CZECH TECHNICAL UNIVERSITY IN PRAGUE

FACULTY OF CIVIL ENGINEERING

BACHELOR THESIS OF ADMINISTRATIVE BUILDING

BASHAR ALACHKAR 2020

CZECH TECHNICAL UNIVERSITY IN PRAGUE
Faculty of Civil Engineering
Thákurova 7, 166 29 Prague 6, Czech Republic

BACHELOR´S THESIS ASSIGNMENT FORM

I. PERSONAL AND STUDY DATA

Surname: Alachkar   Name: Bashar   Personal number: 470443

Assigning Department: K124 - Building Structures

Study programme: Civil Engineering

Branch of study: Building Structures

II. BACHELOR THESIS DATA

Bachelor Thesis (BT) title: Administraion Building

Bachelor Thesis title in English: Administration Building

Instructions for writing the thesis:

The proposal and target of this new administration building is to design and make structural solution with comprehensive solution and the envelop with fire safety solution of the building in accordance with applicable Czech standards norms.

List of recommended literature:

1. Hollis M.: Surveying Buildings, RICS Boks 2007
2. Assessment of Traditional Housing, BRE Watford, 2001
3. Whitlow R.: Materials and Structures, Longman 1992
4. Barry R.: The Construction of Buildings, BSP 1989
5. Foster J.S.: Structures and Fabric, Parts I - III, Longman 1994
6. Schodek, D.: Structures- Pearson. New Yersay. 2004
7. Hanaor, A. : Principles of structures. Blackwell Science. 1998

Name of Bachelor Thesis Supervisor: Ing. Malila Noori, Ph.D.

BT assignment date: 24.02.2020   BT submission date: 17.05.2020

[redacted]
BT Supervisor's signature

[redacted]
Head of Department's signature

III. ASSIGNMENT RECEIPT

I declare that I am obliged to write the Bachelor Thesis on my own, without anyone's assistance, except for provided consultations. The list of references, other sources and consultants' names must be stated in the Bachelor Thesis and in referencing I must abide by the CTU methodological manual "How to Write University Final Theses" and the CTU methodological instruction "On the Observation of Ethical Principles in the Preparation of University Final Theses".

Assignment receipt date

[redacted]
Student's name

CZECH TECHNICAL UNIVERSITY IN PRAGUE

FACULTY OF CIVIL ENGINEERING

TECHNICAL REPORT OF ADMINISTRATIVE BUILDING
PART 1 :BUILDING STRUCTURES

BASHAR ALACHKAR 2020

ABSTRACT:

THE AIM OF THIS THESIS IS TO STUDY AND DISCUSS ALL ENGINEERING SOLUTION AND PROCEDURES OF AN ADMINISTRATIVE BUILDING.
IT IS MOSTLY FOCUSED ON BUILDING STRUCTURES SOLUTION.
THE PROJECT CONSISTS OF FIVE DIFFERENT PARTS.

THE FIRST PART CONCLUDES CIVIL STRUCTURAL DESIGN STUDIES AND TECHNICAL SOLUTION.DRAWINGS ATTACHED TO THIS PART ARE SEVERAL DRAWINGS SUCH AS PLAN VIEWS, ROOF STRUCTURE, SECTIONS, FACADE VIEWS AND FIVE CONNECTION DETAILS.
THE SECOND PART IS FOCUSED ON PRELIMINARY DESIGN AND SOLUTION OF CONCRETE STRUCTURES.THIS PART MAINTAIN TWO DRAWINGS PLAN VIEW AND FORMWORK.
THE THIRD PART SHOWS THE FOUNDATION DESIGN OF THE OBJECT,WHILE THIS PART CONSISTS OF PLAN VIEW, SECTIONS AND CALCULATION.
THE FOURTH PART IS FOCUSED ON GENERAL SOLUTION OF BUILDING SERVICES SYSTEMS, CONTAIN PROPER DESIGN OF DRAINAGE, WATER SUPPLY SYSTEM AND VENTILATION SYSTEM.
THE FIFTH PART STUDIES THE BASIC SOLUTION FROM THE POINT OF VIEW OF FIRE SAFETY, INCLUDING PROPER DESIGN OF SECURING THE BUILDING AGAINST CATASTROPHES.
NOTE:ALL STRUCTURAL SOLUTIONS OF ADMINISTRATIVE BUILDING ARE PROVIDED IN ACCORDANCE WITH CZECH STANDARD NORMS.

CONTENTS:

1. LOCATION:

THIS OFFICE BUILDING IS LOCATED IN AN URBAN AREA OF BRNO, CZECH REPUBLIC.THE TOTAL AREA WHERE THE BUILDING IS DESIGNED ON LAND IS 2720 M^2 WHILE THE AREA OF BUILDING IS 940M^2.THIS BUILDING IS CONSISTED OF FOUR FLOORS,BASEMENT AMD GENERAL SURROUNDINGS. THE PAVEMENT IS DESIGNED WITH DIMENSION OF 1,5M THERE ARE CONCRETE EXTERIOR TILES AND THE OTHER AREA OF THE LAND WILL BE AFTER THE ROUGH LANDSCAPING GRASSED AND PLANTED WITH LOW AND MEDIUM GREENERY.

2. FOUNDATION:

GENERALLY THE FOUNDATION OF THE STRUCTURE DEPENDS ON CONTINOUS REINFORCED COCNRETE PADS ON WHICH THE LOAD BEARING COLUMNS WITH THE THICKNESS OF 400X400MM ARE PLACED CENTRALLY. DUE TO THE FACT THAT THE USE OF CONCRETE AS IT IS EASY TO PLACE, SPREADED AND LEVELED IN THE FOUNDATION TRENCH. DUE TO ITS ABILITY TO HARDEN CONCRETE CREATES A BASIS FOR COLUMNS AND DEVELOPS PROPER COMPRESSIVE STRENGTH TO SUPPORT THE FOUNDATION LOAD, THEREFORE, THE BASIC PURPOSE OF THIS FOUNDATION IS TO SPREAD THE LOAD OVER A LARGER AREA SO THAT THE SOIL HAS CAPABILITY TO WITHSTAND THE STRESS, AND SAFE BEARING PRESSURE IS NOT EXCEEDED.

2.1. PADS:

THE ADMINISTRATIVE BUILDING WILL BE BASED DEEP ON LARGE DIAMETER PADS WITH DIMENSIONS OF 2,1 X 2,1 AND 2,7 X 2,7 M.IT WILL BE USED FOR COLUMNS WITH DIMENSIONS OF 400X400MM REINFORCED CONCRETE CLASS C30/37.DESIGNED DEPTH OF THE PADS IS 1,2 M. CALCULATION OF THE PADS ARE PROVIDED IN THE REPORT OF FOUNDATION.

2.2. STRIPS:

THE BUILDING IS ALSO EQUIPPED WITH A CONCRETE BOX LOCATED IN THE CENTER OF THE BUILDING.THIS PART IS SUPPORTED BY STRIP FOUNDATION WITH A THICKNESS OF 500MM AND DEPTH OF 1,2 – 1,5 M.

3. STRUCTURAL SYSTEM:

THE STRUCTURAL SYSTEM IS A COLUMN SYSTEM. VERTICAL LOAD BEARING STRUCTURES CONSISTS OF 400X400 MM THICKNES REINFORCED CONCRETE COLUMNS CLASS C30/37 , THE STAIRS WILL BE CONSTRUCTED FROM PREFABRICATED REINFORCED CONCRETE STAIRS. WALLS IN BASEMENT WILL BE PROVIDED WITH REINFORCED CONCRETE.

WHILE THE HIGHER FLOORS WILL BE PROVIDED BY CERAMIC BRICKS POROTHERM 30 PROFI AS A NON-LOAD BEARING WALLS OF 300 MM THICKNESS.PARTITION WALLS ARE CONSTRUCTED WITH CERAMIC BLOCKS POROTHERM AKU 11.5.THESE CERAMIC BLOCKS WILL BE LOCATED IN THE INTERNAL PARTS OF THE BUILDING.

3.1. EXTERNAL WALLS:

WILL BE PROVIDED BY CERAMIC BRICKS POROTHERM 30 PROFI AS A NON-LOAD BEARING WALLS OF 300 MM THICKNESS WITH DRY FIX PLASTERS.

3.2. PARTITION WALLS:

1. POROTHERM 8 PROFI DRYFIX BINCLUDE OF BOTH SIDES PLASTER THE THICKNESS WILL BE 100MM. (STORES , BATHROOM)

2. POROTHERM 11.5 AKU DRYFIX INCLUDE OF BOTH SIDES PLASTER THE THICKNESS WILL BE 135MM FOR OFFICES.

3. LUXFER GLASS WALLS ARE CONSTRUCTED IN KITCHEN.

4. PLASTERS: INTERNAL PLASTER ARE WEBER MUR PLASTER FOR POROUS EDGING INTERIOR WALLS AND CEILINGS WITH THICKNESS T =10 [MM] AND EXTERNAL IS SAME APPLICATION ALSO WITH THICKNESS T= 10MM.

