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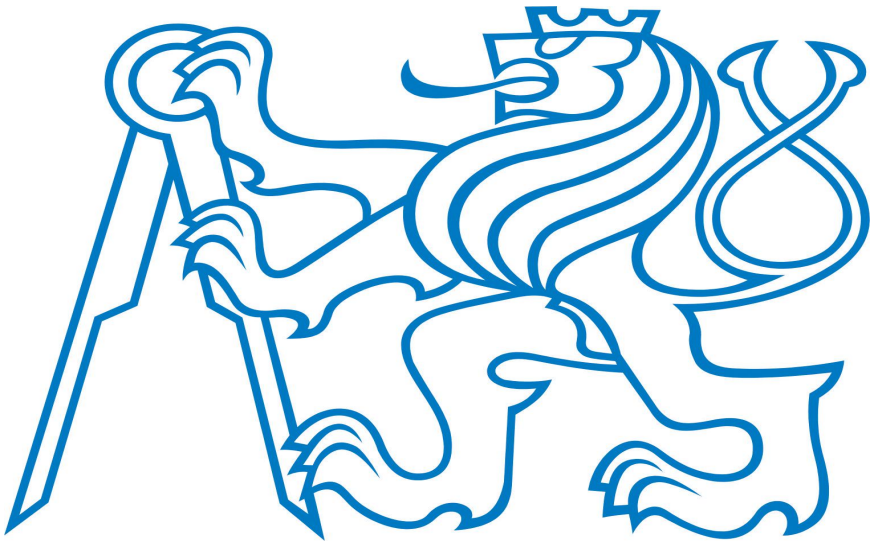

TECHNICAL REPORT
PART BUILDING SERVICE

According to the standards CSN 01 3107; ISO 128-23; CSN 01 3450

Diploma Project

RESIDENTIAL APARTMENT BUILDING

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Apartment Building Multifunctional

Identification data:

- **Project name:** Residential apartment building (Multifunctional)
- **Location:** Prague Pod Harfou
- **Function of the building:** Apartment building, Administrative, Shopping,Garage.
- **Stage :** Building permits.
- **Investor** : Private.
- **supplier:** will be selected by tender.

General description of the building:

- This Apartment building is located in an urban area Pod Harfou Prague 09 Czech Republic the total area of the building is 667 m^2 this building is consists of 7 floors including of the basement,the basement is provided for car parking, ventilation and boiler rooms for the whole residence of the building and on the ground floor there is stores and storage's, staircase , elevators, roof is not accessible to public except repair and maintain reason.
  Apartments type:
- Basement:boiler room, ventilation room 1x staircase ,1x corridors,1x elevator the rest of the area is provided for motor and car parking.
- Ground floor:1x staircase, 1x elevator 8x corridors,1x toilets,1x shopping, 1x technical room and also there is 24x storage's.
- 2nd floor:10x offices 1x men toilet,1x women toilet,1x disable toilet,1x cleaning room1x corridor,1x staircase,1x elevator and 1x balcony in one sides of the building.
- On the 3th to the last floors which is 4x apartment, each apartment consists of 1x bed room,1x bath with toilet,1x corridor,1x kitchen with dinning room except apartment A-J as they have one single bed room.
- there is opening in order to have accessibility to the roof for service or emergency case.
- Generally Surrounding the building with dimension of 1,5m there is stone pavements and the other area of the building will be after the rough landscaping grassed and planted with low and medium greenery.

Drawing documentation:

- Typical, ground floors and basement drainage systems.
- Rain drainage and internal drainage supply.
- Typical, ground floors and basement Water supply systems.
- Typical, ground floors and basement Gas supply systems.
- Typical, ground floors and basement Ventilation's and Heat systems.
- Situation of the Building.
    - Note: All the drawing can be seen in my attachments which is in folders.

Drainage systems of the building:

Building drain connection:

- Basically more details and solution of the sewer system is plotted in attachment which is consists of sewerage and rainwater indeed both of them are separated.
- The connection of the Sewerage pipe is PVC DN 150 and rainwater is PVC DN 225 and shall connected to the an existing sewerage network administrator.

