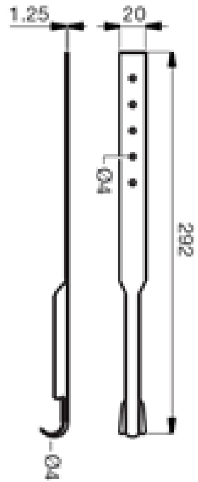
II. PLUMBING ELEMENTS:

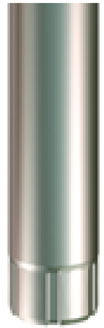
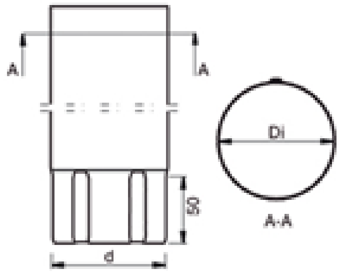
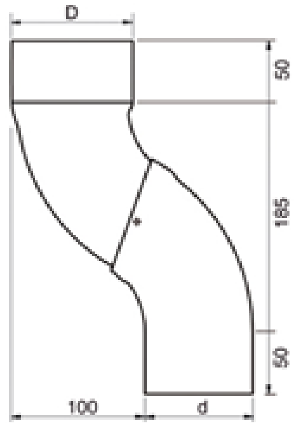
N0.	DISCRIBE	PICTURE	UNIT	TECHNICAL FACTS	MATERIAL	PAINT	QTY.
1	**LINDAB R Gutter** The half round gutter both looks good at the house and prevent the houses from being damaged because of rain.		m	Dim 150 D = 155mm d = 17mm Section area: A* = 9400mm2 Water carrying area: A** = 8900mm2 	Steel	μ = 0.6mm Precoated galvanized steel, Colour: Gray	100
2	**LINDAB RSK Gutter joint** The gutter joint with its innovative design has a rubber sealing for a better and guaranteed waterproof installation. The long-lasting EPDM sealing is attached from the factory with two spots of glue that makes it stay in the right position when installing.		pieces	Dim 150 	Steel, EPDM rubber.	μ = 0.7mm Precoated galvanized steel, Colour: Gray	4

3	**LINDAB K16 Bracket** Long rafter brackets with clips is used on the roof pitch under the roof material and bended at the construction site to the right degrees to create a good slope for the gutter. Class H (high load capability).		pieces	Dim 150 L = 160mm 	Steel	μ = 5mm Power coated galvanized steel; Colour: Gray	50
4	**LINDAB OMV Gutter outlet** The nozzle piece has a perfect fit to the half round gutter, following its geometry closely. The nozzle piece is designed to sit vertical when the gutter is mounted with the proper lower front than back. The nozzle piece is developed to be installed without any fasteners or silicon.		pieces	Dim 150/100 A = 212 mm H = 73 mm 	Steel	μ = 0.6mm Precoated galvanized steel, Colour: Gray	8

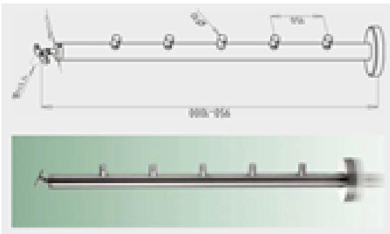
5	**LINDAB RGU Stop end** A single stop end with universal geometry that fits both right and left side of the gutter. The stop end is developed to fit to the gutter and to be installed traditionally with fasteners and silicon as sealing.		pieces	Dim 150 	Steel	μ = 0.6mm Precoated galvanized steel, Colour: Gray	2
6	**LINDAB RVI Gutter angle, inner** The half round gutter angle in 90 degrees is pressed in one piece, not welded which eliminates the risk for leakage.		pieces	Dim 150 L = 300 mm 	Steel	μ = 0.6mm Precoated galvanized steel, Colour: Gray	4

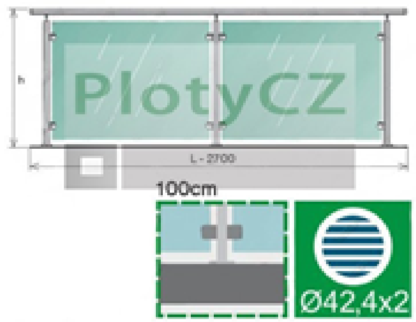
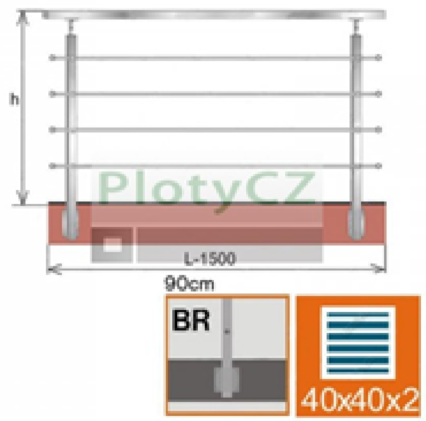
7	**LINDAB RVY Gutter angle, outer** The half round gutter angle in 90 degrees is pressed in one piece, not welded which eliminates the risk for leakage.		pieces	Dim 150 L = 130mm 	Steel	µ = 0.6mm Precoated galvanized steel, Colour: Gray	2
8	**LINDAB OSK Overflow protection** Use an overflow protection to prevent water from flushing over instead of in the gutter, for examples on big buildings with a big roof areas. This is angled version.		pieces		Steel	µ = 0.6mm Precoated galvanized steel, Colour: Gray	2

9	**LINDAB OSKR Overflow protection, straight** Use an overflow protection to prevent water from flushing over instead of in the gutter, for examples on big buildings with a big roof areas. This is straight version.		pieces	Dim 150 	Steel	μ = 0.6mm Precoated galvanized steel, Colour: Gray	8
10	**LINDAB STAG Stay strap** The stay strap can be used to help the bracket if the gutter is installed in tough environments with high demands on the strength. The stay strap can be used to help the bracket if the gutter is installed in tough environments with high demands on the strength. class H (high load capability).		pieces		Steel	μ = 1.2mm Power coated galvanized steel; Colour: Gray	50

11	**LINDAB Downpipe - SROR** The downpipe both looks good at the house and prevent the houses from being damaged because of rain.		m	D = 150mm 	Steel	μ = 0.6mm Precoated galvanized steel, Colour: Gray	79.2
12	**LINDAB SOKN** A one piece bend to simplify the construction when the ground connection pipe is further out from the wall of the house than the downpipe.		pieces		Steel	μ = 0.6mm Precoated galvanized steel, Colour: Gray	8