3.3. SLAB STRUCTURE:

THE FINAL DEPTH OF THE REINFORCED CONCRETE SLAB CLASS C30/37 IS 230MM.IT HAS THE EXACT THICKNESS IN THE WHOLE BUILDING AND EACH FLOOR.BEAMS ARE SUPPORTED BY COLUMNS WITH A DEPTH OF 300MM AND A WIDTH OF 400MM.

3.4. FLOORS:

ALL LAYERS OF THE FLOORING ARE EXPLAINED ON PAGE 13 THAT SHOWS SPECIFIED INFORMATION REGARDING FLOORING LAYERS ON PAGE 13.

3.5. STAIRS:

1. REINFORCED CONCRETE PREFABRICATED STAIRCASE IS DESIGNED AS A TWO FLIGHT PRECAST, MADE OF CONCRETE C30/37, SITUATED NEXT TO ELEVATOR SHAFT WITH REINFORCED CONCRETE LANDING. IN EACH LEVEL THERE IS ONE COMMUNICATION CORE WITH A STAIRCASE AND AN ELEVATOR WHICH CONNECTS ALL FLOORS.

2. THE BASIC GEOMETRY OF THE STAIRCASES IS 160/310 MM AT INCLINATION OF 27˚ WITH A WIDTH OF STEP 1200MM AND LENGTH OF FLIGHT 3100MM.

3. FLIGHT TO THE LANDING CONNECTION IS DONE BY SCHOCK TRANSOLE TYPE F SOUND INSULATION UNIT.ITS FIRE GRADING F90/F120 – IMPACT SOUND PRESSURE LEVEL ΔL = 12 DB.

3.6. ELEVATOR:

THE ELEVATOR SHAFTS ARE DESIGNED FROM REINFORCED CONCRETE WITH THICKNESS OF 200 MM. THE ACOUSTIC SOLUTION OF THE NOISE FROM THE ELEVATOR IS CARRIED OUT BY SOUNDPROOF CONCRETE WALLS AROUND THE ELEVATOR. CHOSEN TYPE OF ELEVATOR IS SCHINDLER 5500 WITH A LOAD CAPACITY OF 630 KG / 8 PERSONS.

3.7. LINTELS:

WINDOW IN PLACE OF THE LINTEL,IS EQUIPPED WITH HIDDEN LOUVER BOX. THIS TYPE OF LINTELS IS CONSTRUCTED OVER ALL THE WINDOWS AROUND THE BUILDING.IT CONTAINS AEROGEL AND EPS INSULATION WHICH HALTS THERMAL BRIDGES AND MAINTAIN LOW THERMAL CONDUCTIVITY.

3.8. ROOF:

THE DESIGN IS A FLAT ROOF WITH MINIMUM SLOPE OF 2-2.5%.THE ROOF IS FINSHED WITH WASHED RIVER GRAVEL AND THE DRAINAGE IS PROVIDED WITH SCUPPER WHICH DRAINS THE WATER VERTICALLY TO THE UNDERGROUND FLOOR.

4. INSULATION:

OBVIOUSLY THE BUILDING IS DESIGNED ACCORDING TO CSN 73 0540-2. THERMAL PROTECTION OF BUILDINGS DEPENDS ON VALUES OF THERMAL RESISTANCE(HEAT TRANSFER COEFFICIENT).CALCULATIONS ARE PROVIDED ON PAGE 14.

4.1. THERMAL INSULATION:

XPS EXTRUDED POLYSTYRENE T = 130 MM VERIFIED IN BASEMENT WALLS.ISOVER T-F THERMO IS PLACED AFTER EXTERNAL WALLS T = 160 MM.ISOVER GREY 100 WITH THICKNESS OF T = 180-240 MM IS PLACED IN THE ROOF STRUCTURE.LINTLES PROFILES ARE SUPPORTED BY AEROGEL 50MM TO PREVENT ALL TYPES OF THERMAL BRIDGES.THE LAYER BETWEEN THE UNDERGROUND FLOOR AND THE GROUND FLOOR IS PROVIDED WITH THERMAL INSULATION ISOVER N-F T=100MM AND ACOUSTIC INSULATION ISOVER T-N T = 50MM TO PREVENT THE NOISES FROM THE CARS IN GARAGE.

4.2. PERIMETER WALLS:

THE BASEMENT IS CONSTRUCTED OF REINFORCED CONCRETE WITH T = 240 MM AND INSULATED WITH XPS EXTRUDED POLYSTYRENE T = 130 MM, THERMAL RESISTANCE OF THE STRUCTURE U=0.30 TRANSFERS COEFFICIENT STANDARD REQUIRES U = 0.30 [W/(M2·K)].

4.3. EXTERNAL WALLS:

ABOVE THE BASEMENT WALLS ARE CONSTRUCTED POROTHERM PROFI 30 T T = 300 MM INSULATED WITH THERMAL INSULATON ISOVER T-F THERMO BY THICKNESS OF T = 160 MM.THERMAL RESISTANCE OF THIS COMPOSITOIN IS U = 0.161 HEAT TRANSFER COEFFICIENT STANDARD REQUIRES U = 0.30 [W/(M2·K)].

4.4. ROOF:

BASICALLY THE ROOF IS CONSTRUTED OF REINFORCED CONCRETE SLAB WITH T = 230 MM WHICH IS INSULATED WITH ISOVER GREY 100,PLACED AS DOUBLE BOARDS WITH THICKNESSES 100MM AND 80-140MM.THERMAL RESISTANCE OF THE STRUCTURE IS U = 0.172 HEAT TRANSFER COEFFICIENT STANDARD REQUIRES U = 0.24 [W/(M2·K)].

5. WINDOWS AND DOORS:

5.1. WINDOWS AND GLASS:

ALUMINUM WINDOWS , PERIMETER FITTINGS, MICRO, THERMALLY INSULATING,TRIPLE GLAZING (WITH GLASS WALLS DOOR GLAZING IS MADE OF SAFETY LAMINATED GLASS) FILLED WITH GAS (ARGON) SPACER STAINLESS STEEL OR ALUMINUM FRAME SWISSPACER, HEAT TRANSFER COEFFICIENT OF THE WINDOW Uw = 1.1 [W/(M2·K)].

5.2. DOORS:

TYPICAL WOOD TYPE FOR THE INTERNAL PARTATION WALLS WITH THE STEEL FRAME WHICH WILL BEHAVE AS A LINTEL REBATED TO THE WOODEN DOORFRAMES, FULL OR PARTIALLY GLAZED - DEPENDING ON THE SPECIFIC SITUATION.

5.3. GLASS SLIDING DOORS:

THE BUILDING WILL BE PROVIDED WITH AUTOMATIC FIRE-PROOF GLASS DOORS IN COSTUME SIZE.THE FILLING CAN BE MADE FROM FIRE-PROOF AND INSULATED GLASS.ALUMINUM LANING FIRE-PROOF PANEL.

6. AIR AND VENTILATION OF THE BUILDING:

THIS BUILDING IS IN AN NEW URBAN AREA WHICH IS LOCATED FAR AWAY FROM INFELUENCE OF THE ENVIRONMENT (TRAFFIC NOISE,POLLUTIONS,ETC) THEREFORE THE BIULDING IS A HYBRID VENTILATION SYSTEM WHICH COUNTS ON NATURAL VENTILATION THROUGH THE WINDOWS AND MECHANICAL SYSTEM THROUGH MACHINES.THE MECHANICAL VENTILATION IS PROVIDED WITH HVAC SYSTEM THAT IS RESPONSIBLE OF VENTILATING,HEATING AND COOLING THE BUILDING. EACH FLOOR EXHAUSTS AIR FROM (TOILET , BATHROOM, KITCHEN ROOM AND GARAGE) IS LED OUT THROUGH THE ROOF TOP BY VERTICAL PIPES WHICH IS POSITIONED IN THE INSTALLATION SHAFTS.

7. LIST OF DOCUMENTS, CSN, TECHNICAL REGULATIONS, LITERATURE, SOFTWARE:

GEOLOGICAL AND HYDROGEOLOGICAL REPORT

CSN 735305 DESIGN OF ADMINISTRATIVE BUILDINGS

CSN 73 1101 DESIGN OF MASONRY STRUCTURES

CSN 73 1201 DESIGN OF CONCRETE STRUCTURES

CSN 73 0035 LOADING OF STRUCTURES

EN 1991-1-3 SNOW LOADS

CSN 73 1001 FOUNDATION ENGINEERING - FOUNDATION SOIL BENEATH SHALLOW FOUNDATIONS.