- Generally The slope of building drain connection is considered as 5% (for DN 100, DN 75 DN 225,DN 150).
- The man hole will be in frost-free depth and will be concreted and fitted walk-on cover. The shaft dimensions 1000 x 800 mm.
- The drain connection will be made from plastic pipes.
- DR-SP,there are two pipes rainwater and waste water which are directed to the main sewer system separately from the same place but they are not intersect one another the rainwater pipes are placed bellow the waste water pipes.

Building drain

- Obviously, the slope of building drain is minimally from 2-5% in this case It will be used plastic pipes. The diameters vary from 75mm up to 200mm with the knee pipe with angle of 45◦. Connection with plumbing fixtures is provided by connecting pipes, which are connected with the main vertical stacks with DN 110. There are 5 vertical stacks for drainage and 3 vertical stacks for rainwater drainage. The vertical stacks are placed in vertical shafts and in external walls, the connection pipes are placed in internal walls and in the floor. *(The dimensions are shown in the technical drawings).*

Waste water internal distribution:

- All of the waste water pipes are made up of PVC pipes, with diameters DN 75 -110 mm basically the pipes are conducted in grooves in the wall, and floor. 2-5% is assumed for inclination of the piping.
- The pipes with diameters DN 110 and 200 mm , it is conducted in pre-prepared pits.
- Also as a result We need to have anchored all of the pipes for a better safety at a distance of mounting brackets for a good functionality which mainly indicates the pipe manufacturer. Due to the fact all of the drain pipes on the roof shall be provided with the ventilation and equipped with ventilation head.
- Also each of the ventilation pipes has same properties as drain pipes and join the waste pipes also conducted to the installation shaft.
- The drainage pipes is directed to the basement with the diameter of (DN110-150mm) after that the drain pipes is directed through to the basement wall and also in the basement wall there are several opening which are provided for passages of the sewerage pipes.
- There are 21 rainwater pipes with the DN110 for exterior and 200 for interior with properties of copper and the slope is assumed 5%.

fixtures and fittings:

- Obviously in the basement plane there occurs 1x outlet fittings.
- Functionality in the ground floors.1x sink, 2x corner valve (toilet).
- In the typical floor(administrative) 6x sinks,2x kitchen sink, 1x dishwasher, 8x toilet.

Basic Material:

- Each of this PVC pipes which we used in our building we use DN from 50 to 200mm.
- From the risk of the freezing for external pipes which effected by influenced of environment we provide thermal insulation while the ground pipes does not need because of their deep position and protection by subsoil layers.

Drains cleaning:

- Basically in case if do we need a drains cleaning the process will be implemented by vertical drains from the roof top through to the ventilation ducts.

pumping:

- So in this case that we see that the public sewer is positioned in deep elevation therefore the justification says that we do not need.

Wastewater stacks:

- Plastic pipes will be used, with DN 110. The waste water stacks are placed in vertical shaft in this building.

Horizontal fixture branch:

- Due to the fact Slope of 5% is applied. Used material would be plastic pipes with DN 110 and DN 200. The pipes are located in the ground-floor, in the foundations.

Plumbing fixtures

- KOHLER PLUMBING company is responsible for the designed installation. Material used is ceramics. Installations : washbasin , bath, sink and washing-machine.

Rainwater

- There are 2 vertical rain pipes and this Rainwater drainage is made by cooper pipes. The diameter of vertical rainwater pipes is DN 200 and the horizontal is DN 225 (slope of 3.5%).

Conclusion:

- After the investigations of the all process we reached to the point that this project is generally designed within the scope of the project for the building permit accordance with applicable regulations (CSN 73 6660, CSN 73 6005). obligatory Performing the work will be done by an authorized company, which at the handover submit their authorization certificate to implementation of the building.The company is obliged to follow the regulations of material manufacturers.
- The total sanitation is needed to test for leaks according to CSN 73 6760th.

Water supply systems:

Source of drinking water:

- Basically the Source of drinking water is central connection fresh water from the street underground water network.

Building water supply connection:

- Slope of the drain connection of the building is about 0.5% . connection will be conducted in frost-free depth of about 1 to 1.5m.
- Water supply connection will be made from copper pipes, diameter 25mm.
- fresh water supply connection is plotted in situation.
- Water connection will be DN25 polypropylene and will be connected to the existing water system network under pressure.

Water meter assembly:

- The main water meter assembly is placed in the ground-floor in the west. It‘s composed of filter, water meter, 2x reducer, 2x drain valve, shut off valve, check valve.