III. LOCKSMITH ELEMENTS:

N0.	DISCRIBE	Picture	UNIT	TECHNICAL FACTS	MATERIAL	QTY.
1	**JAP Prutová výplň vodorovná** Stainless steel rail on stairs AISI304. These are not separate units, but everything is built on the spot. Mounting the handrail requires drilling threads into the handrail for subsequent gripping of the handrail holders and gluing of the side posts.		m	D42,4 / 5xd12, Inner Mounting Brackets Side anchoring, Filling 5xD12, Height 1000mm, Length 3000mm. 	Anchor pillar: Stainless steel; 5 bars: Stainless steel; Wooden handle	21

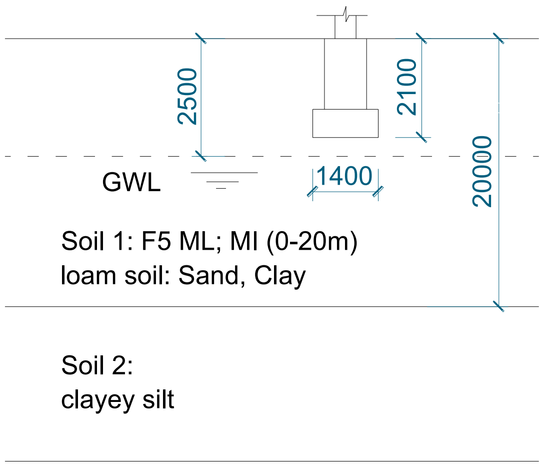
2	**PlotyCZ Handrail, Glass Fill - Set** These are not separate units, but everything is built on the spot. Mounting the handrail requires drilling of the threads into the handrail for the subsequent holding of the handrail and slats. side posts.		m	H1000 / L2786mm Columns and handrail D42,4mm; Glass fill; Top anchoring.	Stainless handrail; Material AISI304, Brushed K320.	14
3	**PlotyCZ Guardrail** These are not separate units, but everything is built on the spot. Mounting the handrail requires drilling threads into the handrail for subsequent gripping of the handrail holders and gluing of the side posts. Recommend: Buy a set of glue, drill, cutting paste, cutting and grinding wheel.		m	Lateral anchoring, 4xD12, Height 900mm, Length 1500mm. Kit 40x40x2; Outdoor holder	Stainless steel	23.5

E.2 Static assessment

- **Design Situation:**

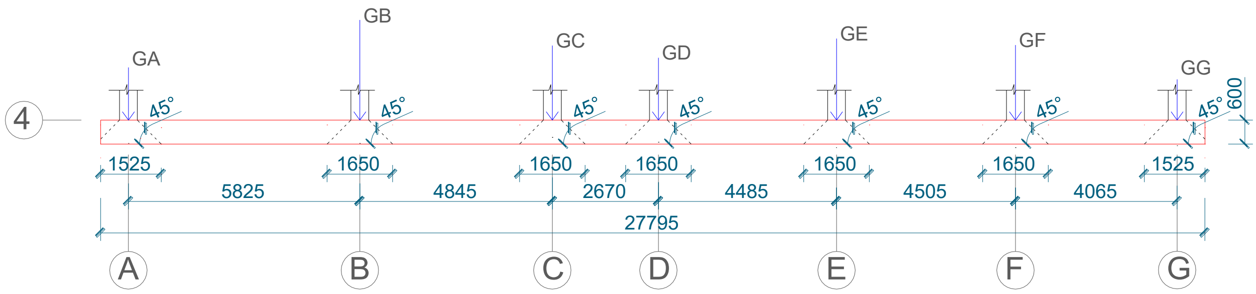
Strip foundation for conrete-timber building, which is an apartment building with 3 above-ground floors and 1 basement. The embedment depth of foundation is 2.1m; the groundwater level is situated at 2.5m from the ground surface.

- **Soil condition:**



- **Load summary Eurcode:**

Load calculation on the strip foundation along axis 4 – subjects columns:



N0.	Type of Load	Thickness	Density	Characterictics Value	Load Coeff.	Designed Value
		δ, mm	ρ, KN/m³	q_k, KN/m²	γ_G, γ_Q	q_d, KN/m²
1	**Load from Roof**					
	Dead Load					
	Tiled Roof			0.05	1.15	0.0575

	Laths 50x30@ 350mm		4	0.0042	1.15	0.0048
	Wateroofing layer				1.15	0.0000
	Rafters 90x120 @ 600		4.2	0.027216	1.15	0.0313
	Insulation KNAUF NATUROLL PRO	160		0.00165	1.15	0.0019
	OSB Deck	25	6	0.15	1.15	0.1725
	SDK Ceiling (Rigips RB)	12.5		0.09	1.15	0.1035
	Live Load					
	Snow			0.75	1.5	1.1250
	Total			1.07		1.4965
2						
	Load from 3th Floor					
	Dead Load					
	Ceramic Tiles			0.4	1.15	0.4600
	Cement motar	8	20	0.16	1.15	0.1840
	Gypsum Fireboards	25		0.18	1.15	0.2070
	Mineral Wool	20		0.85	1.15	0.9775
	V.C.M Layer				1.15	0.0000
	Honey Comb Insulation	60		0.255	1.15	0.2933
	Earth Wool Loft Roll	160		0.006745363	1.15	0.0078
	Joists 220x75 @ 600		4.1	0.04059	1.15	0.0467
	SDK Ceiling			0.09	1.15	0.1035
	Partitions			0.5	1.15	0.5750
	Live Load					
	Live Load			2.5	1.5	3.7500
	Total			4.98		6.6047
3						
	Load from 2rd Floor					
	Dead Load					
	Ceramic Tiles			0.4	1.15	0.4600
	Cement motar	8	20	0.16	1.15	0.1840
	Gypsum Fireboards	25		0.18	1.15	0.2070
	Mineral Wool	20		0.85	1.15	0.9775
	V.C.M Layer				1.15	0.0000
	Honey Comb Insulation	60		0.255	1.15	0.2933
	Earth Wool Loft Roll	160		0.006745363	1.15	0.0078
	Joists 220x75 @ 600		4.1	0.04059	1.15	0.0467
	SDK Ceiling			0.09	1.15	0.1035
	Partitions			0.5	1.15	0.5750
	Live Load					
	Live Load			2.5	1.5	3.7500
	Total			4.98		6.6047
4						
	Load from 1st Floor					

	Dead Load					
	Ceramic Tiles	25		0.4	1.15	0.4600
	Cement motar	15	20	0.3	1.15	0.3450
	Concrete Slab	200	25	5	1.15	5.7500
	Earth Wool Loft Roll	160		0.006745363	1.15	0.0078
	SDK Ceiling			0.09	1.15	0.1035
	Partitions			0.5	1.15	0.5750
	Live Load					
	Live Load			3	1.5	4.5000
	Total			9.30		11.7413
	Total (KN/m^2)			**Qk**		**Qd**
				20.33		**26.45**

Timber Beam			
	ρ	8	KN/m^3
Roof	b	0.3	m
3th	h	0.5	m
2rd	γ_G	1.15	
1st			
	Gtb	**39.39**	KN