CSN 73 1901 DESIGN ROOFS

CSN 73 0540-2 THERMAL PROTECTION OF BUILDINGS

CSN 73 0532 ACOUSTICS

CSN 73 0532 PROTECTION OF BUILDINGS AGAINST RADON FROM SUBSOIL

CSN 73 4301 RESIDENTIAL BUILDINGS

CSN 73 4130 STAIRS AND INCLINED RAMPS

CSN 73 3305 PROTECTIVE RAILINGS

CSN 73 4201 CHIMNEYS AND FLUES

8. LIST OF ATTACHEMENTS:

8.1. DESCRIPTION OF THE WINDOWS,DOORS,ELEVATOR AND LUXFER WALLS.

8.2. TEPLO CALCULATION OF THE U – VALUE.

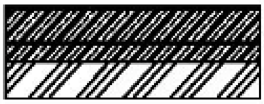
9. LIST OF DRAWINGS:

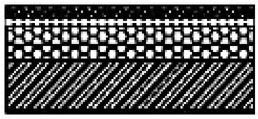
1. SITUATION, SCALE 1:250
2. PLAN VIEW OF UNDERGRAOUND FLOOR, SCALE 1:50
3. PLAN VIEW OF GROUND FLOOR, SCALE 1:50
5. PLAN VIEW OF TYPICAL FLOOR, SCALE 1:50
6. PLAN VIEW OF ROOF 5TH FLOOR, SCALE 1:50
7. PLAN VIEW OF ROOF DRAINAGE 1:50
8. SECTION A-A', SCALE 1:50
9. SECTION B-B', SCALE 1:50
10. NORTH VIEW, SCALE 1:50
11. SOUTH VIEW, SCALE 1:50
12. EAST VIEW, SCALE 1:50
13. WEST VIEW, SCALE 1:50
14. DETAIL A, SCALE 1:10
15. DETAIL B, SCALE 1:10
16. DETAIL C, SCALE 1:5
17. DETAIL D, SCALE 1:10
18. DETAIL E, SCALE 1:10

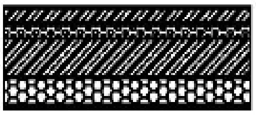
10. SOFTWARES:

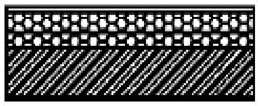
1. AUTOCAD 2020
2. MS OFFICE
3. TEPLO 2017

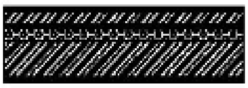
11. LIST OF LAYERS:

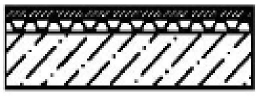
UNDERGROUND LEVEL FLOOR F1	t [mm]	
-FINISH OF FLOORING	20	
-REINFORCED CONCRETE SLAB	250	
-WATER PROOFING IPA	5	
-RF COONRETE	150	
-SOIL		
U=0.30 W/m²K		

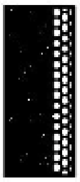
FLAT ROOF R	t [mm]	
-GRAVEL	50	
-WATERPROOFING - PVC	2	
-THERMAL INSULATION -ISOVER EPS GREY 100	80–140	
-THERMAL INSULATION -ISOVER EPS GREY 100	100	
-VAPOUR BARRIER -ALUMINUM FOIL	2	
-REINFORCED CONCRETE SLAB	230	
-PLASTER	10	
U=0.172 W/m²K		

UNDERGROUND LEVEL TO GF F2	t [mm]	
-Tiles	9	
-GLUE LAYER BASF	5	
-CONCRETE LEVELING LAYER	50	
-SEPARATION PE FOIL	1	
-ACOUSTIC INSULATION ISOFER T-N	50	
-REINFORCED CONCRETE SLAB	230	
-CEMENT GLUE	10	
-THERMAL INSULATION EPS ISOFER NF	100	
-PLASTER	10	
U= 0.24 W/m²K, R_w= 54 dB, L_w= 58 dB		

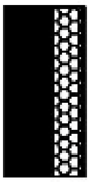
FLAT ROOF R2	t [mm]	
-WATERPROOFING - PVC	2	
-THERMAL INSULATION ISOVER EPS GREY 100	80–140	
-THERMAL INSULATION ISOVER EPS GREY 100	100	
-VAPOUR BARRIER ALUMINUM FOIL	2	
-REINFORCED CONCRETE SLAB	230	
-PLASTER	10	
U=0.172 W/m²K		

TYPICAL FLOORS F3	t [mm]	
-Tiles	9	
-GLUE	5	
-CONCRETE LEVELING LAYER	50	
-SEPARATION PE FOIL	1	
-ACOUSTIC INSULATION ISOFER T-N	50	
-CEMENT GLUE	10	
-REINFORCED CONCRETE SLAB	230	
-PLASTER	10	
R_w= 54 dB, L_w= 58 dB		

STAIRS LANDING F5	t [mm]	
-ANTI SLIP TILES	9	
-GLUE	5	
-LEVELING CONCRETE	30	
-PE FOIL	0.2	
-ACOUSTIC INSULATION	40	
-RF CONCRETE SLAB	230	
-PLASTER	10	

EXTERNAL WALL UNDERGROUND LEVEL W01	t[mm]	
-INNER PLASTER	10	
-REINFORCED CONCRETE WALL	240	
-WATERPROOFING- ASPHALT	5	
-XPS BOARDS	130	
-NOP FOIL		
U=0.30W/m²K		

PARTITION WALL W1	t[mm]	
- INNER PLASTER - POROTHERM UNIVERSAL	10	
- POROTHERM Aku 497/115/238 mm	115	
-INNER PLASTER - POROTHERM UNIVERSAL	10	
U=0.30W/m²K, R_w= 45 dB		

PERIMETER WALL W1	t[mm]	
-INNER PLASTER POROTHERM UNIVERSAL	10	
-MASONRY POROTHERM P30 profi	300	
-GLUE CEMIX 132	10	
-THERMAL INSULATION EPS T-F THERMO	160	
-OUTER PLASTER POROTHERM UNIVERSAL	10	
U=0.208 W/m²K		

12. LAYERS SPECIFICATION AND CALCULATION (TEPLO) :

SHRNUTÍ VLASTNOSTÍ HODNOCENÝCH KONSTRUKCÍ

Teplo 2017 EDU tepelná ochrana budov (CSN 730540, EN ISO 6946, EN ISO 13788)

Název kce	Typ	R [m2K/W]	U [W/m2K]	Ma,max[kg/m2]	Odparení	DeltaT10 [C]
Flat Roof...	strecha	5.661	0.172	0.0005	ano	---
Ground Floor...	podlaha	3.835	0.240	nedochází ke kondenzaci v.p.		---
External Wall with R.F...	stena	4.639	0.208	0.0008	ano	---
External Wall with Por...	stena	6.026	0.161	0.0421	ano	---

Vysvetlivky:

R	tepelný odpor konstrukce
U	soucinitel prostupu tepla konstrukce
Ma,max	maximální množství zkond. vodní páry v konstrukci za rok
DeltaT10	pokles dotykové teploty podlahové konstrukce.

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 : **Flat Roof**
Zpracovatel : TT 2017
Zakázka :
Datum : 27/04/2020

ZADANÁ SKLADBA A OKRAJOVÉ PODMÍNKY :

Typ hodnocené konstrukce : Strecha jednopláštová
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 3	0.4000	1.7400	1020.0	2500.0	32.0	0.0000
2	Al folie 2	0.0020	204.0000	870.0	2700.0	700000.0	0.0000
3	Isover EPS Gre	0.1500	0.0280	1270.0	20.0	50.0	0.0000
4	PVC	0.0020	0.2100	1470.0	1280.0	18570.0	0.0000
5	Sterkopisek	0.0500	2.0000	1010.0	2000.0	50.0	0.0000

Poznámka: D je tlouštka 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 pocátecní zabudovaná vlhkost ve vrstve.

Císlo	Kompletní název vrstvy	Interní výpocet tep. vodivosti
1	Železobeton 3	---
2	Al folie 2	---
3	Isover EPS Grey 100	---
4	PVC	---
5	Sterkopisek	---

Okrajové podmínky výpoctu :

Tepelný odpor pri prestupu tepla v interiéru Rsi : 0.10 m2K/W
dtto pro výpocet vnitrní povrchové teploty Rsi : 0.25 m2K/W
Tepelný odpor pri prestupu tepla v exteriéru Rse : 0.04 m2K/W
dtto pro výpocet vnitrní povrchové teploty Rse : 0.04 m2K/W

Návrhová venkovní teplota Te : -20.0 C
Návrhová teplota vnitrního vzduchu Tai : 21.0 C
Návrhová relativní vlhkost venkovního vzduchu RHe : 85.0 %
Návrhová relativní vlhkost vnitrního vzduchu RHi : 65.0 %

VÝSLEDKY VÝPOCTU HODNOCENÉ KONSTRUKCE :

Tepelný odpor a soucinitel prostupu tepla podle EN ISO 6946:

Tepelný odpor konstrukce R : 5.661 m2K/W
Soucinitel prostupu tepla konstrukce U : **0.172 W/m2K**

Soucinitel prostupu zabudované kce U,kc : 0.19 / 0.22 / 0.27 / 0.37 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 : 8.6E+0012 m/s

Teplotní útlum konstrukce Ny* podle EN ISO 13786 : 1501.1
Fázový posun teplotního kmitu Psi* podle EN ISO 13786 : 15.9 h

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

Vnitrní povrchová teplota v návrhových podmínkách Tsi,p : 19.28 C
Teplotní faktor v návrhových podmínkách f,Rsi,p : **0.958**

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

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]:	20.3	18.7	18.7	-19.2	-19.4	-19.5	-19.7
p [Pa]:	1616	1603	276	269	179	90	87
p,sat [Pa]:	2380	2151	2151	111	109	107	106

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	0.5520	0.5520	1.872E-0010

Rocní bilance zkondenzované a vyparené vodní páry:

Množství zkondenzované vodní páry za rok Mc,a: **0.0005 kg/(m2.rok)**
Množství vyparitelné vodní páry za rok Mev,a: **0.0075 kg/(m2.rok)**

Ke kondenzaci dochází pri venkovní teplote nižší než 0.0 C.