Horizontal piping:

- The decline a of horizontal piping is 0.5%. All horizontal pipes are made from copper. The pipes are placed mainly in the walls, in the ground floor in the flooring.

Vertical piping:

- All vertical pipes are made from copper. It is placed in the vertical shafts. The hydrant water supply pipe is placed in the bearing wall.

- **Connection piping:**

- The connection pipes have decline 5% and it is made from copper pipes. All connection pipes area replaced.

Outlet valve: Outlet valves are angle valves which are made from chrome and MP valves.

Distribution of water in internal:

- Slope of the drain connection of the building is about 0.5% . connection will be conducted in frost-free depth of abut 1 to 1.5m.
- Cold water is conducted in polypropylene piping conducted in the wall grooves , at the entrance to the building and before ascending pipe is provided with a ball valve and outlet valve of possible reasons for the crash.
- Hot water is also conducted in polypropylene pipes conducted in the wall grooves before each rising hot water pipe is provided with a ball valve and outlet valve of possible reasons for the crash.
- circulation pipe is also polypropylene is conducted freely suspended below the ceiling before each rising pipe is with a ball valve and outlet valve of possible reason for the crash.
- All three of these lines shall be kept longer For checks provided dilatation spacer and each pipe must be carefully fitted due to insulation reasons and unwanted heat.
- Fire pipeline is made of steel, is guided by its own pipe from the meter assembly is brought into the stairwell of the building, where it joins the rising fire lines and is equipped with fire hydrants.

Functionality and installations:

- boiler room is located in the basement of the building.
- 2 x heater type VITOCELL 100-V - VIESMANN 200 l.
- More information, refer to the manufacturer.
- Generally The size and power is directly proportional to the number of inhabitants in object.
- The Cold water is brought to the heater and is led out of hot water and circulation pipe with is fitted with circulation pump.

fixtures and fittings:

- Obviously in basement plane there occurs 0 outlet fittings.
- Functionality in the ground floors.1x sink, 2x corner valve (toilet).
- In the typical floor(administrative) 6x sinks,2x kitchen sink, 1x dishwasher, 8x toilet.

pipe insulation:

- In order to permit from surrounding of the environmental influence the piping shall be insulated and indeed the fire pipes will be insulated from fireproof material the investigation and judgment will focus more on the manufactures.
- Kind of the thermal insulation materials and their functionality,durability will be based on the manufactures.

water consumption measurements:

- The key function of the Water consumption is basically measured in meter shaft, by using of hydro-metric reports which is supplied by the network administrator, who will intervals to read the status of the meter. Longer secondary water meters will be installed in each residential units.

Final conclusion:

- Usually internal water supply connection and execution of work is according to the current standards of the czech republic and EU.
- CSN 73 66 60 - INDOOR WATER.
- CSN 73 66 55 - CALCULATION OF INTERNAL WATER.
- EN 806-3 - INTERNAL DISTRIBUTION OF WATER FOR HUMAN CONSUMPTION.
- H 132 98 - HEATER WATER.

Gas supply system:

connection:

- Include the administrative and all of the residence of this apartments basically connected to the local existing pipelines with a medium pressure from the road mainly in the position where there is provided by the administration networks.

Connections and main properties:

- Dimension between gas pipelines and other connection is 1,3m.
  slope of the gas connection piping is min. 0,4 %.
- The connector is mounted on the boundary brick which is equipped with a main gas closure and gas meter.
- Protective zones are at least 0.8 m depth and min. 4 m on each side from the pipe.
- The pipes will be placed into an excavation 800x1000mm.
- The excavation will be filled by sand to protect the piping. All required tests must be done before using.
- The low pressure gas connection will lead till the main shut off valve of the building, which is placed in the niche The niche is placed in the external wall.
- The pipes will be made from steel, connected by welding. All visible parts will be painted by yellow colour and all parts will be protected against corrosion.
- The gas pipes are placed in the load-bearing walls (vertical piping) or under ceiling (horizontal piping). The slope is always orientated from a gas meter to the appliances. All tests must be done before using slope of the gas connection piping is min. 0,4 %.

Gas consumption:

- Each independent part of the building has its own gas meter Gallus 2000 G 1,6 and own shut off valve. All devices are placed inside the wall openings. All wall openings are placed in accessible points.