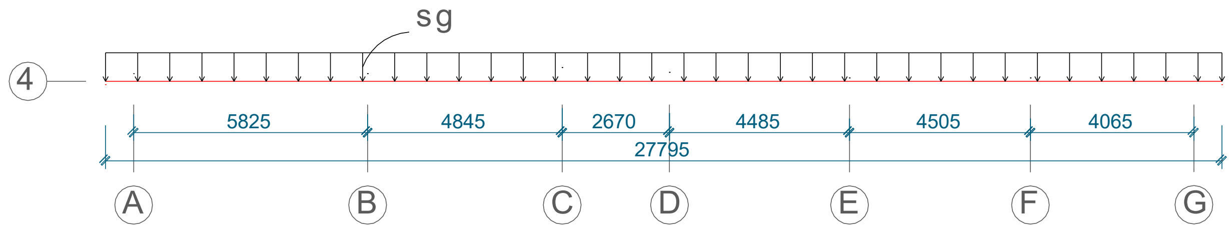
Timber Column			
Roof	b	0.45	m
3th	h	0.45	m
2rd	l	3.30	m
	Gtc	**18.44**	KN

Concrete Beam			
Basement	ρ	25	KN/m^3
	b	0.3	m
	h	0.5	m
	γ_G	1.15	
	Gcb	**41.03**	KN

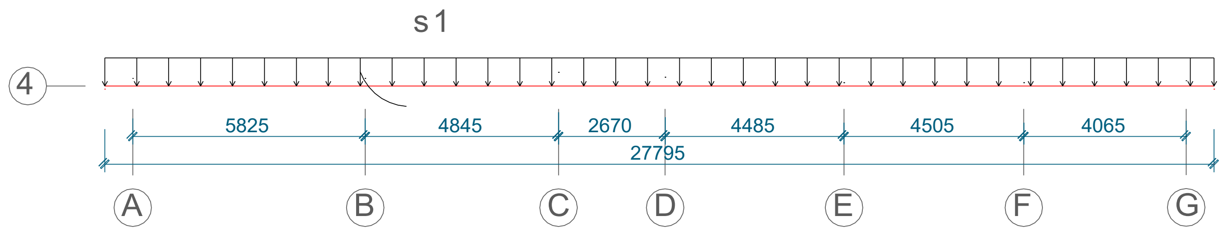
Concrete Column			
	b	0.45	m
	h	0.45	m
	l	3.30	m
	Gcc	**19.21**	KN

A-4	Load area			
		A1-4	19.239	m^2
	Total	GA	626.90	KN
B-4	Load area			
		B1-4	35.211	m^2
	Total	GB	1049.31	KN
C-4	Load area			
		C1-4	24.816	m^2
	Total	GC	774.39	KN
D-4	Load area			
		D1-4	23.628	m^2
	Total	GD	742.97	KN
E-4	Load area			
		E1-4	29.667	m^2
	Total	GE	902.69	KN
F-4	Load area			
		F1-4	28.314	m^2
	Total	GF	866.91	KN
G-4	Load area			
		G1-4	13.431	m^2
	Total	GG	473.29	KN

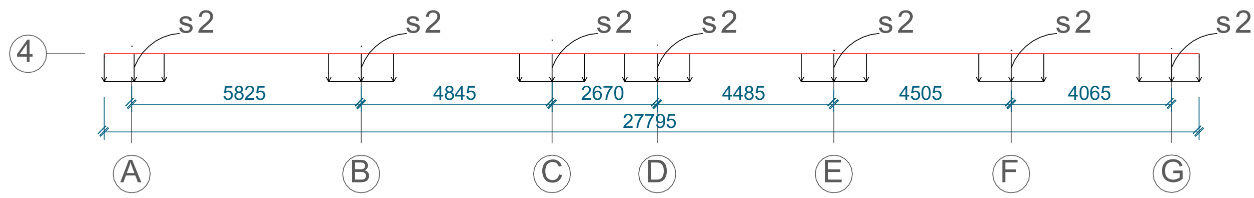
- **Stress contribution:**



Stress by Foundation’s Selfweight



Stress by applied Load



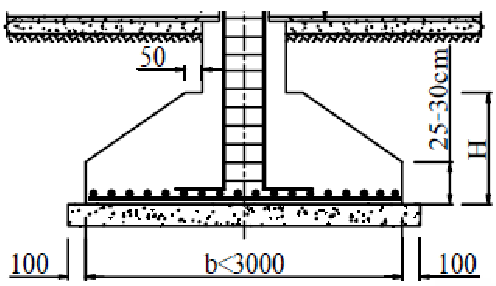
Stress by applied Load

B = 1.4	m	→	A_{ef}	38.913	m^2
L = 27.795	m		G	583.70	KN
T = 2.1	m		σ_g	15.00	KN/m^2
$h_f = 0.6$	m				
hc = 0.45	m				
Stress σ_1					
G_{total}	5436.47	KN			
σ_1	69.85	KN/m^2			
Stress Width					
$l = hc + 2*h_f$	1.65	m			
				$\sum \sigma$	
σ_A	135.69	KN/m2	→	220.55	KN/m2
σ_B	227.12	KN/m2	→	311.98	KN/m2

σ_C	167.62	KN/m2	→	252.47	KN/m2
σ_D	160.82	KN/m2	→	245.67	KN/m2
σ_E	195.39	KN/m2	→	280.24	KN/m2
σ_F	187.64	KN/m2	→	272.50	KN/m2
σ_G	102.44	KN/m2	→	187.30	KN/m2

STRIP FOUNDATION							
Soil Characteristic ČSN 73 1001 (731001)			A1 M2				
	Zemina	F5 ML MI					
	v	0.4					
	β	0.47					
	γ	20	KN/m^3				
	E_{def}	1.5-3	Mpa				
	c_u	30	KPa	→	c_{ud}	24	Kpa
	φ_u	0	degree				
	cef	8	KPa	→	c_{efd}	6.4	Kpa
	φef	19	degree	→	φ'_d	15.2	degree
	γ_c	1.25					

Strip Foundation Parameters		
B	1.4	m
L	27.795	m
T	2.1	m
h_f	0.6	m
hc	0.45	m
α	0	degree
γ_m	1.25	



ULS DESIGN		
General equation for drained design bearing resistance Rd;d/A'		
c'd	6.4	
Nc	12.2	
bc	1	
sc	1.34	1.34
ic	1	
Nq;d	4.3	
bq;d	1	
sq;d	1.26	
iq;d	1	
q'd	42	Kpa
γ'd	20	Kpa
Nγ;d	1.80	
bγ;d	1.00	
sγ;d	0.7	
iq;d	1	

According to Eurocode 7: Geotechnical design EN.1997.1.2004

The check on the bearing resistance of a spread foundation is a re-statement of the general inequality:

$E_d \leq R_d$. That is: $V_d \leq R_d$

Where: Vd is the design action. Vd should include the self-weight of the foundation and any backfill on it.