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.

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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 : 27/04/2020

ZADANÁ SKLADBA A OKRAJOVÉ PODMÍNKY :

Typ hodnocené konstrukce : Podlaha nad nevytápeným ci méne vytáp. vnitrním prostorem
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	Beton hutný 1	0.0500	1.2300	1020.0	2100.0	17.0	0.0000
2	PE folie	0.0001	0.3500	1470.0	900.0	144000.0	0.0000
3	Isover T-N	0.0500	0.0400	800.0	148.0	1.0	0.0000
4	Železobeton 1	0.2300	1.4300	1020.0	2300.0	23.0	0.0000
5	Stavební tmel	0.0100	0.2200	1300.0	1500.0	1350.0	0.0000
6	Isover NF 333	0.1000	0.0430	800.0	88.0	1.0	0.0000
7	Porotherm Univ	0.0100	0.8000	800.0	1450.0	14.0	0.0000

Poznámka: D je tlouštka 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 pocátecní zabudovaná vlhkost ve vrstve.

Císlo	Kompletní název vrstvy	Interní výpocet tep. vodivosti
1	Beton hutný 1	---
2	PE folie	---
3	Isover T-N	---
4	Železobeton 1	---
5	Stavební tmel DEK	---
6	Isover NF 333	---
7	Porotherm Universal	---

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 : 0.17 m2K/W
dtto pro výpocet vnitrní povrchové teploty Rse : 0.17 m2K/W

Návrhová venkovní teplota Te : 21.0 C
Návrhová teplota vnitrního vzduchu Tai : 18.0 C
Návrhová relativní vlhkost venkovního vzduchu RHe : 65.0 %
Návrhová relativní vlhkost vnitrního vzduchu RHi : 60.0 %

VÝSLEDKY VÝPOCTU HODNOCENÉ KONSTRUKCE :

Tepelný odpor a soucinitel prostupu tepla podle EN ISO 6946:

Tepelný odpor konstrukce R : 3.835 m2K/W
Soucinitel prostupu tepla konstrukce U : **0.240 W/m2K**

Soucinitel prostupu zabudované kce U,kc : 0.26 / 0.29 / 0.34 / 0.44 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 : 1.8E+0011 m/s

Teplotní útlum konstrukce Ny* podle EN ISO 13786 : 1952.5
Fázový posun teplotního kmitu Psi* podle EN ISO 13786 : 15.4 h

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

Vnitrní povrchová teplota v návrhových podmínkách Tsi,p : 18.18 C
Teplotní faktor v návrhových podmínkách f,Rsi,p : **0.941**

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

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	6-7	e
theta [C]:	18.1	18.2	18.2	19.0	19.2	19.2	20.9	20.9
p [Pa]:	1238	1247	1406	1406	1464	1613	1614	1616
p,sat [Pa]:	2079	2083	2083	2203	2219	2223	2466	2467

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 nedochází v konstrukci ke kondenzaci vodní páry.

Množství difundující vodní páry Gd : -2.202E-0009 kg/(m2.s)

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.

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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 : **External Wall with R.F Cconcrete**
Zpracovatel : TT 2017
Zakázka :
Datum : 27/04/2020

ZADANÁ SKLADBA A OKRAJOVÉ PODMÍNKY :

Typ hodnocené konstrukce : Stena vnejší jednoplášťová
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	Porotherm Univ	0.0100	0.8000	800.0	1450.0	14.0	0.0000
2	Železobeton 1	0.4000	1.4300	1020.0	2300.0	23.0	0.0000
3	Cemix 132 - so	0.0100	0.9620	840.0	1800.0	30.0	0.0000
4	Isover TF Ther	0.1600	0.0370	800.0	140.0	1.0	0.0000
5	Porotherm Univ	0.0100	0.8000	800.0	1450.0	14.0	0.0000

Poznámka: D je tlouštka 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 pocátecní zabudovaná vlhkost ve vrstve.

Císlo	Kompletní název vrstvy	Interní výpocet tep. vodivosti
1	Porotherm Univ	---
2	Železobeton 1	---
3	Cemix 132 - soklová omítka ruční	---
4	Isover TF Thermo	---
5	Porotherm Univ	---

Okrajové podmínky výpoctu :

Tepelný odpor pri prestupu tepla v interiéru Rsi :	0.13 m2K/W
dtto pro výpocet vnitrní povrchové teploty Rsi :	0.25 m2K/W
Tepelný odpor pri prestupu tepla v exteriéru Rse :	0.04 m2K/W
dtto pro výpocet vnitrní povrchové teploty Rse :	0.04 m2K/W

Návrhová venkovní teplota Te :	-20.0 C
Návrhová teplota vnitrního vzduchu Tai :	21.0 C
Návrhová relativní vlhkost venkovního vzduchu RHe :	85.0 %
Návrhová relativní vlhkost vnitrního vzduchu RHi :	70.0 %

VÝSLEDKY VÝPOCTU HODNOCENÉ KONSTRUKCE :

Tepelný odpor a soucinitel prostupu tepla podle EN ISO 6946:

Tepelný odpor konstrukce R : 4.639 m2K/W
Soucinitel prostupu tepla konstrukce U : **0.208 W/m2K**

Soucinitel prostupu zabudované kce U,kc : 0.23 / 0.26 / 0.31 / 0.41 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 : 5.3E+0010 m/s

Teplotní útlum konstrukce Ny* podle EN ISO 13786 : 1456.3
Fázový posun teplotního kmitu Psi* podle EN ISO 13786 : 17.9 h

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

Vnitrní povrchová teplota v návrhových podmínkách Tsi,p : 18.92 C
Teplotní faktor v návrhových podmínkách f,Rsi,p : **0.949**

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

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	e
theta [C]:	19.9	19.8	17.4	17.3	-19.6	-19.7
p [Pa]:	1740	1717	187	137	111	87
p,sat [Pa]:	2321	2306	1986	1975	107	106

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 kondenzací zóny levá [m]	pravá	Kondenzující množství vodní páry [kg/(m2s)]
1	0.5800	0.5800	4.847E-0009

Rocní bilance zkondenzované a vyparené vodní páry:

Množství zkondenzované vodní páry za rok Mc,a: **0.0008 kg/(m2.rok)**
Množství vyparitelné vodní páry za rok Mev,a: **11.8227 kg/(m2.rok)**

Ke kondenzaci dochází pri venkovní teplote nižší než -15.0 C.

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.

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 : **External Wall with Porotherm**
Zpracovatel : TT 2017
Zakázka :
Datum : 21/11/2020

ZADANÁ SKLADBA A OKRAJOVÉ PODMÍNKY :

Typ hodnocené konstrukce : Stena vnejší jednoplášťová
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	Porotherm Univ	0.0100	0.8000	800.0	1450.0	14.0	0.0000
2	Porotherm 30 P	0.3000	0.1800	1000.0	800.0	10.0	0.0000
3	Cemix 132	0.0100	0.9620	840.0	1800.0	30.0	0.0000
4	Isover TF Ther	0.1600	0.0370	800.0	1.0	1.0	0.0000
5	Porotherm Univ	0.0100	0.8000	800.0	1450.0	14.0	0.0000

Poznámka: D je tlouštka 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 pocátecní zabudovaná vlhkost ve vrstve.