Gas appliances

- In each kitchen, there is placed a gas cooker MORA 1411E12 (consumption 1.15 m^3/h). Gas exhaustion's are spread in the room and the air supply is natural, the volume of the room is bigger than 20 m^3.
- The building was designed with local heating system. Each flat has own gas boiler TIGER 12KTZ (consumption 1.34 m^3/h). Air supply is provided by double-surface chimney Schiedel Absolut ABS 20L. Exhaust gas goes to the chimney.

Heating:

- Include of the ground floor and each individual apartments is heated by the radiators/convectors and all of the radiators are placed in the front of the opening (windows,doors,balcony) and basically with respect to heat lose in the building we determine the size and number of radiators.
- The pipes is initiated from the boilers and vertically rise up through to the opening and connected to the radiators the pipes which is provided for supply water and return water it is made up of copper.
- **NOTE:** Please for More justification of the heating Visit evaluation of the u - value -thermal resistance calculations part of the building structures.

Air and ventilation of the building:

- As i mentioned in the previous that this building is in an new urban area which is far away from influence of the environment(traffic noise,pollution's,etc) therefore the building is neutrally ventilated through to the windows and internal doors are equipped ventilation grill in the underground cellar block,also mechanical ventilation is designed too as a feature.
- The mechanical ventilation is provided for each apartment (toilet , bathroom, kitchen room and garages) the exhaust air is lead out to the roof top by vertical pipes which is positioned in the installation shaft.

Regard to Air and ventilation of the building:

- As i mentioned in the previous that this building is in a new urban area which far away from infeluence of the environment(traffic noise,pollutions,etc) therefore the biulding is nutrally ventilated through to the windows and internal doors are equipped ventilation grill in the underground cellar block , but in case that we equipe the building with permanent ventilation then i placed an automatic fan (MRW AL 280/250 X1 HE recuperation ex-changer) in wall for general purpose of fresh intake air from outside in each flats and exhaust air of flat shall be take it out from flat by the other fan which is placed in the wall of the bathroom or toilet to take the exhaust air from the flat and transferred inside of bathroom or toilet and together can be take it out by the fan which is situated in toilet or bathroom.
- For the ground floor the Fresh intake air pipe is situated in the roof of the ground floor because there is an advantages that during the summer we take the fresh air from the roof.

DETERMINATION OF THE SIZE OF ROOF GULLIES AND VERTICAL RAINWATER DRAINAGE PIPES

ČSN 75 6760 [3]

The clearance of the roof inlet and the vertical drain pipe is determined according to ČSN 75 6760 [3] and depends on the **flow rate of the rainwater drains Q_r [ls $^{-1}$]** , which is calculated from the relation:

$Q_r = i \cdot A \cdot C$ [ls $^{-1}$]

where:

and[ls $^{-1}$ .m $^{-2}$] - rain intensity. For roofs and areas threatening the building with flooding, i = 0.03 l. S $^{-1}$.m $^{-2}$.

A [m ^{2}] - ground plan projection of drainage area, or effective roof area calculated in accordance with Article 4. 3. 2 EN 12056-3 (2001) [54]

C [-] - rainwater drain coefficient according to Tab. 2. 4.

Položka	Druh odvodňované plochy, popřípadě druh úpravy povrchu	Sklon povrchu a na něm závislý součinitel (C)		
		do 1 %	1 až 5 %	nad 5 %
1	Střechy s propustnou horní vrstvou tlustší než 100 mm	0,5	0,5	0,5
2	Střechy ostatní	1,0	1,0	1,0
3	Asfaltové a betonové plochy, dlažby se zálivkou			
4	spár	0,7	0,8	0,9
5	Dlažby s pískovými spárami	0,5	0,6	0,7
6	Upravené štěrkové plochy	0,3	0,4	0,5
7	Neupravené a nezastavěné plochy	0,2	0,25	0,3
8	Sady, hřiště	0,1	0,15	0,2
	Zatravněné plochy	0,05	0,1	0,15

Tab. Rainwater runoff factors [3]

From Tab. 2, 4 shows that the drain factor C is equal to C = 1 or C = 0.5 for roofs.