The design action, Vd includes both variable and permanent vertical loads; this latter includes all the

actions:

Supported permanent load

b) Weight of foundation

c) Weight of the backfill

d) Loads from water pressures

e) Uplift

For DRAINED CONDITIONS:

$R/A' = c'N_c b_c s_c i_c + q'N_q b_q s_q i_q + 0.5.\gamma'B'N_\gamma b_\gamma s_\gamma i_\gamma$

Where:

$N_q = e^{\pi . e^{tan\varphi'}} tan^2(45° + \frac{\varphi'}{2})$

$N_c = (N_q - 1)cot\varphi'$

$N_g = 2(N_q - 1)tan\varphi'$

are dimensionless factors for bearing resistance and

bc, bq, bγ the inclination of the foundation base

sc, sq, sγ the shape of foundation

ic, iq, iγ are the factors for the inclination of the load

A' = B'.L' effective foundation area (reduced area with load acting at its centre)

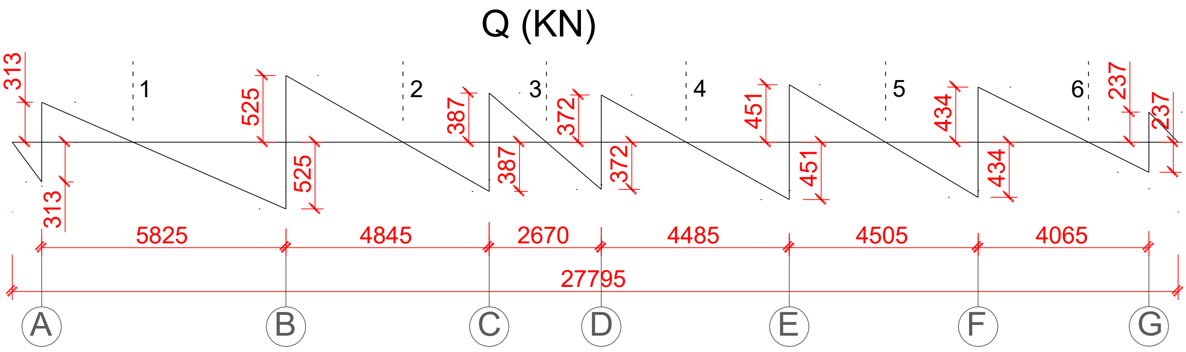
i_q= (1 – 0,70 H / (V + A' c' cotgφ'))m
m=m_B= [2+(B'/L')]/[1+(B'/L')]
m=m_L= [2+(L'/B')]/[1+(L/B')]
m=m_q =m_L cos2q +m_B sin2q
i_c= (i_q · N_q - 1) / (N_q - 1)
i_g= (1 - H / (V + A' c cotgφ'))3
s_q= 1 + (B' / L') · sinφ' (rectangular shape)
s_q= 1 + sinφ' (square or circular shape)
s_c= (sq N_q - 1) / (N_q - 1)
s_g= 1- 0,30 (B' / L') (rectangular shape)
s_g= 0,70 (square or circular shape)
bc = bq - (1-bq) / (Nc tanφ')
bq = bγ = (1-α tanφ')2

Design value of the bearing resistance – Drained Condition				Checking	
Rd/A	332.54	Kpa	→	Rd/A > σ	OK

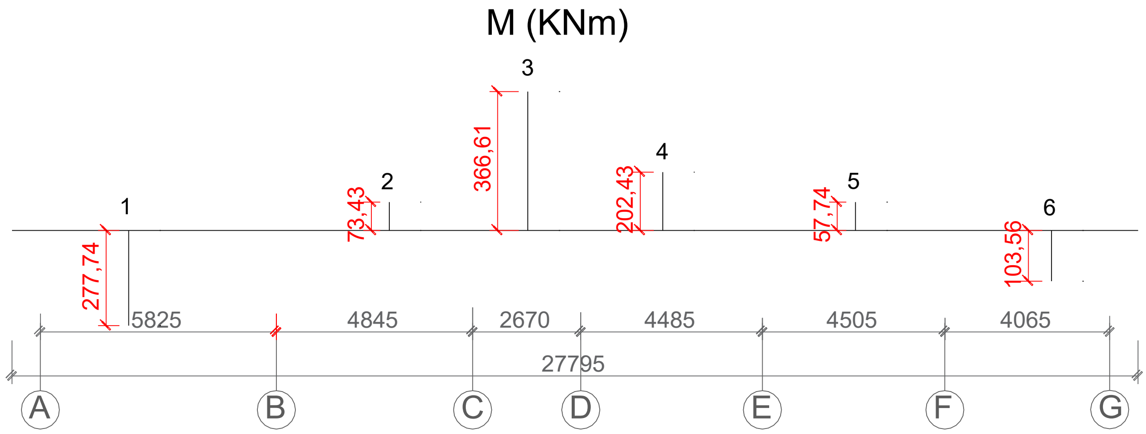
Bending Reinforcement Design			
q_1	97.80	KN/m	Applied Load
q_A	189.97	KN/m	Applied Load
q_B	317.97	KN/m	Applied Load
q_C	234.66	KN/m	Applied Load
q_D	225.14	KN/m	Applied Load
q_E	273.54	KN/m	Applied Load
q_F	262.70	KN/m	Applied Load

q_G	143.42	KN/m	Applied Load

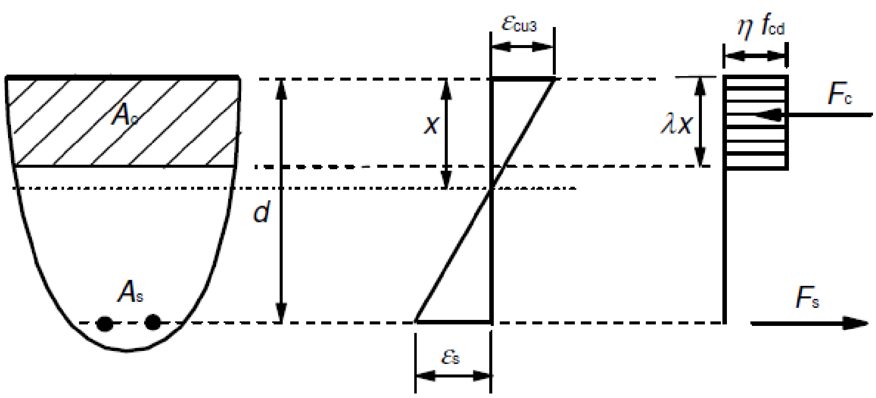
Shear Force Envelope



Bending Moment Envelope



According to Eurocode 2: Design of concrete structures EN1992-1-1 – Eurocodes and Eurocode 7 – Strip foundation design:



Where:

$f_{ck} \leq 50$ MPa	
λ	0.8
η	1.0

$f_{cd} = \alpha_{cc} * f_{ck} / \gamma_c = 0.85 * f_{ck} / 1.5$

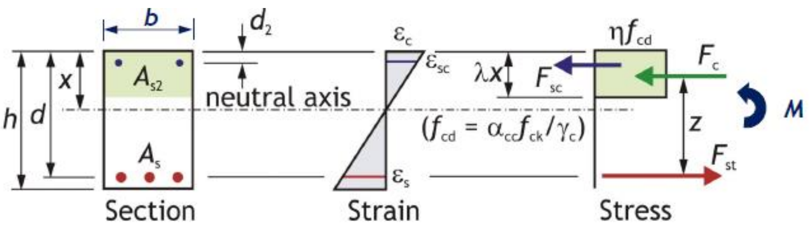
$f_{yd} = f_{yk}/1.15 = 0.87 * f_{yk}$

$F_c = (0.85 * f_{ck} / 1.5) * b * (0.8 * x) = 0.453 * f_{ck}\ b * x$

$F_{st} = 0.87 * A_s * f_{yk}$

For no compression reinforcement $F_{sc} = 0$

Design equations can be derived as follows_ According to Eurocode 2:



➢ Excel Calculation:

Parameters	b	1.4	m				
	h	0.6	m				
	L	27.795	m				
	a	40	mm				
	$Ø_{link}$	10	mm				
Bottom	d	0.544	m				
Top	d'	0.54	m		η	1	
					λ	0.8	
C30/37	fck	30	N/mm2	→	f_{cd}	16.0	N/mm^2
	γc	1.5					
RC-500B	fyk	500	N/mm2	→	f_{yd}	434.8	N/mm^2
	γs	1.15					

Top	**ø**	**12**	mm		
	Quantity	**15**	@ 100		
→	Ast	1695.6	mm^2	δ	0.962
		OK		K'	0.201
	As,min	OK		K	0.029
	As,max	OK			↓
				K<K'	Singly Reinforced

x	38.77	mm
z = 0.95*d	516.8	mm
Fc	737.59	KN

	Mcr	381.18	KNm
→ Mcr ≥ M	M	366.61	KNm

Bottom	**ø**	**12**	mm		
	Quantity	**12**	@ 120		
→	Ast	1356.5	mm²	δ	0.911
		OK		K'	0.187
	As,min	OK		K	0.022
	As,max	OK			↓
				K<K'	Singly Reinforced

x	31.01	mm
z = 0.95*d	516.8	mm
Fc	590.07	KN

	Mcr	304.95	KNm
→ Mcr ≥ M	M	277.74	KNm

- Strucural shear reinforcements:

ø	**8**	mm
@	**300**	mm
n	4	

LIST OF ATTACHMENTS:

1. Teplo Assessments:

➢ Teplo assessment for Floor:

a) 2rd, 3th Floor

KOMPLEXNÍ POSOUZENÍ SKLADBY STAVEBNÍ KONSTRUKCE Z HLEDISKA ŠÍŘENÍ TEPLA A VODNÍ PÁRY

podle EN ISO 13788, EN ISO 6946, ČSN 730540 a STN 730540

Teplo 2015

Název úlohy : **2rd, 3th Floor**
Zpracovatel :
Zakázka :
Datum : 13.02.2018

ZADANÁ SKLADBA A OKRAJOVÉ PODMÍNKY :

Typ hodnocené konstrukce : Podlaha nad nevytápěným či méně vytáp. vnitřním prostorem
Korekce součinitele prostupu dU : 0.000 W/m2K

Skladba konstrukce (od interiéru) :

Číslo	Název	D [m]	Lambda [W/(m.K)]	c [J/(kg.K)]	Ro [kg/m3]	Mi [-]	Ma [kg/m2]
1	Dlažba keramic	0,0080	1,0100	840,0	2000,0	200,0	0.0000
2	weber.bat 20 M	0,0100	1,3800	830,0	2030,0	40,0	0.0000
3	Fermacell	0,0250	0,3200	1000,0	1250,0	13,0	0.0000
4	Isover Aku	0,0200	0,0380	800,0	40,0	1,0	0.0000
5	Keramzit 1	0,0350	0,1300	1260,0	400,0	2,5	0.0000
6	Jutafol N 140	0,0003	0,3900	1700,0	560,0	148275,0	0.0000
7	OSB desky	0,0250	0,1300	1700,0	650,0	50,0	0.0000
8	Dřevo měkké (t	0,1200	0,2230	2322,5	350,2	157,0	0.0000
9	Dřevo měkké (t	0,1000	0,1610*	2296,3	353,8	157,0	0.0000
10	Isover Orsik	0,0700	0,0400	800,0	30,0	1,0	0.0000
11	Fermacell	0,0125	0,3200	1000,0	1250,0	13,0	0.0000

Poznámka: D je tloušťka vrstvy, Lambda je návrhová hodnota tepelné vodivosti vrstvy, C je měrná tepelná kapacita vrstvy, Ro je objemová hmotnost vrstvy, Mi je faktor difúzního odporu vrstvy a Ma je počáteční zabudovaná vlhkost ve vrstvě.

* ekvival. tep. vodivost s vlivem tepelných mostů, stanovena interním výpočtem

Číslo	Kompletní název vrstvy	Interní výpočet tep. vodivosti
1	Dlažba keramická	---
2	weber.bat 20 MPa cementový potěr	---
3	Fermacell	---
4	Isover Aku	---
5	Keramzit 1	---
6	Jutafol N 140 Special	---
7	OSB desky	---
8	Dřevo měkké (tok kolmo k vláknům)	---
9	Dřevo měkké (tok kolmo k vláknům)	vliv systematických tep. mostů dle EN ISO 6946 Tep. vodivost zákl. materiálu: 0.180 W/(m.K) Tep. vodivost tep. mostů: 0.040 W/(m.K) Šířka tepelných mostů: 0.0750 m Tloušťka tepelných mostů: 0.1000 m Os. vzdálenost tep. mostů: 0.6000 m
10	Isover Orsik	---
11	Fermacell	---

Okrajové podmínky výpočtu :

Tepelný odpor při přestupu tepla v interiéru Rsi : 0.17 m2K/W
dtto pro výpočet vnitřní povrchové teploty Rsi : 0.25 m2K/W
Tepelný odpor při přestupu tepla v exteriéru Rse : 0.17 m2K/W
dtto pro výpočet vnitřní povrchové teploty Rse : 0.17 m2K/W

Návrhová venkovní teplota Te : 10.0 C
Návrhová teplota vnitřního vzduchu Tai : 20.0 C
Návrhová relativní vlhkost venkovního vzduchu RHe : 80.0 %
Návrhová relativní vlhkost vnitřního vzduchu RHi : 55.0 %

VÝSLEDKY VÝPOČTU HODNOCENÉ KONSTRUKCE :

Tepelný odpor a součinitel prostupu tepla podle EN ISO 6946:

Tepelný odpor konstrukce R : 4.030 m2K/W
Součinitel prostupu tepla konstrukce U : **0.229 W/m2K**

Součinitel prostupu zabudované kce U,kc : 0.25 / 0.28 / 0.33 / 0.43 W/m2K
Uvedené orientační hodnoty platí pro různou kvalitu řešení tep. mostů vyjádřenou přibližnou přirážkou podle poznámek k čl. B.9.2 v ČSN 730540-4.