Císlo	Kompletní název vrstvy	Interní výpocet tep. vodivosti
1	Porotherm Univ	---
2	Porotherm 30 Profi	---
3	Cemix 132	---
4	Isover TF Thermo	---
5	Porotherm Univ	---

Okrajové podmínky výpoctu :

Tepelný odpor pri prestupu tepla v interiéru Rsi : 0.13 m2K/W
dtto pro výpocet vnitrní povrchové teploty Rsi : 0.25 m2K/W
Tepelný odpor pri prestupu tepla v exteriéru Rse : 0.04 m2K/W
dtto pro výpocet vnitrní povrchové teploty Rse : 0.04 m2K/W

Návrhová venkovní teplota Te : -20.0 C
Návrhová teplota vnitrního vzduchu Tai : 21.0 C
Návrhová relativní vlhkost venkovního vzduchu RHe : 85.0 %
Návrhová relativní vlhkost vnitrního vzduchu RHi : 70.0 %

VÝSLEDKY VÝPOCTU HODNOCENÉ KONSTRUKCE :

Tepelný odpor a soucinitel prostupu tepla podle EN ISO 6946:

Tepelný odpor konstrukce R : 6.026 m2K/W
Soucinitel prostupu tepla konstrukce U : **0.161 W/m2K**

Soucinitel prostupu zabudované kce U,kc : 0.18 / 0.21 / 0.26 / 0.36 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 : 2.0E+0010 m/s

Teplotní útlum konstrukce Ny* podle EN ISO 13786 : 1395.8
Fázový posun teplotního kmitu Psi* podle EN ISO 13786 : 16.6 h

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

Vnitrní povrchová teplota v návrhových podmínkách Tsi,p : 19.38 C
Teplotní faktor v návrhových podmínkách f,Rsi,p : **0.960**

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

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**	**e**
theta [C]:	20.1	20.1	9.0	9.0	-19.7	-19.7
p [Pa]:	1740	1678	352	220	149	87
p,sat [Pa]:	2357	2345	1150	1144	106	105

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	**Hranice kondenzacní zóny**		**Kondenzující množství**
císlo	**levá [m]**	**pravá**	**vodní páry [kg/(m2s)]**
1	0.4800	0.4800	6.375E-0008

Rocní bilance zkondenzované a vyparené vodní páry:

Množství zkondenzované vodní páry za rok Mc,a: **0.0421 kg/(m2.rok)**
Množství vyparitelné vodní páry za rok Mev,a: **11.1103 kg/(m2.rok)**

Ke kondenzaci dochází pri venkovní teplote nižší než -5.0 C.

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.

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CZECH TECHNICAL UNIVERSITY IN PRAGUE

FACULTY OF CIVIL ENGINEERING

TECHNICAL REPORT OF ADMINISTRATIVE BUILDING
PART 2 :STRUCTURAL SYSTEM

BASHAR ALACHKAR 2020

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2. FORMWORK AND STRUCTURAL DESIGN OF THE BULDING

THE STRUCTURAL SOLUTION OF THE BUILDING DEPENDS ON A TWO-WAY CONCRETE FLAT SLAB WITH DEPTH OF H = 230 MM SUPPORTED BY (400X400) MM COLUMNS.SLAB OF THE STAIRCASE IS ASSUMED AS A ONE-WAY SLAB WHICH IS SUPPORTED IN CONCRETE WALLS.

3. LIST OF DRAWINGS:

1. STRUCTURAL SYSTEM OF THE BUILDING
2. STRUCTURAL FORMWORK OF THE BUILDING

4. FUNDAMENTAL REQUIREMENTS:

USED DOCUMENTS, STANDARDS

ČSN EN 1990 EUROCODE: BASIS OF STRUCTURAL DESIGN

ČSN EN 1991-1-1 EUROCODE 1: ACTIONS ON STRUCTURES: GENERAL ACTIONS - DENSITIES, SELF-WEIGHT AND IMPOSED LOADS.

ČSN EN 1991-1-3 EUROCODE 1: ACTIONS ON STRUCTURES: GENERAL ACTIONS - SNOW LOADS

ČSN EN 1991-1-4 EUROCODE 1: ACTIONS ON STRUCTURES: GENERAL ACTIONS - WIND

ČSN EN 1992-1-1 EUROCODE 2: DESIGN OF CONCRETE STRUCTURES: GENERAL RULES AND RULES FOR BUILDINGS

ČSN EN 1993-1-1 EUROCODE 3: DESIGN OF STEEL STRUCTURES: GENERAL RULES AND RULES FOR BUILDINGS

ČSN EN 1996-1-1 EUROCODE 6: DESIGN OF MASONRY STRUCTURES: GENERAL RULES FOR REINFORCED AND UNREINFORCED MASONRY STRUCTURES.

SOURCE: HTTP://EUROCODES.JRC.EC.EUROPA.EU/SHOWPAGE.PHP?ID=13

5. PRELIMINARY DESIGN (DESIGN DIMENSIONS OF ALL ELEMENTS)

DESIGN OF THE DIMENSIONS:

5.1 DEPTH OF THE SLAB: H_S

ONE-WAY SLAB

EMPIRICAL ESTIMATION:

$$D_S \geq \left(\frac{l}{Kc1.kc2.kc3.\gamma d,tab}\right)$$

CONCRETE CLASS: C30/37

$$D_S \geq \left(\frac{7000}{1.1.1,2.30,8}\right)$$

STEEL: B500B

DS$\approx 190mm$

H_S = DS+C=190+25= 215MM

H_S = 230MM

220 WILL NOT MATCH SPAN DEPTH RATIO

5.2 EFFECTIVE DEPTH:

D = H_S - C - $\frac{\emptyset}{2}$

5.3 COVER DEPTH:

C → C = C_{MIN} + ΔC_{DEV} → 100 YEARS WORK LIFE, STRUCTURAL CLASS X0

C_{MIN}=MAX($C_{MIN,B}$:$C_{MIN,DUR}$:10)MM → C_{MIN}=MAX(10:10:10)MM → C_{MIN}= 10 MM

C = C_{MIN} + ΔC_{DEV} → C = 20 → C = 25 MM.

D = H_S - C - $\frac{\emptyset}{2}$ → STEEL BAR: ∅ 10 MM

D = 230 – 25 - $\frac{10}{2}$ → D = 195 MM. D = 195 MM.

5.4 SPAN/DEPTH RATIO (DEFLECTION CONTROL):

$\Lambda = \frac{L}{D} \leq \Lambda_{LIM} = K_{C_1}K_{C_2}K_{C_3}\Lambda_{D,TAB}$ K_{C_1}- EFFECT OF SHAPE =1.0

$\Lambda = \frac{7000\ MM}{195\ MM} \leq \Lambda_{LIM}$ = 1*1*1.2*30.8 ? K_{C_2}- EFFECT OF SPAN = 1.0

K_{C_3}- EFFECT OF REINFORCEMENT = 1.2

$\Lambda_{D,TAB}$ FOR SLAB CONSIDER THE VALUE FOR 0.5% REINFORCEMENT RATIO, C30/37 = 30.8 → Λ = 35.89 < Λ_{LIM} = 36.96 OKAY

6. DIMENSION OF THE COLUMN:

$N_{RD} \geq N_{ED}$?

6.1 CALCULATION OF THE LOAD:

SLAB LOAD					
			CHARACTERISTIC	Γ_F	DESIGN
			[KN/M²]		[KN/M²]
PERMANENT					
	SELF-WEIGHT	$0.23m \times 25\frac{kN}{m^3}$	5.74	1.35	7.76
	OTHER		1.56	1.35	2.033
	∑		7.3	1.35	9.855
VARIABLE					
	CATEGORY B		2.5	1.5	3.75
∑			9.8		≈14
ROOF LOAD					
			CHARACTERISTIC	Γ_F	DESIGN
			[KN/M²]		[KN/M²]
PERMANENT					
	SELF-WEIGHT	$0.2m \times 25\frac{kN}{m^3}$	5.75		
	OTHER		2		
	∑		7.75	1.35	10.46
VARIABLE					
	SNOW		0.56	1.5	0.84
∑			8.31		≈12

6.2 CALCULATION OF VARIABLE LOAD:

SNOW LOAD S_K: $s_k = \mu_i C_e C_t s$ S_K = 0.8*1*1*0.7 S_K = 0.56

CALCULATION OF N_{ED}:

TRIBUTING AREA TRIBUTARY
A = 7*6 = 42 M^2

LOAD FROM THE SLAB:
5 * TYPICAL FLOOR = 5 * 42 M^2 * 12 $\frac{kN}{m^2}$ = 2520 KN
1 * ROOF = 1 * 42 M^2 * 12 $\frac{kN}{m^2}$ = 504 KN
∑ = 3024 KN

7. CALCULATION OF BEAM STRUCTURE

SPAN OF CONTINUOUS BEAM = 7 M
THEN EFFECTIVE DEPTH OF BEAM = 7000 / 26
D = 269 MM ≈ 270 MM
TOTAL DEPTH = EFFECTIVE DEPTH + DIAMETER OF BAR/2 + CLEAR COVER
ASSUME DIAMETER OF BAR = 10MM

7.1 DEPTH OF BEAM

D = 270 + 10/2 + 25 D = 300 MM

7.2 WIDTH OF BEAM

WIDTH = D/1.5
WIDTH = 305 /1.5
B = 203 MM
SO, WE WILL TAKE 400 MM FOR WIDTH BECAUSE OF COLUMN WIDTH
THEN,
WIDTH / DEPTH = 400/305 = 1.31 > 0.3, OKAY