The clearance of the roof inlet and the vertical rain drain line is then determined by the hydraulic capacity of the inner storm drain pipe **Q_{RWP} [ls $^{-1}$]** of the following table. 2. 5:

Jmenovitá světlost vnitřního odpadního potrubí DN	Hydraulická kapacita Q_{RWP} [l.s^{-1}] Stupeň plnění f = 0,30
70	3,2
90	4,8
100	8,1
125	12,6
150	25,0

Hydraulic capacity of internal rainwater pipe [3]

$$Qr = i * A * C\left(l/s\right)$$

$$Qr = 0.03 * 616.70 * *0.8 = 14.80\left(m^2\ l/s\right)$$

$$DN = 200mm$$

Justifications our calculations is determined between 125 to 150 but I select 200mm for further evaluations,the reason is that I would like to increase internal size of pipe instead of increasing them by numbers,

PRINCIPLES FOR ROOF DRAINAGE SOLUTIONS:

Recommended principles for designing the shape and drainage of roofs are given in Annex G and H ČSN 73 1901 [1]. These include:

1. At least two roof outlets should be designed for one roof area that is drained inside the layout. If only one inlet is designed, it is recommended to complete the roof with a safety overflow.

2. Rainwater drain pipes from roofs, which are led through unheated areas, must be tempered or designed in such a way that they do not freeze.

3. No obstacles shall prevent the water from flowing to the eaves, gutters or inlets.

4. Water drainage from roof areas through attic constructions to outdoor rain drain pipes should not be designed.

5. The gutter and inter-roof gutters should not be designed, especially in foothill and mountain areas.

6. Roofs with internal drainage should be designed to be frost-proof.

7. Snow from the roofs of the building shall not be allowed to fall and the water shall run down to the roofs of the building at a lower level.

8. Roofs with external drainage located above the heated areas should be designed in such a way as to prevent the formation of ice walls at the edge of the roof and the risk of water leaking into the roof.

9. When waterproofing coatings are led to the top surface of an attic, they are usually protected by flashing. The flashing must have a slope of at least 3% towards the roof surface.

10. It is recommended to thermally insulate the inlets, to heat them, or to provide thermal insulating covers.

11. If the inlet fitting is tempered by the contact of the waste pipe with the internal environment, it is necessary to ensure a controlled drainage of any condensate from the pipe surface.

12. Waste piping through ventilated air layers of multi - layer roofs is thermally insulated it is recommended to overlap the thermal insulation with a minimum of 0.5 m into the roof area.

13. Do not place the inlets and pipe penetrations in the leeward corners of roofs, in the immediate vicinity of attics or other above-ground structures (roof superstructures, chimneys, etc.). The distance between these points should be at least 0.5 m, preferably 1 m.

Requirements for storm sewage pipes are given in ČSN 73 6760 [3]. In particular, the following principles apply:

1. No odor shall be allowed to escape from rain gullies, in places where nuisance may occur in adjacent areas and areas of use.

2. It is forbidden to use roof sediment traps on the inner rain drain pipe.

3. Outdoor rainwater piping installed in a mechanical damage area shall be made of a material resistant to damage up to a height of 1.5 m above the ground.

4. On the inner rain drain pipe, the cleaning fittings are installed at a height of 1 m above the floor of the lowest floor before it enters the downspouts and near the kinks.

Determination of water needs for small appliances Annex - A2

Determination of water demand values:
q – apartments with central bathrooms with central hot water preparation – **100 l/person/day**

Number of people in the apartment complex:
1: Basement: – 0
2: Ground floor: – stores 3 person = **9 person.**
3: Typical floor administrative: – 55 = 55 person in total except meeting room.
4:Apartment flat: – flat A,B,C,D,E,F,G,H,I,J. – 2 person in each unite flat =20x4 = **80 person**.
Total number of people in complex = 144 **people = n**

Calculation of water demand balance:
Average water requirement:
Q_p = q x n = 100x144 = **14400 l/d**

Maximum daily water requirement:
K_d = (Daily inequality coefficient) = (1000 – 5 000 resident) = 1,4
$Q_m = Q_p \times K_d$
Q_p = **14400 l/d**
$Q_m = Q_p \times K_d$ = **14400 l/d** x 1,4 =**20160 l/d**

Maximum hourly water demand:
$Q_h = Q_m \times K_h \times 1/z$
Q_m = **20160 l/d**
K_h = (Coefficient of hourly inequality) = 2,1
z = (apartments) = 24h
$Q_h = Q_m \times K_h \times 1/$apartments = (**20160 l/d** x 2,1) / 24 =**1764 l/h**