Difúzní odpor a tepelně akumulační vlastnosti:

Difuzní odpor konstrukce ZpT : 4.0E+0011 m/s

Teplotní útlum konstrukce Ny* podle EN ISO 13786 : 973.2
Fázový posun teplotního kmitu Psi* podle EN ISO 13786 : 18.7 h

Teplota vnitřního povrchu a teplotní faktor podle ČSN 730540 a EN ISO 13788:

Vnitřní povrchová teplota v návrhových podmínkách Tsi,p : 19.44 C
Teplotní faktor v návrhových podmínkách f,Rsi,p : **0.944**

Difúze vodní páry v návrh. podmínkách a bilance vodní páry podle ČSN 730540:
(bez vlivu zabudované vlhkosti a sluneční radiace)

Průběh teplot a částečných tlaků vodní páry v návrhových okrajových podmínkách:

rozhraní:	i	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
theta [C]:	19.6	19.6	19.6	19.4	18.2	17.6	17.6	17.1	15.9	14.5
p [Pa]:	1285	1279	1277	1276	1276	1276	1127	1122	1046	983
p,sat [Pa]:	2281	2279	2276	2251	2088	2009	2008	1953	1806	1648

rozhraní:	10-11	e
theta [C]:	10.5	10.4
p [Pa]:	983	982
p,sat [Pa]:	1267	1260

Poznámka: theta je teplota na rozhraní vrstev, p je předpokládaný částečný tlak vodní páry na rozhraní vrstev a p,sat je částečný tlak nasycené vodní páry na rozhraní vrstev.

Při venkovní návrhové teplotě nedochází v konstrukci ke kondenzaci vodní páry.

Množství difundující vodní páry Gd : 8.037E-0010 kg/(m2.s)

Poznámka: Hodnocení difúze vodní páry bylo provedeno pro předpoklad 1D šíření vodní páry převažující
skladbou konstrukce. Pro konstrukce s výraznými systematickými tepelnými mosty je výsledek výpočtu jen
orientační. Přesnější výsledky lze získat s pomocí 2D analýzy.

STOP, Teplo 2015

b) Ground Floor

KOMPLEXNÍ POSOUZENÍ SKLADBY STAVEBNÍ KONSTRUKCE Z HLEDISKA ŠÍRENÍ TEPLA A VODNÍ PÁRY

podle EN ISO 13788, EN ISO 6946, CSN 730540 a STN 730540

Teplo 2017 EDU

Název úlohy : **Ground Floor**
Zpracovatel : TT 2017
Zakázka :
Datum : 18-Mar-18

ZADANÁ SKLADBA A OKRAJOVÉ PODMÍNKY :

Typ hodnocené konstrukce : Podlaha na zemine
Korekce soucinitele prostupu dU : 0.000 W/m2K

Skladba konstrukce (od interiéru) :

Císlo	Název	D [m]	Lambda [W/(m.K)]	c [J/(kg.K)]	Ro [kg/m3]	Mi [-]	Ma [kg/m2]
1	Železobeton 1	0.1500	1.4300	1020.0	2300.0	23.0	0.0000
2	Isover Ultimat	0.1000	0.0320	840.0	25.0	1.0	0.0000
3	Folie PVC	0.0005	0.1600	960.0	1400.0	16700.0	0.0000
4	Skelná vlna 1	0.0200	0.0460	940.0	15.0	2.5	0.0000
5	Fermacell Vapo	0.0250	0.3200	1100.0	1150.0	300.0	0.0000
6	Podlahové lino	0.0040	0.1700	1400.0	1200.0	1000.0	0.0000

Poznámka: D je tloušťka vrstvy, Lambda je návrhová hodnota tepelné vodivosti vrstvy, C je merná tepelná kapacita vrstvy, Ro je objemová hmotnost vrstvy, Mi je faktor difúzního odporu vrstvy a Ma je pocáteční zabudovaná vlhkost ve vrstve.

Císlo	Kompletní název vrstvy	Interní výpocet tep. vodivosti
1	Železobeton 1	---
2	Isover Ultimate U KFN 25 Sol	---
3	Folie PVC	---
4	Skelná vlna 1 (do roku 2003)	---
5	Fermacell Vapor	---
6	Podlahové linoleum	---

Okrajové podmínky výpoctu :

Tepelný odpor pri prestupu tepla v interiéru Rsi : 0.17 m2K/W
dtto pro výpocet vnitrní povrchové teploty Rsi : 0.25 m2K/W
Tepelný odpor pri prestupu tepla v exteriéru Rse : 0.00 m2K/W
dtto pro výpocet vnitrní povrchové teploty Rse : 0.00 m2K/W

Návrhová venkovní teplota Te :	5.0 C
Návrhová teplota vnitrního vzduchu Tai :	20.0 C
Návrhová relativní vlhkost venkovního vzduchu RHe :	100.0 %
Návrhová relativní vlhkost vnitrního vzduchu RHi :	55.0 %

Mesíc	Délka [dny/hodiny]		Tai [C]	RHi [%]	Pi [Pa]	Te [C]	RHe [%]	Pe [Pa]
1	31	744	18.6	61.9	1325.9	3.9	100.0	807.1
2	28	672	18.6	64.7	1385.8	3.0	100.0	757.4
3	31	744	18.6	66.0	1413.7	3.8	100.0	801.5
4	30	720	19.6	64.6	1472.7	5.8	100.0	921.8
5	31	744	20.6	65.6	1590.9	8.2	100.0	1086.9
6	30	720	20.6	69.4	1683.1	10.8	100.0	1294.7
7	31	744	20.6	71.2	1726.7	12.3	100.0	1429.8
8	31	744	20.6	70.5	1709.7	13.0	100.0	1497.0
9	30	720	20.6	65.9	1598.2	12.8	100.0	1477.5
10	31	744	19.6	65.2	1486.4	10.9	100.0	1303.3
11	30	720	18.6	66.2	1418.0	8.6	100.0	1116.8
12	31	744	18.6	65.0	1392.3	6.0	100.0	934.6

Poznámka: Tai, RHi a Pi jsou prum. mesícní parametry vnitrního vzduchu (teplota, relativní vlhkost a cástecný tlak vodní páry) a Te, RHe a Pe jsou prum. mesícní parametry v prostredí na vnejší strane konstrukce (teplota, relativní vlhkost a cástecný tlak vodní páry).