7.3 DEPTH OF BEAM CHECK

WIDTH OF BEAM = ¼ OF SPAN
= ¼ X 7000
= 1750 MM > 305 MM, OKAY

7.4 CHECK FOR LATERAL STABILITY OR BUCKLING:

ALLOWABLE L = 60 B
ALLOWABLE L = 60 X 400
ALLOWABLE L = 24000 MM = 24 M
THERFOREALLOWABLE L = 24 M
HERE, ALLOWABLE L = 24 M > 7M, OKAY

8. ESTIMATION SELF-WEIGHT OF THE COLUMN

≈25 KN

N_{ED} = 3024 KN + 25 KN
N_{ED} = 3050KN.
3.3.5- $N_{RD} \geq N_{ED}$
$N_{RD} \geq N_{ED} \rightarrow N_{RD} = 0.8\ A_C\ F_{CD} + A_S\ \boldsymbol{\sigma_s}$ A_S = 0.02 A_C
3024 KN = 0.8 A_C * 20000 + 0.02 A_C * 400000 $\boldsymbol{\sigma_s}$= 400MPA
MIN A_C = 0.126 M^2

SQUARE COLUMN: 400 X 400 MM

A_C = 0.16
$N_{RD} = 0.8\ A_C\ F_{CD} + A_S\ \boldsymbol{\sigma_s} \geq N_{ED}$ = 260.5 KN ?
$N_{RD} = 0.8 * 0.16M^2 * 20000\ \frac{kN}{m^2} + 0.02 * 0.16\ M^2 * 400000\ \frac{kN}{m^2}$
N_{RD} = 3840 KN > N_{ED} = 3024 KN. **OKAY**

9. DESIGN OF THE STAIRCASE:

DESIGN OF THE GEOMETRY OF THE STAIRCASE:
DIMENSION OF THE STRUCTURE:

HEIGHT OF THE FLOOR H_K =3200 MM
DEPTH OF THE MAIN SLAB H_S = 200 MM
DEPTH OF FLOOR STRUCTURE H_F = 200 MM
THICKNESS OF CLADDING OF THE STAIRS H_C = 30 MM

DIMENSIONS OF THE STAIRCASE:

IDEAL HEIGHT OF ONE STEP IN THE ADMINISTRATION BUILDING IS 160 MM
$\frac{3200}{160}$ = 20 → 2 STEPS (2 FLIGHTS WITH 10 STEPS EACH)
HEIGHT OF ONE STEP $H = \frac{3200}{20}$ = 160 MM
WIDTH OF ONE STEP B = 630 – 2H = 310 MM

STAIRCASE WITH 160/310 MM STEPS, 2 FLIGHTS WITH 10 STEPS EACH
OTHER DIMENSIONS OF STAIRS

WIDTH OF THE FLIGHT = 1200 MM
WIDTH OF THE LANDING = 1200 MM
SLOPE OF THE STAIRCASE IS □□= ARCTAN $\frac{160}{310}$ = 27.3°.

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PART 3 :FOUNDATION

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1. MATERIALS:

FOR THE LOAD BEARING CONCRETE COLUMNS AND SLAB WAS USED CONCRETE C37/30 – XC2, C=30MM. FOR THE REINFORCEMENT WAS USED B500B.

2. GEOTECHNIC VALUES OF SOILS OF COVERING FORMATIONS:

SUBSOIL SECTIONS: PETROGRAPHIC COMPOSITIONS:

GT1: 0,0 – 2.30 M SANDY LOAM AND LOAMY SAND WITH WASTE

GT2: 2.30 – 4.50M SANDY LOAM AND LOAMY SAND

GT3: 4.50 - 7.40M SAND WITH BOULDERS AND LOAMY ADMIXTURE

GT4: 7.40 - 13.40M OAMY SANDY GRAVEL

GT5: 13.40 – 13.80M WEATHERED CLAYEY SHALES

GT6: 13.80 – 15 M SLIGHTLY WEATHERED CLAYEY SHALES

THE SITUATION OF PADS IS PLACED IN GT2 SANDY LOAM AND LOAMY SAND

2.1 LOADS:

LIFE LOAD FOR ADMINISTRATIVE BUILDINGS IS 3.24 KN/M^2

LIFE LOAD FOR THE PARTITIONS IS 0.8 KN/M^2

SNOW LOAD IS 0.56 KN/M^2

2.2 FOUNDATION PADS

PAD DIMENSIONS – 2.1 X 2.1 X 1.2 M

PAD DIMENSIONS – 2.7 X 2.7 X 1.2 M

DESIGNED BY RULES OF 1 GEOTECHNICAL CATEGORY.

2.3 STRIP FOUNDATION

THE BUILDING IS ALSO EQUIPPED WITH A CONCRETE BOX LOCATED IN THE CENTER OF THE BUILDING.THIS PART IS SUPPORTED BY STRIP FOUNDATION WITH A THICKNESS OF 500MM AND DEPTH OF 1.2 - 1.5 M.

3. PRELIMINARY DESIGN OF FOUNDATION PAD

A	11.00	M^2	A=VDN/RDT
SIDE OF FOUNDATION PAD	3.32	M	

COEFFICIENT CALCULATION

foundation pad dimensions	
b	2.7
l	2.7
h	1
d	1.2

load bearing coefficient		
Nc	20.46	φd>0
Nq	10.45	
Ngamma	6.55	
shape of foundation pad coefficient		
sq	1.419452082	
sc	1.46	
sgamma	0.7	
depth of foundation coefficient		
dc	1.07	
dq	1.06	
dgamma	1	
coefficient of slope of force		
ic	1	
iq	1	
igamma	1	

R/A	450.38	KPA	LOAD BEARING CAPACITY OF SOIL	

STRESS BELOW FOUNDATION PAD

ΣD	415	KPA		
ΣD<R/A	415	<	450	**OK**

PRELIMINARY DESIGN OF FOUNDATION PAD

A	6.60	M2	A=VDN/RDT
SIDE OF FOUNDATION PAD	2.57	M	

Coefficient calculation

foundation pad dimensions	
B	2.1
L	2.1
H	1
D	1.2

load bearing coefficient		
Nc	20.46	φd>0
Nq	10.45	
Ngamma	6.55	
shape of foundation pad coefficient		
sq	1.419452082	
sc	1.46	
sgamma	0.7	
depth of foundation coefficient		
dc	1.08	
dq	1.07	
dgamma	1	
coefficient of slope of force		
ic	1	
iq	1	
igamma	1	

R/A	428.13	kPa	load bearing capacity of soil	

stress below foundation pad

Σd	411	kPa		
σd<R/A	411	<	428	**ok**

4. EUROCODES:

EN 1990 – BASIS OF STRUCTURAL DESIGN

EN 1991 – ACTION OF STRUCTURES

EN 1992 – DESIGN OF CONCRETE STRUCTURES

EN 1996 – DESIGN OF MASONRY STRUCTURES

EN 1997 – GEOTECHNICAL DESIGN

5. SOFTWARES:

- AUTOCAD 2017
- MS OFFICE
- EXCEL

6. ATTACHMENTS:

1. CALCULATION OF FOUNDATION
2. DRAWINGS: FOUNDATION – PLAN
3. DRAWINGS: SECTIONS (BELONGS TO PLAN DRAWING)

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PART 4 :BUILDING SERVICE

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1) DRAINAGE SYSTEMS:

BUILDING DRAIN CONNECTION:

DRAINAGE SYSTEM SUPPORTS ALL BATHROOMS AND KITCHENS WICH ARE DISTRIBUTED IN THE BUILDING FLOORS EVENLY.THE CONNECTION OF THE DRAINAGE PIPES IS SEPERATED INTO TWO MAIN PARTS.DRAINAGE PIPES WHICH TRANSPORTS DRAINAGE WASTES FROM BATHROOMS AND KITCHEN, WHILE THESE PIPES ARE MADE OF PVC WITH DIAMETER OF 175mm AND 200 mm.
THE DIFFERENCE OF THE DIAMETER RANGES BETWEEN 175mm AND 200mm IS CAUSED BY THE CHANGE OF PRESSURE ON THESE PIPES.
SECOND TYPE OF PIPES IS DRAINAGE PIPES TRANSPORTING RAIN WATER FROM THE ROOF OF THE OBJECT ALL THE WAY DOWN TO UNDERGROUND FLOOR.THESE PIPES ARE ALSO MANIFACTURED BY PVC MATERIALS AND ARE BUILT WITH A DIAMETER 75mm.
IT'S IMPORTANT TO MENTION THAT ALL DRAINAGE PIPES WICH PLACED HORIZONTALLY IN THE OBJECTS ARE PLACED DIAGONALLY WITH THE A RANGE OF SLOPING THAT DIFFERS BETWEEN 2% AND 2,5%.
THE MAIN HOLE WILL BE CONSTRUCTED OUTSIDE OF THE OBJECT IN FROST-FREE DEPTH AND WILL BE FITTED WALK-ON COVER. ALL PIPES WHICH WILL BE PLACED IN THE SAME SHAFTS OR LOCATION WILL BE PLACED ON DIFFERENT HEIGHTS TO PREVENTS INTERSECTIONS.

1.1 SHAFTS

THE BUILDING CONTAINS VARIOUS TYPES OF SHAFTS

S01 350mm X 700mm MAIN SHAFT WICH TRANSPORTS WATER, DRAINAGE, GAS AND VENTILATION PIPES .
S02 150mm X 150mm RAIN WATER DRAINAGE SHAFT.
S03 150mm X 150mm RAIN WATER DRAINAGE SHAFT.
S04 150mm X 150mm RAIN WATER DRAINAGE SHAFT.
S05 150mm X 150mm RAIN WATER DRAINAGE SHAFT.
S06 200mm X 200mm WASTE WATER DRAINAGE FROM BATHROOMS.

1.2 BUILDING DRAIN

THE SLOPE OF BUILDING DRAIN IS 2% IN THIS CASE IT WILL BE USED PVC PIPES. THE DIAMETERS CHANGES FROM 50mm UP TO 200MM WITH THE KNEE PIPE AND ANGLE OF 45◦.

1.3 WASTE WATER INTERNAL DISTRIBUTION:

ALL OF THE WASTE WATER PIPES ARE MADE UP OF PVC PIPES, WITH DIAMETERS DN 50mm-125mm -175mm – 200mm THE PIPES WITH DIAMETERS DN 125,150,175 AND 200mm ARE CONDUCTED IN PRE-PREPARED DITCH. AS A RESULT ALL PIPES HAVE TO BE FIXED FOR SAFETY AT A DISTANCE OF MOUNTING BRACKETS FOR A GOOD FUNCTIONALITY. DRAIN PIPES.THE ROOF SHALL BE EQUIPPED WITH THE VENTILATION HEAD. THE DRAINAGE PIPES WITH THE DIAMETER OF(DN75mm) ARE DIRECTED THROUGH VERTICAL PIPES TO THE BASEMENT AND THEN TRANSPORTED TO A WIDER PIPE (DN100mm) WHICH IS CONNECTED TO THE PUBLIC MANHOLE OUTSIDE THE OBJECT.OPPENING ARE PLACED IN THE BASEMENT WALLS SO IT CAN ALLOWS THE PIPES TO GO THROUGH THEM.THERE ARE 4 RAINWATER PIPES WITH THE DIAMETER OF DN75mm WHICH DRAINS THE RAINWATER FROM THE ROOF TO THE BASEMENT.

1.4 BASIC MATERIAL:

ALL PVC PIPES WHICH ARE USED IN THE BUILDING VARIES BETWEEN 50mm AND 200mm. PIPES ARE PREVENTED FROM FREEZING BECAUSE THEY ARE ALL PLACED INSIDE THE BUILDING.

1.5 DRAINS CLEANING:

THE PROCESS OF CLEANING THE DRAINS WILL BE IMPLEMENTED BY VERTICAL DRAINS FROM THE ROOF TOP THROUGH THE VENTILATION CORNERS AND OPENNINGS.

1.6 HORIZONTAL FIXTURE BRANCH:

WASTE WATER DRAINAGE AND WATER DRAINAGE ARE TRANSFERED TO THE UNDERGROUND FLOOR WHERE ALL THE HORIZONTAL PIPES ARE PLACED WHICH DIVERS THE WASTES TO THE PUBLIC MAIN HOLE.

2) WATER SUPPLY SYSTEMS:

2.1 SOURCE OF DRINKING WATER:

THE SOURCE OF DRINKING FRESH WATER IS CENTRAL CONNECTION OF FRESH WATER SUPPLY FROM THE MAIN PROVIDING PIPES OF THE STREET RIGHT NEXT TO THE BUILDING.

2.2 BUILDING WATER SUPPLY CONNECTION:

WATER SUPPLY CONNECTION WILL BE MADE FROM PIPES.FRESH WATER SUPPLY CONNECTION IS ATTACHED IN THE SITUATION DRAWING.WATER CONNECTION WILL BE CONNECTED TO THE EXISTING WATER SYSTEM NETWORK UNDER PRESSURE.

2.3 WATER METER ASSEMBLY:

THE ASSEMBLY OF WATERMETER WILL BE PLACED IN THE UNDERGROUND FLOOR IN THE TECHNICAL ROOM WHICH WILL ALLOWS REACHABILITY FOR MAINTENANCE AND MEASUREMENTS .

2.4 HORIZONTAL PIPING:

HORIZONTAL PIPES HAS INCLINATION OF 2%. WHILE THESE PIPES ARE MADE FROM PVC.ALL PIPES ARE HIDDEN MAINLY IN THE WALLS AROUND THE BATHROOMS AND KITCHEN.THIS PROCEDURE DOESNT ALLOW THE VISION OF THE PIPES EXCEPT THROUGH SMALL SHAFT DOORS.

2.5 VERTICAL PIPING:

ALL VERTICAL PIPES ARE MADE FROM PVC WHILE THEY ARE PLACED IN THE VERTICAL SHAFTS.HYDRANT‘S SUPPLY PIPE IS PLACED IN THE BEARING WALL.

2.6 OUTLET VALVE

THESE VALVES ARE ANGLE VALVES WHICH ARE MADE FROM CHROME.

2.7 FUNCTIONALITY AND INSTALLATIONS:

THE BOILER ROOM IS LOCATED IN THE UNDERGROUND FLOOR OF THE BUILDING.HEATER TYPE VITOCELL 100-V - VIESMANN 200 L IS PLACED NEXT TO THE BOILER.THE COLD WATER IS CONNECTED TO THE HEATER AND IS TRANSFERED INTO HOT WATER.HOT WATER IS TRANSPORTED THROUGH TWO PIPING SYSTEM HOT WATER SYSTEM AND CIRCULATION WATER SYSTEM.

2.8 FIXTURES AND FITTINGS:

IN THE GARAGE OCCURS 0 OUTLET FITTINGS.EACH FLOOR CONTAINS 8X SINK, 11X CORNER VALVE (TOILET), 1X KITCHEN SINK.

2.9 WATER CONSUMPTION MEASUREMENTS:

THE FUNCTION OF WATER CONSUMPTION IS ORIGINALLY MEASURED IN METER SHAFT, BY USING OF HYDROMETRIC REPORTS WHICH IS SUPPLIED NETWORK ADMINISTRATOR.IT WILL INTERVALS TO READ THE STATUS OF THE METER.

3) CONCLUSION:

HOWEVER WATER SUPPLY CONNECTION AND ACCOMPLISHMENT OF WORK IS ACCORDING TO THE STANDARDS OF THE CZECH REPUBLIC AND THE EUROPEAN UNION.

4) VENTILATION SYSTEM

THE BUILDING IS EQUIPPED WITH AN HVAC SYSTEM WHCH IS RESPONSIBLE OF HEATING,VENTILATING AND COOLING THE BUILDING.THIS SYSTEM IS PLACED ON THE ROOF BUT IS ALSO CONNECTED TO THE BASEMENT THROUGH THE MAIN SHAFT S01.VENTILATION SUCTION UNITS ARE PLACED IN THE UNDERGROUND FLOOR FOR THE REASON OF SUCKING THE WASTE AIR.VENTILATION SYSTEM IN THE GARAGE DEPENDS ON MAIN GARAGE DOOR WHICH ALLOWS A FAIR AMOUNT OF FRESH AIR TO ENTER THE FLOOR.EACH STORE IN THE GARAGE WILL CONTAINS A SUCTION UNIT WHICH WILL ALSO SUCK THE WASTE AIR ENTERED FROM THE MAIN DOOR OF THE STORE.

4.1 CALCULATION OF SUCTION UNIT DIMENSIONS IN THE GARAGE:

WIDTH OF FLOOR 29m
LENGTH OF FLOOR 32m
HEIGHT OF FLOOR 2.85m
VOLUME OF THE FLOOR BY MULTIPLICATION WILL MATCH 2644,8 m^3
SUCTION AIR AMOUNT IS 1322.4 m^3/h = 0.367333 m^3/s
DEPENDING ON SPEED 2m/s =0.183667 m^2
SIZE OF PIPES 0.428563 m X 0.428563 m.

5) EUROCODES

CSN 73 66 60 - INDOOR WATER.
CSN 73 66 55 - CALCULATION OF INTERNAL WATER.
EN 806-3 - INTERNAL DISTRIBUTION OF WATER FOR HUMAN CONS.
H 132 98 - HEATER WATER.

6) LIST OF DRAWINGS

1. UNDERGROUND WASTE WATER
2. UNDERGROUND SUPPLY WATER/DOMESTIC HOT WATER
3. TYPICAL FLOOR WASTE WATER
4. TYPICAL FLOOR SUPLLY SYSTEM
5. UNDERGROUND VENTILATION SYSTEM

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PART 5 :FIRE SAFETY

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1. **FIRE COMPARTMENTS:**

EACH FLOOR IS DEVIDED INTO DIFFERENT AMOUNT OF FIRE COMPARTMENTS (FC).THE BUILDING HAS AN AREA OF 900m^2 WHICH EXCEEDS THE LIMIT OF ADMINISTRATIVE BUILDINGS FOR ONE FIRE COMPARTMENT.