Prumerná mesícní venkovní teplota Te byla vypoctena podle cl. 4.2.3 v EN ISO 13788 (vliv tepelné setrvacnosti zeminy).

Pro vnitrní prostredí byla uplatnena prirážka k vnitrní relativní vlhkosti : 5.0 %

Výchozí mesíc výpoctu bilance se stanovuje výpoctem podle EN ISO 13788.
Pocet hodnocených let : 1

VÝSLEDKY VÝPOCTU HODNOCENÉ KONSTRUKCE :

Tepelný odpor a soucinitel prostupu tepla podle EN ISO 6946:

Tepelný odpor konstrukce R : 3.769 m2K/W
Soucinitel prostupu tepla konstrukce U : **0.254 W/m2K**

Soucinitel prostupu zabudované kce U,kc : 0.27 / 0.30 / 0.35 / 0.45 W/m2K
Uvedené orientacní hodnoty platí pro ruznou kvalitu rešení tep. mostu vyjádrenou približnou prirážkou podle poznámek k cl. B.9.2 v CSN 730540-4.

Difúzní odpor a tepelne akumulacní vlastnosti:

Difuzní odpor konstrukce ZpT : 1.2E+0011 m/s

Teplotní útlum konstrukce Ny* podle EN ISO 13786 : 122.6
Fázový posun teplotního kmitu Psi* podle EN ISO 13786 : 7.9 h

Teplota vnitrního povrchu a teplotní faktor podle CSN 730540 a EN ISO 13788:

Vnitrní povrchová teplota v návrhových podmínkách Tsi,p : 19.07 C
Teplotní faktor v návrhových podmínkách f,Rsi,p : **0.938**

Obe hodnoty platí pro odpor pri prestupu tepla na vnitrní strane Rsi=0,25 m2K/W.

Císlo mesíce	Minimální požadované hodnoty pri max. rel. vlhkosti na vnitrním povrchu: --------- 80% ---------		-------- 100% ---------		Vypoctené hodnoty		
	Tsi,m[C]	f,Rsi,m	Tsi,m[C]	f,Rsi,m	Tsi[C]	f,Rsi	RHsi[%]
1	14.6	0.726	11.2	0.494	17.7	0.938	65.6
2	15.3	0.785	11.8	0.566	17.6	0.938	68.8
3	15.6	0.795	12.1	0.563	17.7	0.938	69.9
4	16.2	0.754	12.8	0.504	18.7	0.938	68.1
5	17.4	0.743	13.9	0.462	19.8	0.938	68.8
6	18.3	0.767	14.8	0.409	20.0	0.938	72.1
7	18.7	0.774	15.2	0.350	20.1	0.938	73.5
8	18.6	0.732	15.0	0.270	20.1	0.938	72.6
9	17.5	0.601	14.0	0.154	20.1	0.938	67.9
10	16.3	0.626	12.9	0.229	19.1	0.938	67.4
11	15.6	0.701	12.2	0.357	18.0	0.938	68.8
12	15.3	0.740	11.9	0.468	17.8	0.938	68.3

Poznámka: RHsi je relativní vlhkost na vnitrním povrchu, Tsi je vnitrní povrchová teplota a f,Rsi je teplotní faktor.

Difúze vodní páry v návrh. podmínkách a bilance vodní páry podle CSN 730540:

(bez vlivu zabudované vlhkosti a slunecní radiace)

Prubeh teplot a cástecných tlaku vodní páry v návrhových okrajových podmínkách:

rozhraní:	i	1-2	2-3	3-4	4-5	5-6	e
theta [C]:	19.4	19.0	7.1	7.0	5.4	5.1	5.0
p [Pa]:	1285	1224	1223	1076	1075	942	872
p,sat [Pa]:	2245	2190	1005	1004	896	877	872

Poznámka: theta je teplota na rozhraní vrstev, p je predpokládaný cástecný tlak vodní páry na rozhraní vrstev a p,sat je cástecný tlak nasycené vodní páry na rozhraní vrstev.

Pri venkovní návrhové teplote dochází v konstrukci ke kondenzaci vodní páry.

Kond.zóna císlo	Hranice kondenzacní zóny levá [m]	pravá	Kondenzující množství vodní páry [kg/(m2s)]
1	0.2500	0.2500	1.433E-0008
2	0.2613	0.2991	1.176E-0009

Rocní bilance zkondenzované a vyparené vodní páry:

Množství zkondenzované vodní páry za rok Mc,a: **0.0845 kg/(m2.rok)**
Množství vyparitelné vodní páry za rok Mev,a: **0.5259 kg/(m2.rok)**
Ke kondenzaci dochází pri venkovní teplote nižší než 10.0 C.

Poznámka: Vypoctená celorocní bilance má pouze informativní charakter, protože výchozí venkovní teplota nebyla zadána v rozmezí od -10 do -21 C. Uvedený výsledek byl vypocten za predpokladu, že se konstrukce nachází v teplotní oblasti -15 C.

Bilance zkondenzované a vyparené vodní páry podle EN ISO 13788:

Rocní cyklus c. 1

V konstrukci dochází behem modelového roku ke kondenzaci.

Kondenzacní zóna c. 1

Mesíc	Hranice kond.zóny v m od interiéru levá	pravá	Dif.tok do/ze zóny v kg/m2 za mesíc g,in	g,out	Kondenz./vypar. v kg/m2 za mesíc Mc/Mev	Akumul. vlhkost v kg/m2 za mesíc Ma
2	0.2500	0.2500	0.0689	0.0032	0.0657	0.0657
3	0.2500	0.2500	0.0740	0.0036	0.0704	0.1361
4	0.2500	0.2500	0.0618	0.0036	0.0582	0.1942
5	0.2500	0.2500	0.0561	0.0038	0.0523	0.2465
6	0.2500	0.2500	0.0391	0.0033	0.0358	0.2823
7	0.2500	0.2500	0.0281	0.0032	0.0250	0.3073
8	0.2500	0.2500	0.0163	0.0030	0.0133	0.3206
9	0.2500	0.2500	0.0021	0.0030	-0.0009	0.3197
10	0.2500	0.2500	0.0115	0.0031	0.0084	0.3281
11	0.2500	0.2500	0.0282	0.0030	0.0252	0.3533
12	0.2500	0.2500	0.0513	0.0034	0.0479	0.4011
1	0.2500	0.2500	0.0579	0.0034	0.0545	0.4575

Max. množství zkondenzované vodní páry za rok Mc,a: **0.4575 kg/m2**
Množství vyparitelné vodní páry za rok Mev,a: **0.0000 kg/m2**
z toho se odparí do exteriéru: 0.0000 kg/m2
...... a do interiéru: 0.0000 kg/m2

Na konci modelového roku je zóna stále vlhká (tj. Mc,a > Mev,a).