UNDERGROUNDFLOOR: THE FLOOR IS SPLITED INTO SIX FIRE COMPARTMENTS.

1. **A-P01.01/N04-II** STAIRS AND ELEVATOR HALL
2. **P01.02-III** MAIN GARAGE PARKING AREA
3. **P01.03-III** STORES
4. **P01.04-III** STORES
5. **P01.05-III** TECHNICAL ROOM
6. **P01.06-III** UPS ROOM.

GROUND FLOOR: THE FLOOR IS DIVIDED INTO THREE FIRE COMPARTMENTS

1. **A-P01.01/N04-II** STAIRS AND ELEVATOR HALL
2. **N01.13-III** OFFICES
3. **N01.14-III** OFFICES

TYPICAL FLOOR:THE FLOOR IS ALSO DIVIDED INTO THREE FIRE COMPARTMENST

1. **A-P01.01/N04-II** STAIRS AND ELEVATOR HALL
2. **N01.15-III** OFFICES
3. **N01.16-III** OFFICES

FIRE LOAD IS CALCULATED ACCORDING THE FOLLOWING FORMULA:
BUILDING P_V = 45 KG/M^2, III. FRG
PEW P_V = 30KG/M^2, II. FRG
THIRD FIRE COMPARTMENT IS USED FOR THE WHOLE BUILDING EXCEPT THE PROTECTIVE EXCAPE WAY WHICH HAS SECOND FIRE COMPARTMENT.

2. **FIRE RESISTANCE IN WALLS:**

1. PERIMETER WALL, UNDERGROUND LEVEL REW 45 DP1
2. EXTERNAL WALL GROUND FLOOR EI 60 DP1
3. EXTERNAL WALL TYPICAL FLOORS EI 60 DP1

3. **FIRE RESISTANCE IN CEILINGS:**

REINFORCED CONCRETE SLAB WITH A THICKNESS OF 230MM IS CONSTRUCTED IN THE CEILINGS BETWEEN UNDERGROUND FLOOR, GROUND FLOOR AND THE ROOF STRUCTURE.IN THIS CASE AND DEPENDING ON THIRD FIRE COMPARTMENT LEVEL AND CALCULATION.

1. CEILING BETWEEN UNDERGROUND LEVEL AND GROUND LEVEL REI 45 DP1
2. CEILING BETWEEN TYPICAL FLOORS LEVEL REI 45 DP1
3. CEILING BETWEEN LAST FLOOR AND ROOF REI 45 DP1

4. **ESCAPE ROUTES:**

ESCAPE WAYS (EW) ARE DIVIDED TO TWO TYPES: NON-PROTECTIVE ESCAPE WAY(NPEW) AND PROTECTIVE ESCAPE WAY (PEW) ACCORDING TO ČSN 73 0818 – FIRE SAFETY OF BUILDINGS – OCCUPATION OF BUILDINGS

5. **PEW:**

IN THE CENTER OF THE BUILDING EXISTS THE PROTECTIVE ESCAPE WAY WITH AN AREA OF 42M^2.THE MAIN STAIRCASE SYSTEM IS LOCATED IN THE PEW AND IT IS ALSO EQUIPED WITH THE ELEVATOR WHICH IS USED AS AN EVACUATION ELEVATOR ALSO.
PEW HAS THE SECOND FIRE COMPARTMENT LEVEL
P_V = 30KG/M^2, II. FRG
THERE IS A PROTECTIVE ESCAPE WAY (PEW) A-P01.01/N04-II CONNECTION ALL STORIES. THE PEW COMBINES VENTILATION OF FORCED INLET AND NATURAL OUTLET AT HIGHEST POINT.
OPENINGS TO PEW ARE GLASS SLIDING DOORS WHICH DESIGNED DEPENDING ON LIMIT “EI-C-S”. THESE DOORS OPENS AUTOMATICALLY IN CASE OF FIRE AND ARE SMOKE PROOF DOORS. ULTIMATE LENGTH OF PEW = 42,3 M.

6. **NPEW:**

EACH FLOOR HAS ONE LARGE CORRIDOR WITH A WIDTH BETWEEN 1.65m AND 2.0m THAT ALLOWS THE MOVEMENT BETWEEN ALL ROOMS REACHING THE PEW.
THESE CORRIDORS ARE PROVIDED WITH FIRE DETECTORS, EMERGENCY LIGHTS AND FIRE EQUIPMENTS.
LENGTH OF EACH NPEW IN THE BUILDING DOES NOT EXCEED THE LIMIT OF 35M.

7. NUMBER OF EVACUATION PERSON:

	ADMINISTRATIVE BUILDING	
	AREA [M^2]	N0. OF EVACUATED PEOPLE
UL	18(PARKING) X0.5	9
GF	940	68
1	940	72
2	940	72
3	940	72
Σ E		**293 PERSONS**

8. STAIRCASE:

IN THE CENTER OF THE BUILDING EXISTS THE PROTECTIVE ESCAPE WAY WITH AN AREA OF 42M^2.THE MAIN STAIRCASE SYSTEM IS LOCATED IN THE PEW.THE STAIRCASE HAS A WIDTH OF STEP 1200MM AND LENGTH OF FLIGHT 3100MM.
1200 > 1100MM (MINIMUM WIDTH).
FIRE EMERGENCY LIGHTNINGS AND DETECTORS ARE PROVIDED ALSO AT THE STAIRCASE AND HALLS.

9. FIRE EQUIPMENTS:

EACH FLOOR IS PROVIDED WITH FIRE EQUIPMENTS THAT RESPECTS THE TYPE AND USAGE OF THE FLOOR.

1. PARKING IS EQUIPPED WITH HYDRANT 20M + 10M STREAM AND FIRE ESTINGUISHER 183B FOR THE REASON OF CAR EXISTANCE.
2. ALL THE REMAIN FLOORS ARE ALSO EQUIPPED WITH HYDRANT 20M + 10M STREAM AND FIRE ESTINGUISHER 21A.
3. AS MENTIONED BEFORE ALL THE BUILDING SPACES SUCH AS STAIRS, CORRDIDORS, PARKING AND STORES ARE EQUIPPED WITH FIRE DETECTORS AND EMERGENCY LIGHTNINGS.

10. SUPLLY OF WATER:

THE MAIN WATER PIPELINE DN 150 IS CONNECTED TO THE HYDRANTS IN EACH FLOOR.AN OUTER ACCESS AREA FOR FIRE-FIGHTING CARS WITH A DIMENSION OF 4X10M^2 AND HYDRANT IS LOCATED NEXT TO THE MAIN ROAD.

11. LIST OF DOCUMENTS, CSN:

ČSN 730804FIRE SAFETY CONSTRUCTION: PRODUCTION OBJECTS - ANNEX I, GARAGES
ČSN 730818 FIRE SAFETY OF BUILDINGS: OBJECT OCCUPATION BY PERSONS
ČSN 730821 FIRE SAFETY OF BUILDINGS: FIRE RESISTANCE OF BUILDING STRUCTURES
ČSN 730833 FIRE SAFETY OF BUILDINGS: HOUSING AND ACCOMMODATION BUILDINGS
ČSN 730872 FIRE SAFETY OF BUILDINGS: PROTECTION OF FIRE EXTINGUISHING STRUCTURES

ACKNOWLEDGEMENTS

I WOULD LIKE TO EXPRESS MY SPECIAL APPRECIATION AND THANKS TO MY ADVISOR PROFESSOR ING.MALILA NOORI, PHD, YOU HAVE BEEN A TREMENDOUS MENTOR FOR ME. I WOULD LIKE TO THANK YOU

FOR ENCOURAGING MY THESIS AND FOR ALLOWING ME TO GROW AS A BACHELOR. YOUR ADVICE ON THESIS STUDY AS WELL AS ON MY CAREER HAVE BEEN INVALUABLE.

I WOULD ALSO LIKE TO THANK MY CONSULTANTS, DOC.ING IVA BROUKALOVA, ING.JAN SALAK, CSC, AND ING, PAVLA DVORAKOVA ,PHD,. I ALSO WANT TO THANK YOU FOR LETTING MY DEFENSE BE AN ENJOYABLE MOMENT, AND FOR YOUR BRILLIANT COMMENTS AND SUGGESTIONS, THANKS TO YOU.

I WOULD ESPECIALLY LIKE TO THANK THE CZECH TECHNICAL UNIVERSITY IN PRAGUE CZECH REPUBLIC FOR THE PRECIOUS FOUR YEARS OF STUDY AND THE HONOR OF BEING ONE OF THE STUDENTS IN THIS GREAT EDUCATIONAL INSTITUTE.