Kondenzacní zóna c. 2

Mesíc	Hranice kond.zóny v m od interiéru levá	pravá	Dif.tok do/ze zóny v kg/m2 za mesíc g,in	g,out	Kondenz./vypar. v kg/m2 za mesíc Mc/Mev	Akumul. vlhkost v kg/m2 za mesíc Ma
2	0.2613	0.2991	0.0032	0.0006	0.0026	0.0026
3	0.2613	0.2991	0.0036	0.0007	0.0029	0.0055
4	0.2613	0.2991	0.0036	0.0007	0.0029	0.0084
5	0.2613	0.2991	0.0038	0.0007	0.0031	0.0115
6	0.2613	0.2991	0.0033	0.0007	0.0027	0.0142
7	0.2613	0.2991	0.0032	0.0006	0.0025	0.0168
8	0.2613	0.2991	0.0030	0.0006	0.0024	0.0192
9	0.2613	0.2991	0.0030	0.0006	0.0024	0.0215
10	0.2613	0.2991	0.0031	0.0006	0.0025	0.0240
11	0.2613	0.2991	0.0030	0.0006	0.0024	0.0264
12	0.2613	0.2991	0.0034	0.0007	0.0028	0.0292
1	0.2613	0.2991	0.0034	0.0006	0.0028	0.0321

Max. množství zkondenzované vodní páry za rok Mc,a: **0.0321 kg/m2**
Množství vyparitelné vodní páry za rok Mev,a: **0.0000 kg/m2**
z toho se odparí do exteriéru: 0.0000 kg/m2
...... a do interiéru: 0.0000 kg/m2

Na konci modelového roku je zóna stále vlhká (tj. Mc,a > Mev,a).

Poznámka: Hodnocení difúze vodní páry bylo provedeno pro predpoklad 1D šírení vodní páry prevažující skladbou konstrukce. Pro konstrukce s výraznými systematickými tepelnými mosty je výsledek výpoctu jen orientacní. Presnejší výsledky lze získat s pomocí 2D analýzy.

- **Teplo assessment for External wall:**

VYHODNOCENÍ VÝSLEDKŮ PODLE KRITÉRIÍ ČSN 730540-2 (2011)

Název konstrukce:

Rekapitulace vstupních dat

Návrhová vnitřní teplota Ti:	20,0 C
Převažující návrhová vnitřní teplota TiM:	20,0 C
Návrhová venkovní teplota Tae:	-13,0 C
Teplota na vnější straně Te:	-13,0 C
Návrhová teplota vnitřního vzduchu Tai:	20,6 C
Relativní vlhkost v interiéru RHi:	50,0 % (+5,0%)

Skladba konstrukce

Číslo	Název vrstvy	d [m]	Lambda [W/mK]	Mi [-]
1	OSB desky	0,012	0,130	50,0
2	Uzavřená vzduch. dutina tl. 25	0,025	0,147	0,4
3	Jutafol N 220 Special	0,0003	0,390	312000,0
4	OSB desky	0,012	0,130	50,0
5	Isover Orsik	0,100	0,040	1,0
6	OSB desky	0,012	0,130	50,0
7	Isover Orsik	0,080	0,040	1,0
8	OSB desky	0,012	0,130	50,0

I. Požadavek na teplotní faktor (čl. 5.1 v ČSN 730540-2)

Požadavek: f,Rsi,N = f,Rsi,cr =	0,751
Vypočtená průměrná hodnota: f,Rsi,m =	0,953

Kritický teplotní faktor f,Rsi,cr byl stanoven pro maximální přípustnou vlhkost na vnitřním povrchu 80% (kritérium vyloučení vzniku plísní).

Průměrná hodnota fRsi,m (resp. maximální hodnota při hodnocení skladby mimo tepelné mosty a vazby) není nikdy minimální hodnotou ve všech místech konstrukce. Nelze s ní proto prokazovat plnění požadavku na minimální povrchové teploty zabudované konstrukce včetně tepelných mostů a vazeb. Její převýšení nad požadavkem naznačuje pouze možnosti plnění požadavku v místě tepelného mostu či tepelné vazby.

II. Požadavek na součinitel prostupu tepla (čl. 5.2 v ČSN 730540-2)

Požadavek: U,N =	0,30 W/m2K
Vypočtená hodnota: U =	0,192 W/m2K

U < U,N ... POŽADAVEK JE SPLNĚN.

Vypočtený součinitel prostupu tepla musí zahrnovat vliv systematických tepelných mostů (např. krokví v zateplené šikmé střeše).

III. Požadavky na šíření vlhkosti konstrukcí (čl. 6.1 a 6.2 v ČSN 730540-2)

Požadavky:
1. Kondenzace vodní páry nesmí ohrozit funkci konstrukce.
2. Roční množství kondenzátu musí být nižší než roční kapacita odparu.
3. Roční množství kondenzátu Mc,a musí být nižší než 0,1 kg/m2.rok, nebo 3-6% plošné hmotnosti materiálu (nižší z hodnot).

Vypočtené hodnoty: V kci nedochází při venkovní návrhové teplotě ke kondenzaci.

POŽADAVKY JSOU SPLNĚNY.

2. List of drawings:

Drawing no.	Drawing name	Drawing scale
D.0.0	SITUATION	1:500
D.0.1	BASEMENT	1:50
D.0.2	1st FLOOR	1:50
D.0.3	2rd FLOOR	1:50
D.0.4	3th FLOOR	1:50
D.0.5	ROOF TRUSSES	1:50
D.0.6	FLOOR JOISTS	1:50
D.0.7	BASEMENT CEILING	1:50
D.0.8	1st &2rd FLOOR CEILING	1:50
D.0.9	FOUNDATION	1:50
D.0.9A	SECTION 1-1 & 2-2 FOUNDATION	1:50
D.0.10	SOUTH & NORTH ELEVATION	1:50
D.0.11	EAST & WEST ELEVATION	1:50
D.0.12	SECTION A-A	1:50
D.0.13	SECTION B-B	1:50
D.0.14	LIFT & LEGEND OF ROOM	1:50

CONCLUSION:

The apartment building with three above ground floors and one basement, mainly supported by reinforced concrete and timber frame structure, was designed with prelimary parameters. This supposed building was approached from primary issues, which relate to architectural designs, main support structures, civil works. In addition,

- Making BOQ – The bill of quantities of joinery elements, locksmith elements and plumbing elements,
- Designing reinforced concrete foundations – Strip foundations

All parameters were assumed to solve problems during construction proccess in this detailed design document.

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Thank you very much Lecturer, Ing. Jiří Teslík, Ph.D. for professional and enthusiastic instruction during the Diploma thesis's progress.

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Also, I greatly appreciate about the knowledge which I receive from Lecturers at Civil Engineering Faculty, VŠB – TUO.

Thank You All,

In Ostrava: Student signature: