UNIVERSITAT POLITÈCNICA DE VALÈNCIA

Bachelor Final Project

Study and Constructive Analysis of Deinze's New City Hall

STRABAG

Autor:
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Academic tutor at UPV:
María José Vidal Lucas

Academic tutor at Odisee:
David Peters

2015

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PERSONAL INTRODUCTION

Hello, my name is Luis Latorre Zaplana, I'm 23 years old, I live in Puerto de Sagunto (Valencia) and I'm student of the last course in Degree in Technical Architecture at the "Universitat Politècnica de València"(UPV) .

I decided to study technical architecture because since my childhood I've been influenced by my parents who are both technical architects and are currently in the profession. I had access to many working places with my father at an early age and that's what sparked my interest in building.

I'm currently in Belgium enjoying an Erasmus scholarship of 5 months (from early February to late June) for my FP and various subjects but while I'm taking the opportunity to improve my English and I have obtained a certificate of Dutch (basic level).

While performing my FP, I realized how different the construction of Belgium regarding Spain. The great importance given to thermal insulation of buildings, greater use of precast concrete or building of no more than 3 floors are some of the main differences I have observed.

Thanks to the aid of Mr.David Peters (my Odisee tutor) and Mr.Filip Vertongen and Mr.Mario Bourgois (project leader and construction leader of the construction from the company Strabag) with numerous corrections and explanations, I have been able to understand 100% the execution and organization of the building and to develop my FP successfully.

To sum up, I advise all students of technical architecture of the UPV to perform their TFG here because the construction is booming right now in Belgium and we have much to learn from them.

INTRODUCTION TO PROJECT

As for my TFG, which is discussed below, is the study and constructive analysis of the new city hall of the town of Deinze. The work involves (as seen in the index) in developing a organization plan of the work, the preparation of a general section, the development of construction details of the building, a technical study *step by step* of a concrete subject of the building, a comparative study of two different types of construction, scheduling tasks represented in a Gantt chart, bibliography and photos.

The city hall of Deinze, is a set of two buildings, a larger main building which is the town hall, a community building and a service center (included the services of OCMW) and a smaller building with a board room and wedding room for the community.

Architecturally, the main building has a rectangular ground and section and it's a 5-storey building and 1 basement common to both buildings, two modules ladder, one with 2 elevators and the other with one, a corridor connecting the two buildings by ground and first floors and installation cabins in the fifth floor. It has several entrances through the basement and the ground floor but the main entrance is in the small building. The facade is modular on the pillars and glazing.

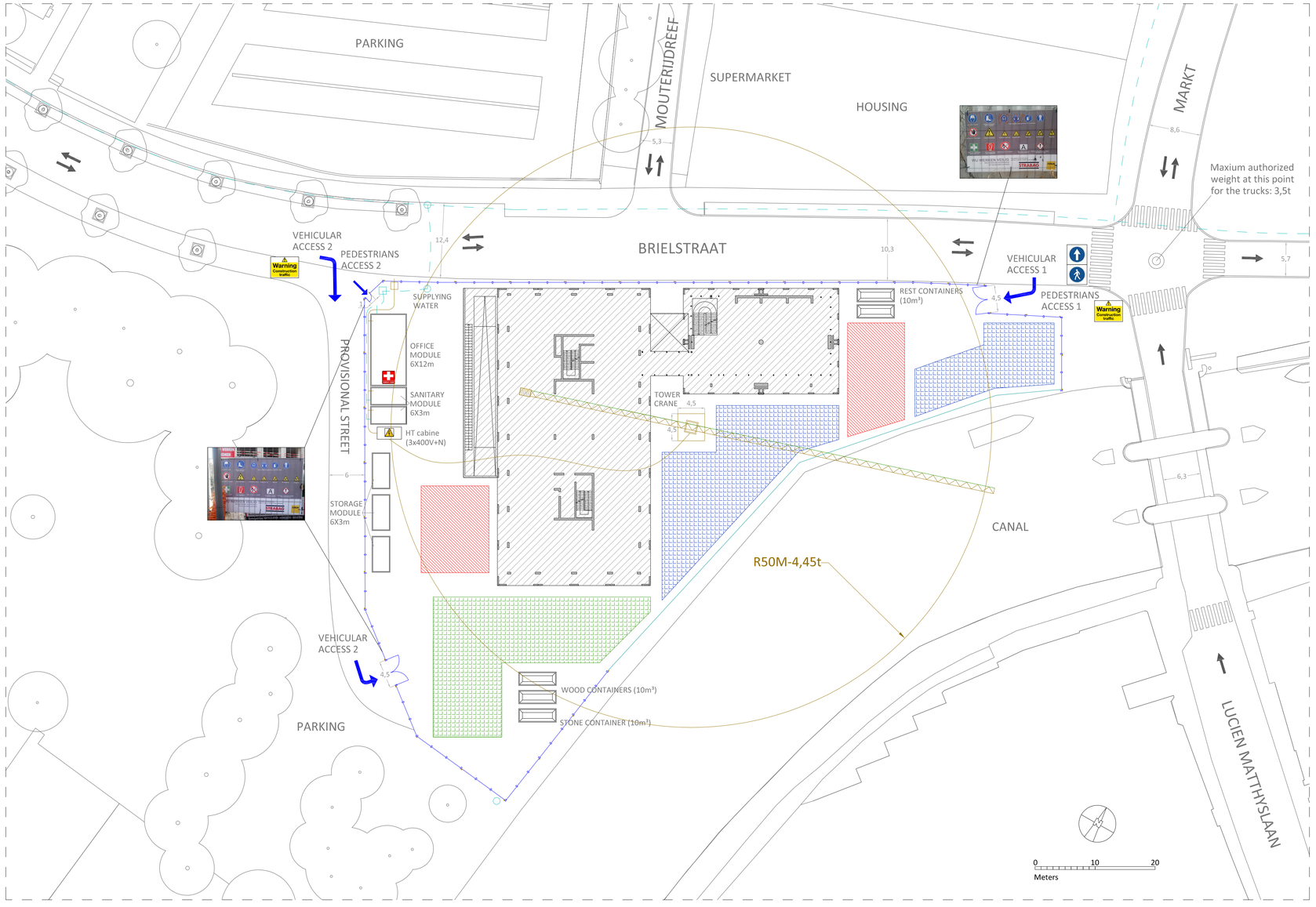
Constructively, the main building consists of foundation slab and concrete piles, perimeter containment walls of *mixed soil* and concrete walls in the basement, brickwork and concrete block partitions, *in situ* and precast concrete columns and beams, composite slabs, precast concrete platforms and prefabricated concrete walls filled with liquid concrete, PUR and PIR as the main insulation, floor and ceiling technical, prefabricated stairs, glass facade with aluminium carpentry and natural stone facing, flat and accessible roof.

Architecturally, the small building has a rectangular ground and section and it's a 2-storey building and 1 basement common to both buildings, and a module ground floor staircase to first. It has two main entrances with revolving door. The facade is modular on the pillars and glazing.

Constructively, the small building consists of foundation slab and concrete piles, perimeter containment walls of *mixed soil* and concrete walls in the basement, brickwork and concrete block partitions , *in situ* and precast concrete columns and beams, composite slabs, precast concrete platforms, metal containment structure housing, PUR and PIR as the main insulation, floor and ceiling technical, prefabricated stairs, glass facade with aluminium carpentry natural stone facing, flat and vegetal roof.

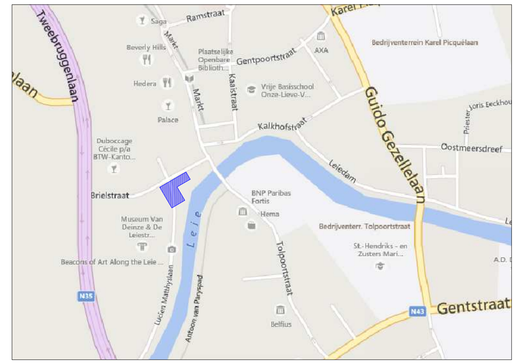
PART 1. ORGANISATION OF THE BUILDING SITE

ORGANISATION OF THE BUILDING SITE

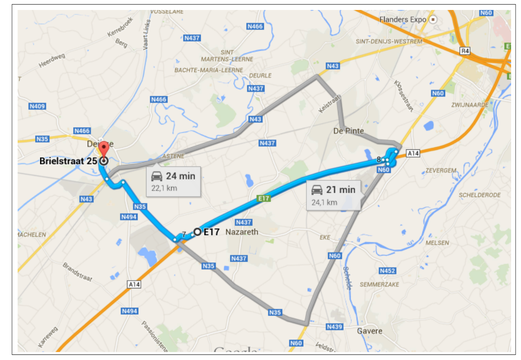


1/400

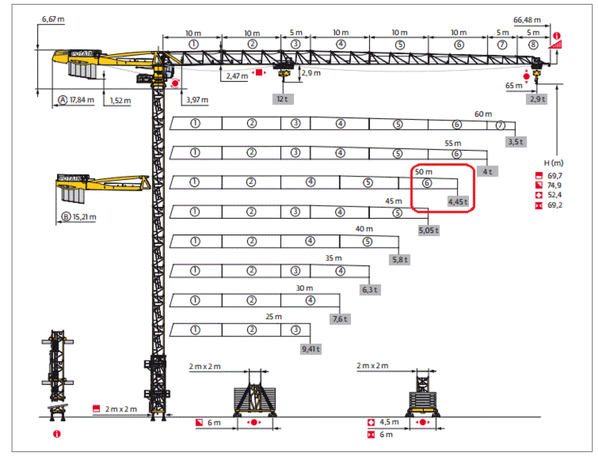
MAP OF THE LOCATION



ACCES FROM E-17



DATA SHEET OF THE CRANE TOWER



LEGEND

- BUILDING EMPLACEMENT
- LOADING ZONE
- STORAGE (steel and precasts)
- STORAGE (rest)
- ELECTRIC METER
- WATER METER
- WATER SUPPLYING POINTS
- LIGHT BEACON (each 10m, entrances and corners)
- ELECTRICAL INSTALLATION
- WATER INSTALLATION
- FENCED (2m)
- FENCED (1m)

USEFUL TELEPHONE NUMBERS

- European SOS: 112
- Deinze hospital Sint-Vincentiusziekenhuis (Schutterijstraat 34): 09/387 71 11
- Deinze fire department (Stadionlaan 24): 09/381 81 11
- Deinze police station (Stadionlaan 22): 09/381 41 00

SIGNALING OF THE CONSTRUCTION SITE

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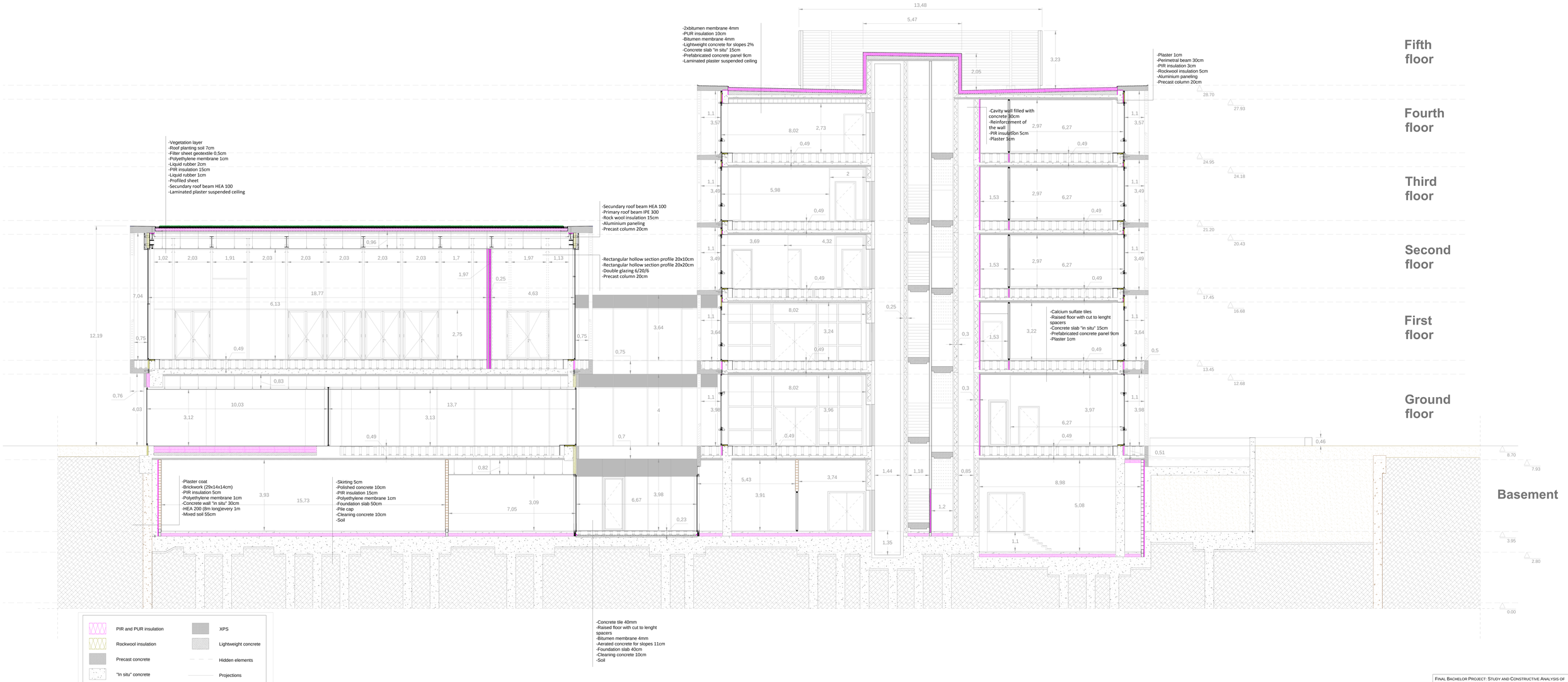
DRAWING: ORGANISATION OF THE BUILDING SITE	
STUDENT: LUIS LATORRE ZAPLANA	SCALE: 1/400
PLANE No. 1	DATE: 17/06/2015

PART 2. GENERAL SECTION OF THE BUILDING (1:50)



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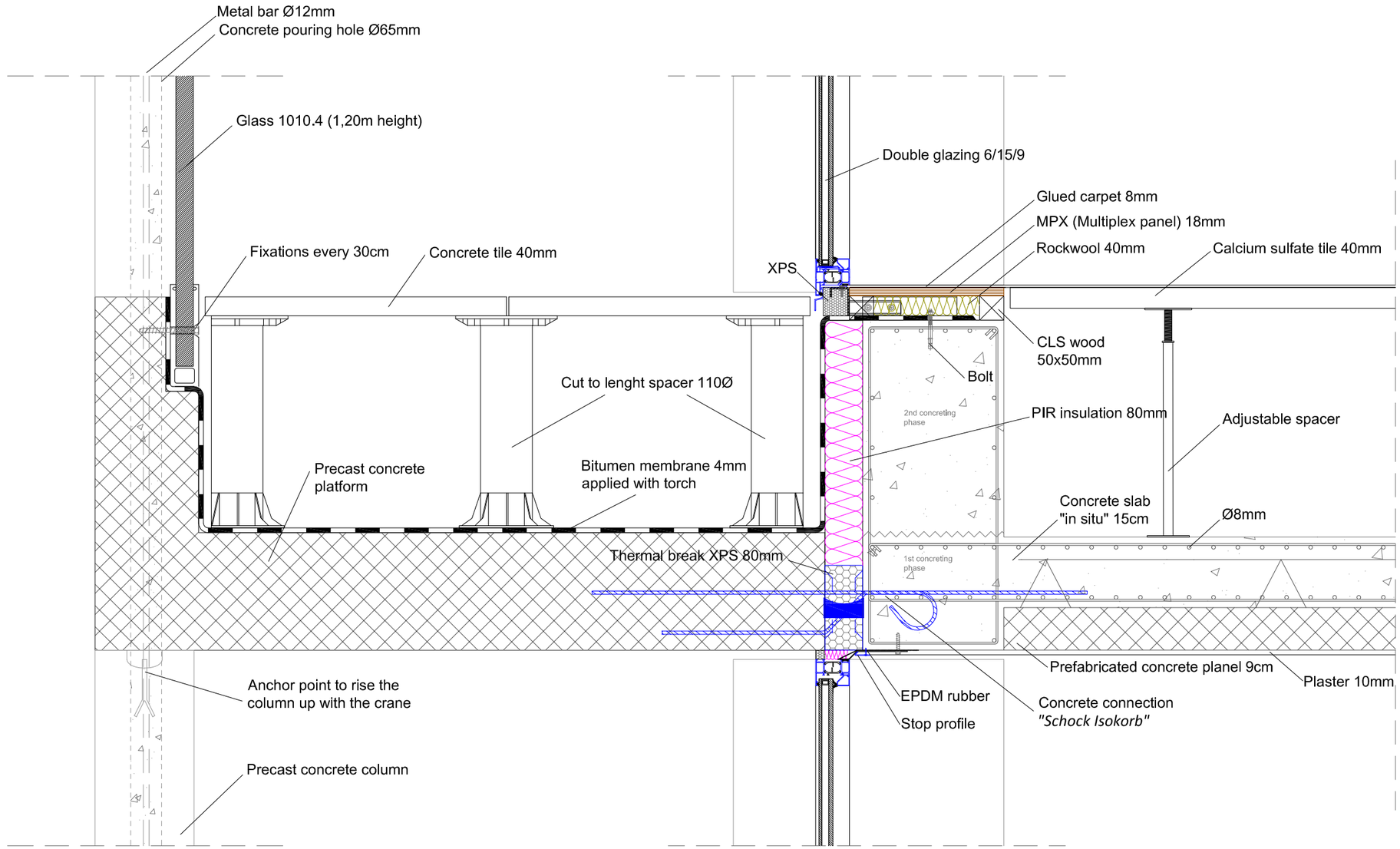
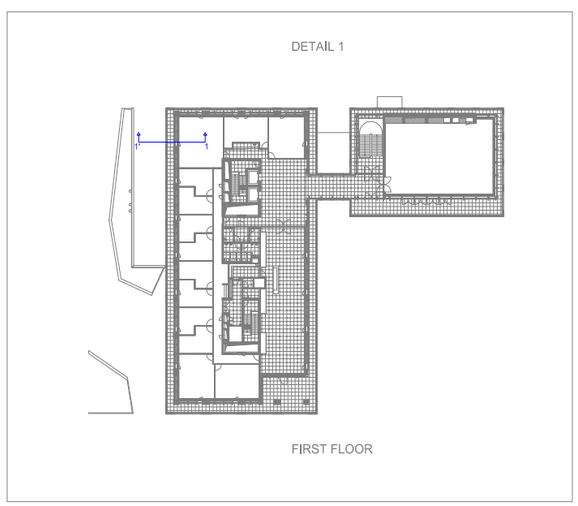
DRAWING: General section of the building	
STUDENT: LUIS LATORRE ZAPLANA	SCALE: 1/50
PLANE No. 2	DATE: 17/06/2015

PART 3. DETAILS (1:10)





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DRAWING: Detail 1	
STUDENT: LUIS LATORRE ZAPLANA	SCALE: 1/10
PLANE No. 3	DATE: 17/06/2015

-Skirting 5cm
-Polished concrete 10cm
-PIR insulation 15cm
-Polyethylene membrane 1cm
-Foundation slab 50cm
-Cleaning concrete 10cm
-Soil

DPC (damp proof course)

2xconcrete block
(39x14x14cm)

Aluminium profile

2nd concreting
phase

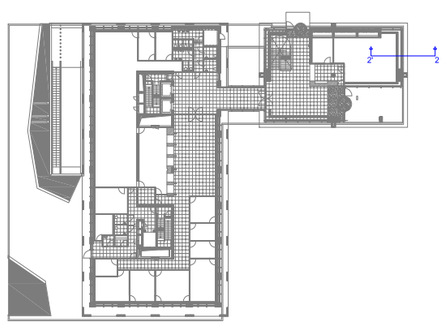
-Plaster coat
-Brickwork (29x14x14cm)
-PIR insulation 5cm
-Polyethylene membrane 1cm
-Concrete wall "in situ" 30cm
-HEA 200 (8m long)every 1m
-Mixed soil 55cm

1st concreting phase

Stremaform
plate

Concrete spacer

DETAIL 2



GROUND FLOOR

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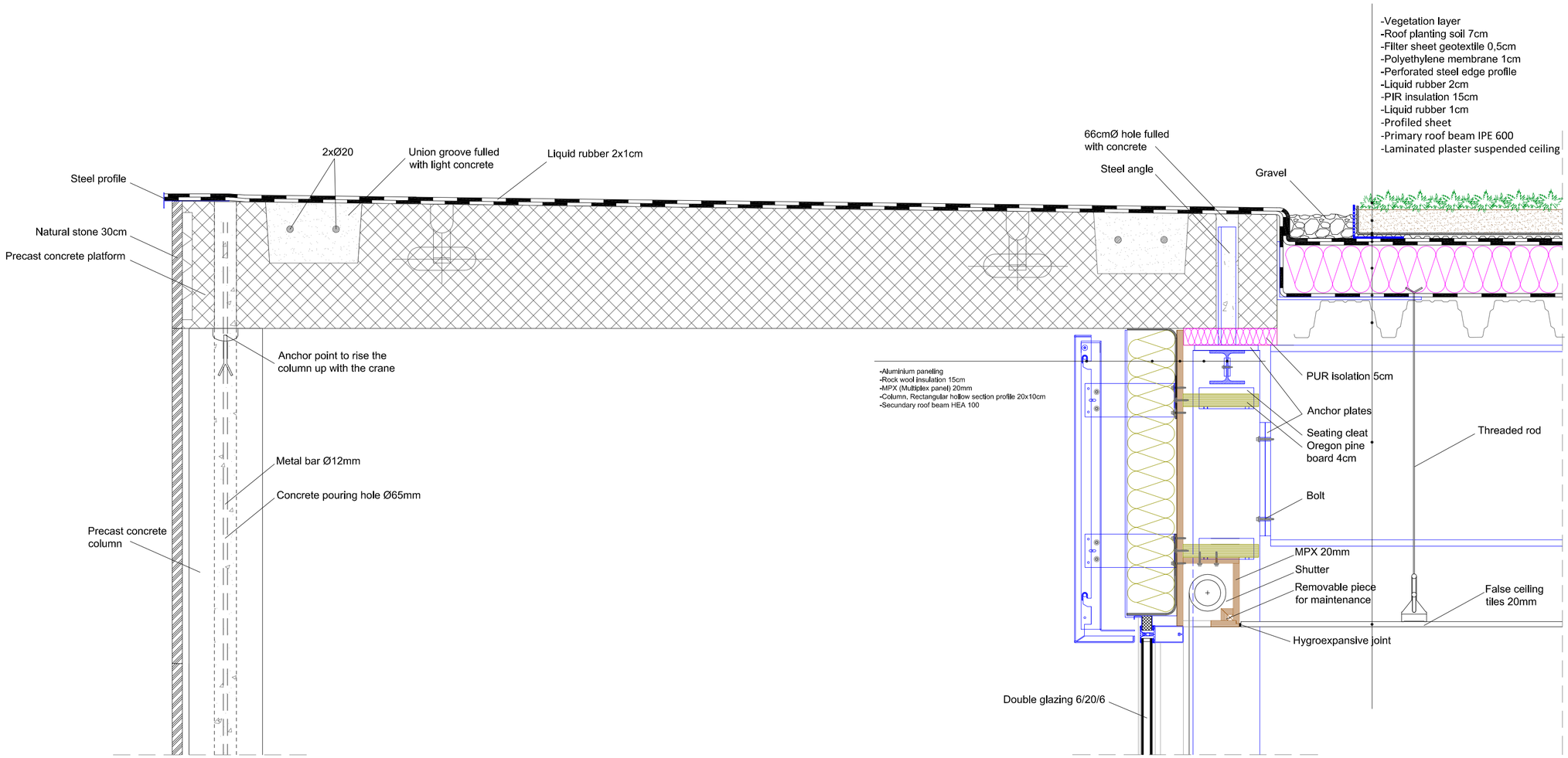
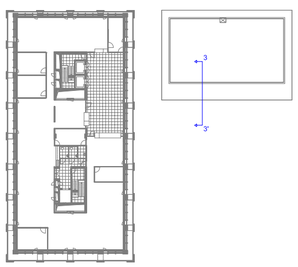
DRAWING: Detail 2	
STUDENT: LUIS LATORRE ZAPLANA	SCALE: 1/10
PLANE No. 4	DATE: 17/06/2015



DETAIL 3



THIRD FLOOR

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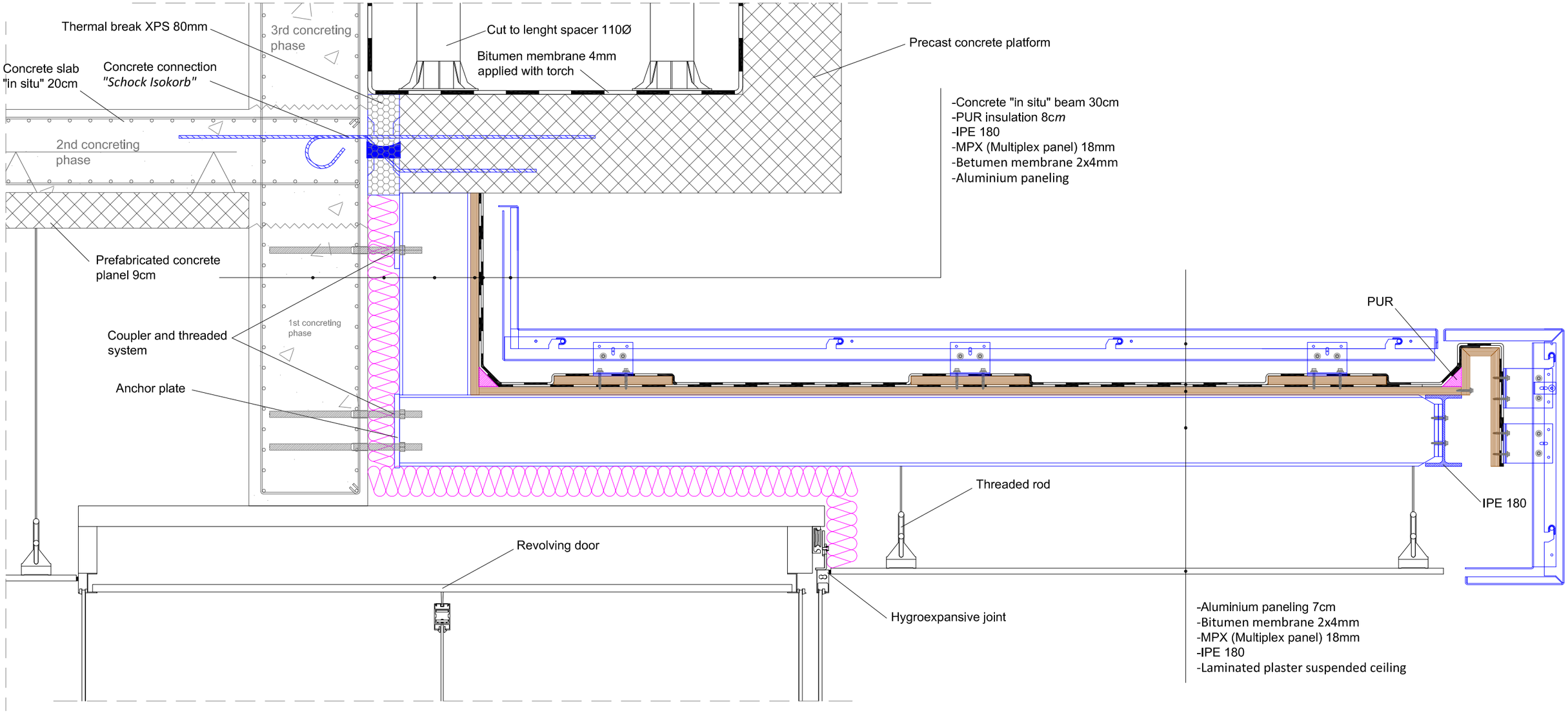
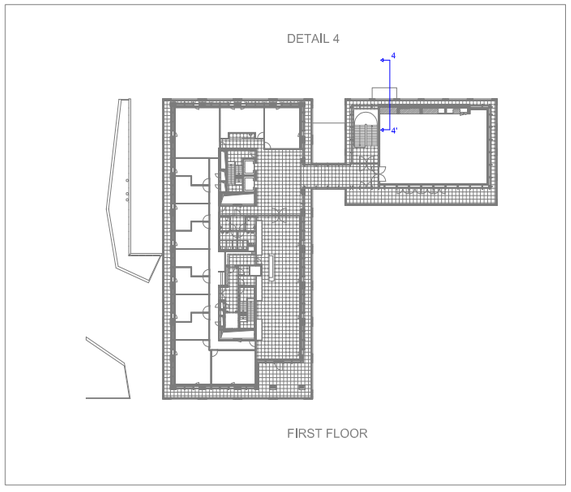
DRAWING: Detail 3	
STUDENT: LUIS LATORRE ZAPLANA	SCALE: 1/10
PLANE No. 5	DATE: 17/06/2015





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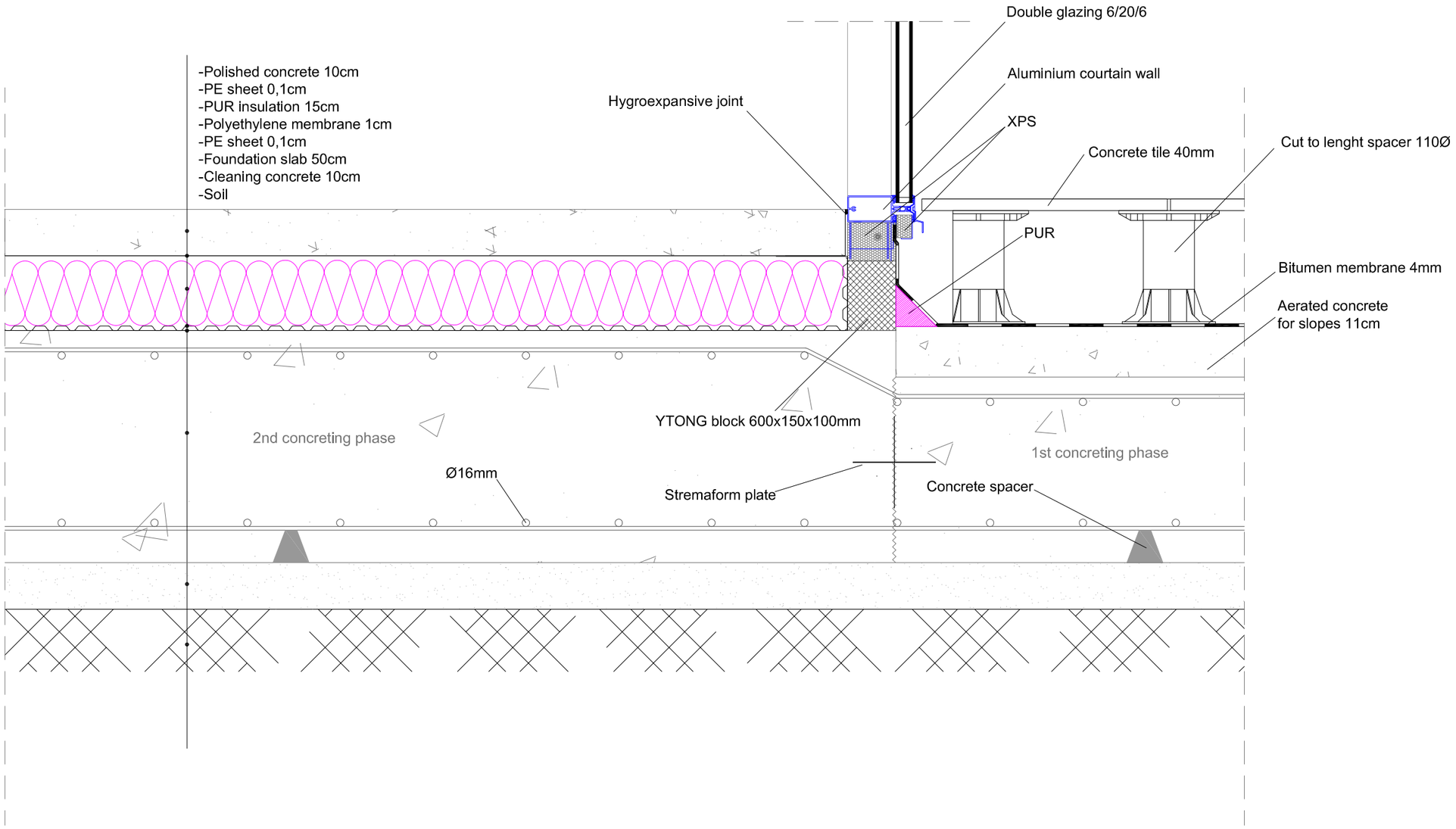
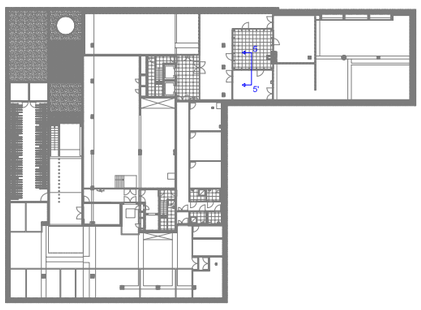
DRAWING: Detail 4

STUDENT: LUIS LATORRE ZAPLANA	SCALE: 1/10
PLANE No. 6	DATE: 17/06/2015



DETAIL 5



BASEMENT

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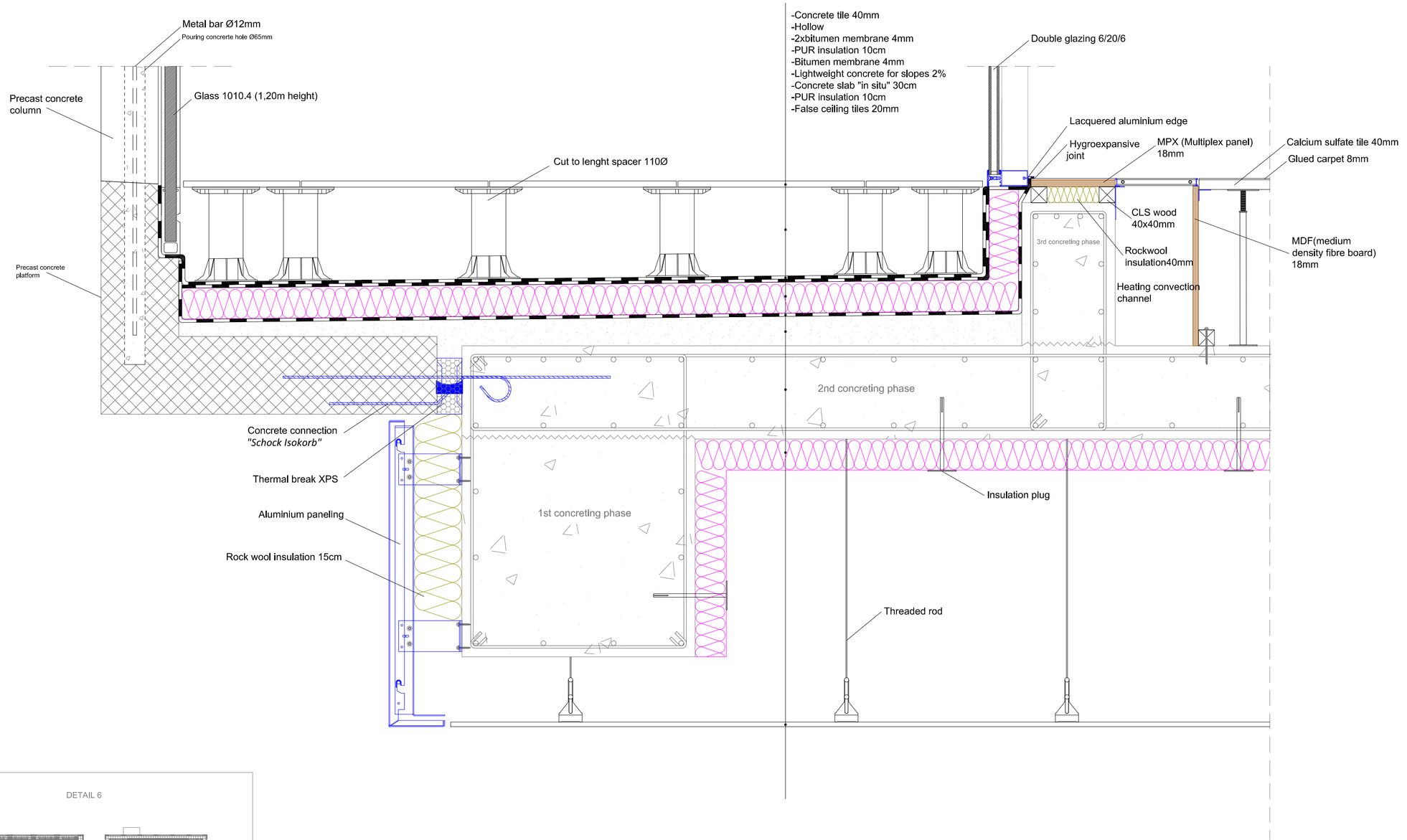
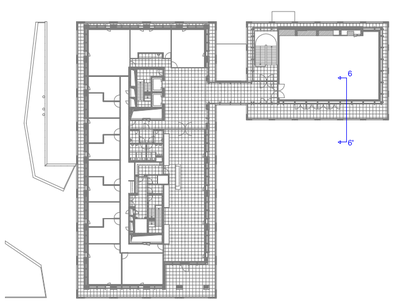
DRAWING: Detail 5	
STUDENT: LUIS LATORRE ZAPLANA	SCALE: 1/10
PLANE No.7	DATE: 17/06/2015



DETAIL 6



FIRST FLOOR

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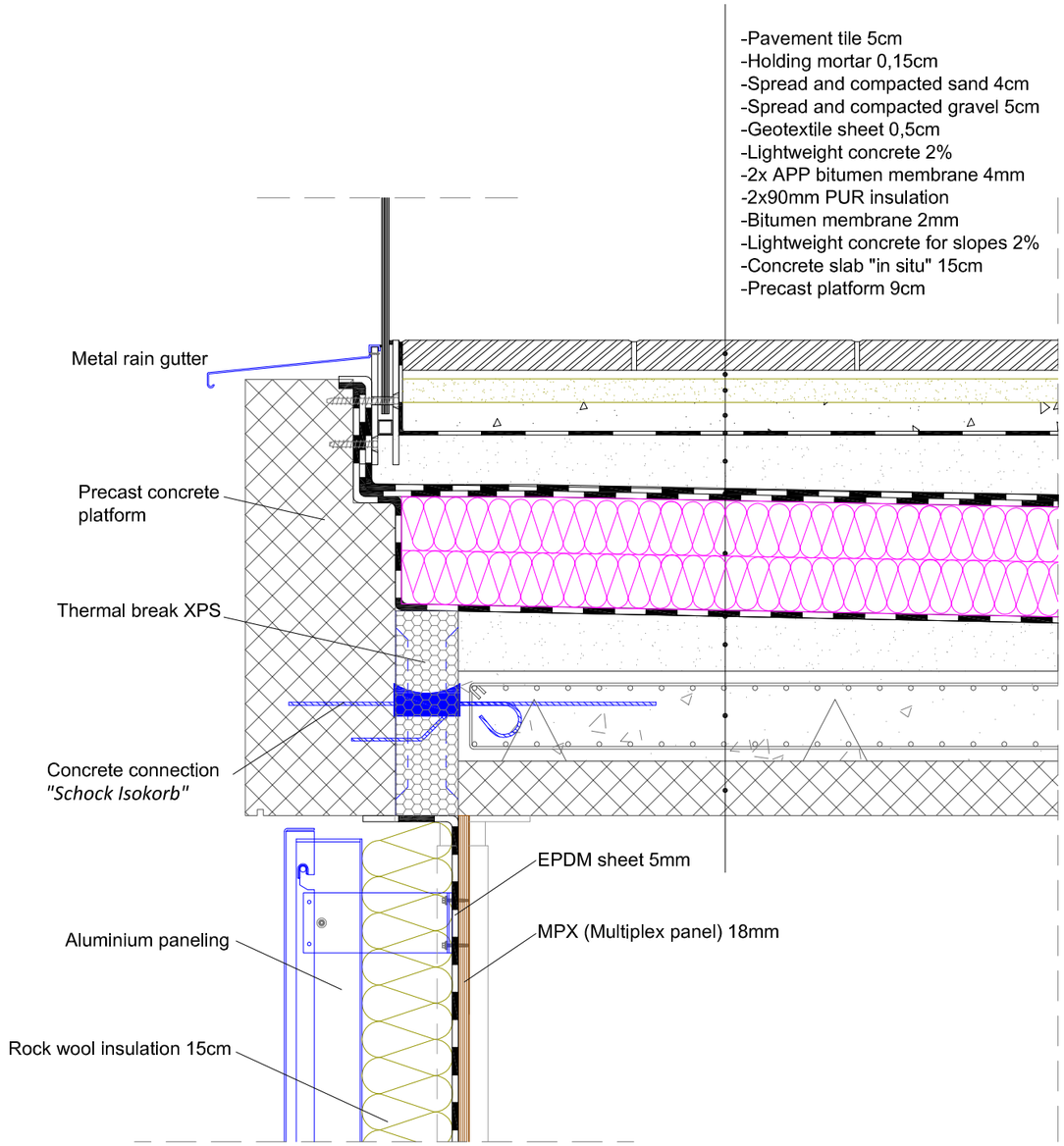
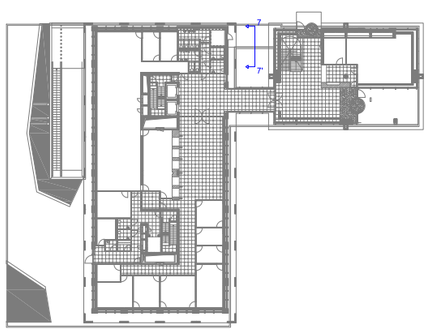
DRAWING: Detail 6	
STUDENT: LUIS LATORRE ZAPLANA	SCALE: 1/10
PLANE No. 8	DATE: 17/06/2015



DETAIL 7



GROUND FLOOR

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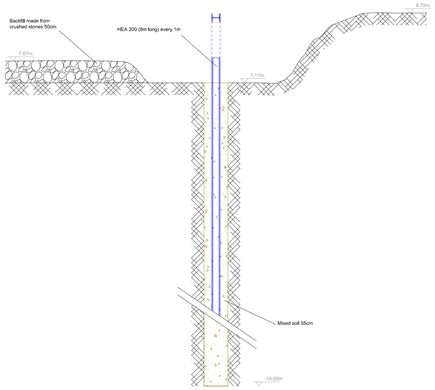
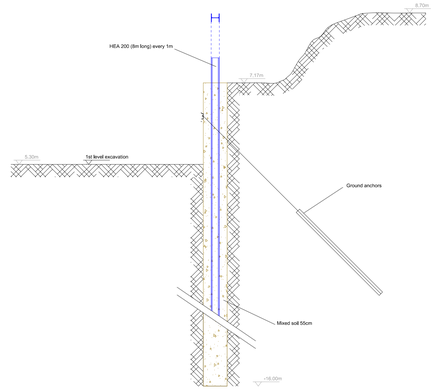
DRAWING: Detail 7	
STUDENT: LUIS LATORRE ZAPLANA	SCALE: 1/10
PLANE No. 9	DATE: 17/06/2015

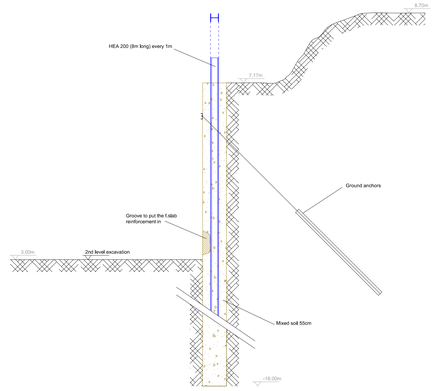
PART 4. TECHNICAL STUDY



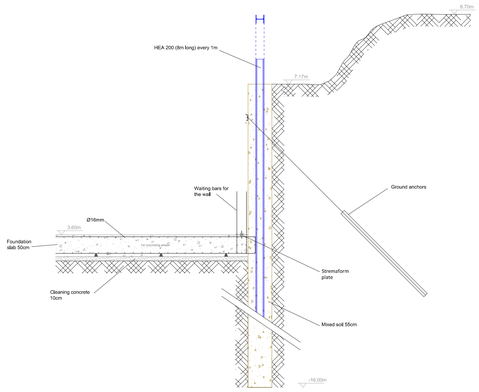
1) Firstly, the entire space of the plot is backfilled with crushed stones to a height of 50cm so that the machines can move, as the soil cannot bear much weight. With the aid of a backhoe a deep trench is executed (23m deep and 0,55m wide), adding liquid concrete at the same time, and it's mixed with the soil. That's called mixed soil. Before the concrete hardens, with the help of the tower crane, eight meters long steel profiles (HEA 200) are introduced every single meter as a reinforcement to the mixed soil wall and they serve as union of the set.



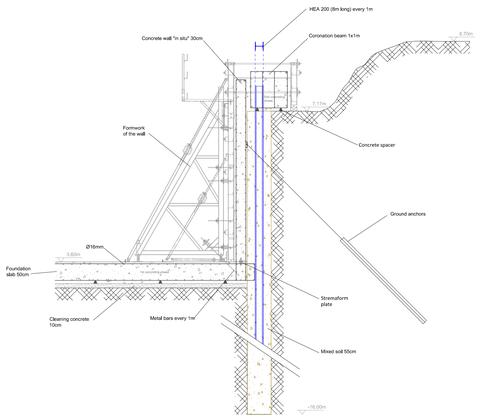
2) Secondly, when the concrete has already hardened and with the aid of a regular backhoe, it's made a first excavation of approximately 2m deep. Then, a hydraulic **drilling** makes separated holes at 45 degrees and insert **steel bars** or **ground anchors** inside them, in order to hold the mixed soil wall when the excavation goes on.



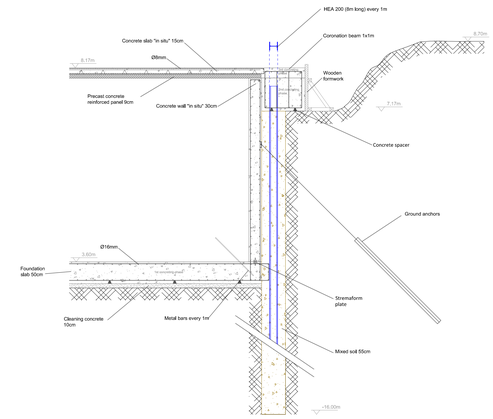
3) After that, a second 2m deep excavation is made reaching the level +3'00 according to the **implementation project**. A longitudinal **groove** is made at the lower part of the M.S. wall that keeps visible, to introduce the future reinforcement in.



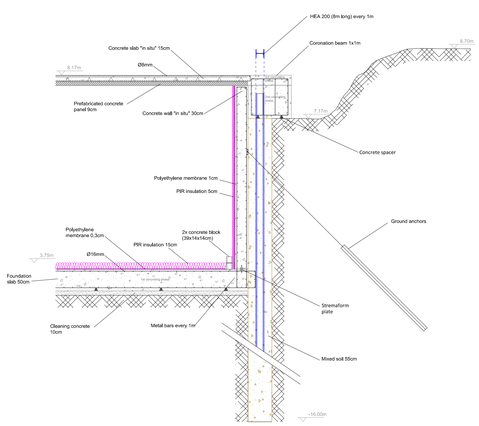
4) Coming up next, a 50cm deep **foundation slab** is made, placing on the future joint with the inside wall a metallic element (*Plaka Nederland*) to prevent water from passing into the building.



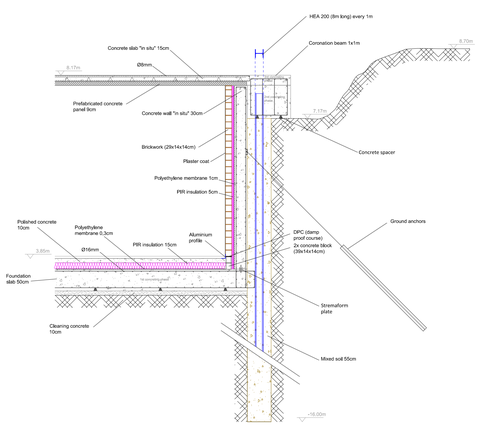
5) Once the foundation slab is done, the next step is the formworking, reinforcement and concrete **pouring** of the inside wall (30cm) and the **coronation beam** which is located above it. During the **assembly** of the **formwork**, several steel bars are inserted into the hard concrete to hold the formwork when the pouring of the concrete is being carried out.



6) After the inside wall and the mixed soil wall are made, it starts the execution of the first slab of the building which is made from 9cm **precast concrete panels** supported by the inside wall and a 15cm layer of **"*in situ*" concrete** laid over the panels. To execute the 1st slab, the concrete is poured so that the coronation beam is completely filled, and the slab as well.



7 & 8) To **isolate** internally the building there's one step left: the addition of the **insulating** elements. A **polyethylene membrane** and **PIR insulation panels** (*IKO Enetherm*) are placed both vertically and horizontally. Besides, two rows of **concrete blocks** are placed as a base for a **brickwork**, and in the joint between them there is dpc (**damp proof course**) to prevent intrusion of **soil moisture**. The floor is ended with a layer of **polished concrete** and with an aluminium **skirting**.



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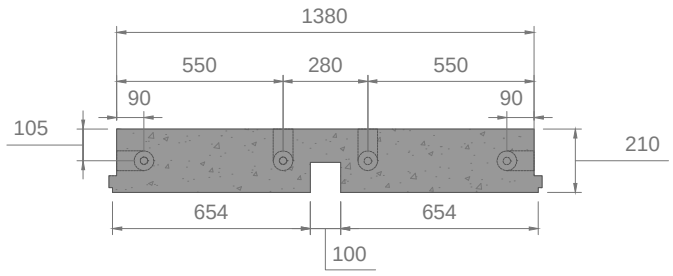
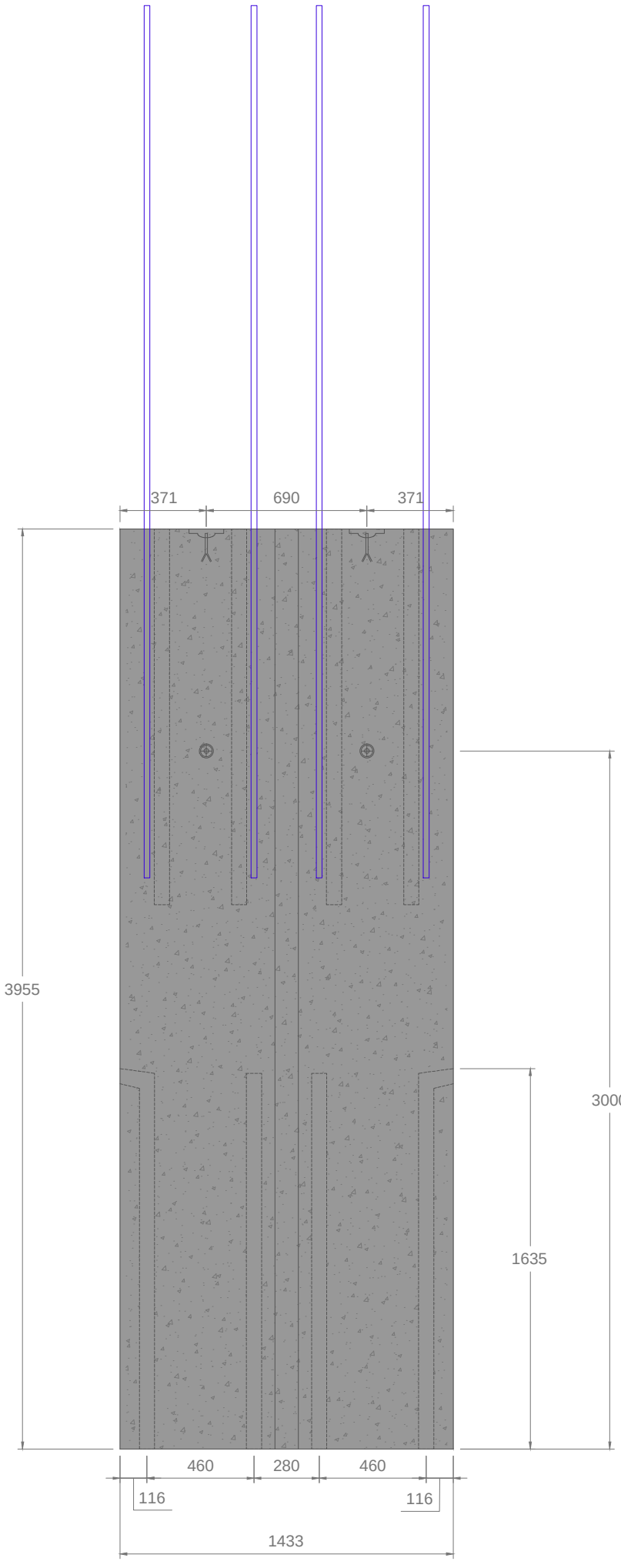
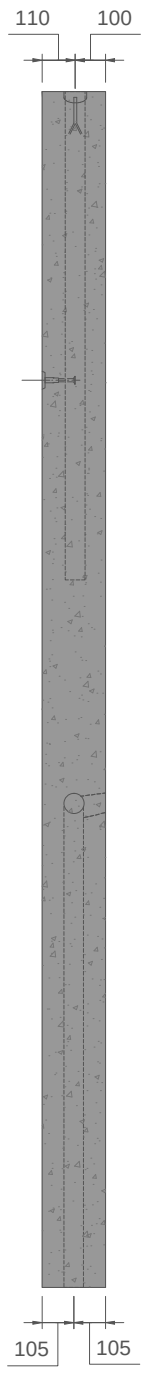
DRAWING: Step by step - Retaining walls

STUDENT: LUIS LATORRE ZAPLANA	SCALE: 1/50
PLANE No. 10	DATE: 17/06/2015

PART 5. COMPARATIVE STUDY







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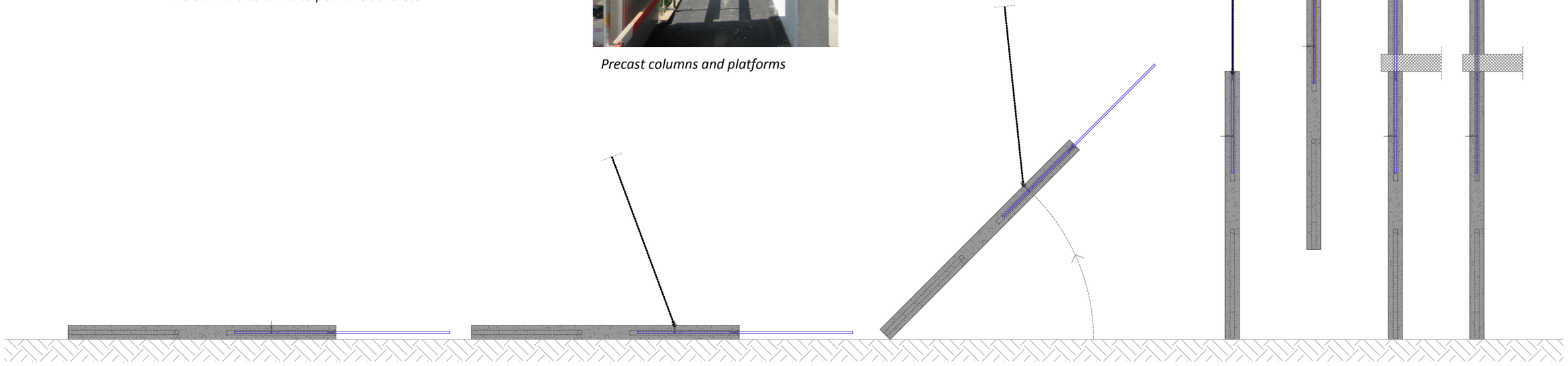
DRAWING: Precast column	
STUDENT: LUIS LATORRE ZAPLANA	SCALE: 1/25
PLANE No. 11	DATE: 17/06/2015

Holes in the columns to pour the concrete

Precast columns and platforms



1) Firstly, the precast column is laied on the ground.

2) Then, a worker attaches a double leg sling from the tower crane to a front groove of the precast column.

2) The operator of the tower crane starts incorporating the column,following the instructions of the operator. This step is necessari because the column wouldn't be able to hold its own weight if it were lifted up for the top and it'd split in the middle part.

3,4,5,6) When the column has been incorporated, the operator attaches the double leg sling to the other groove on the top and the crane operator place the column above a precast element. Every column has four waiting bars on the top to be nailed with the precast platform and the colum of the next floor. When the column is placed, with the aid of a concrete pump, the operator pours liquid concrete in the holes where the bars have been nailed and here's how column-platform-column get fixed together.

Waiting bars

Double leg sling

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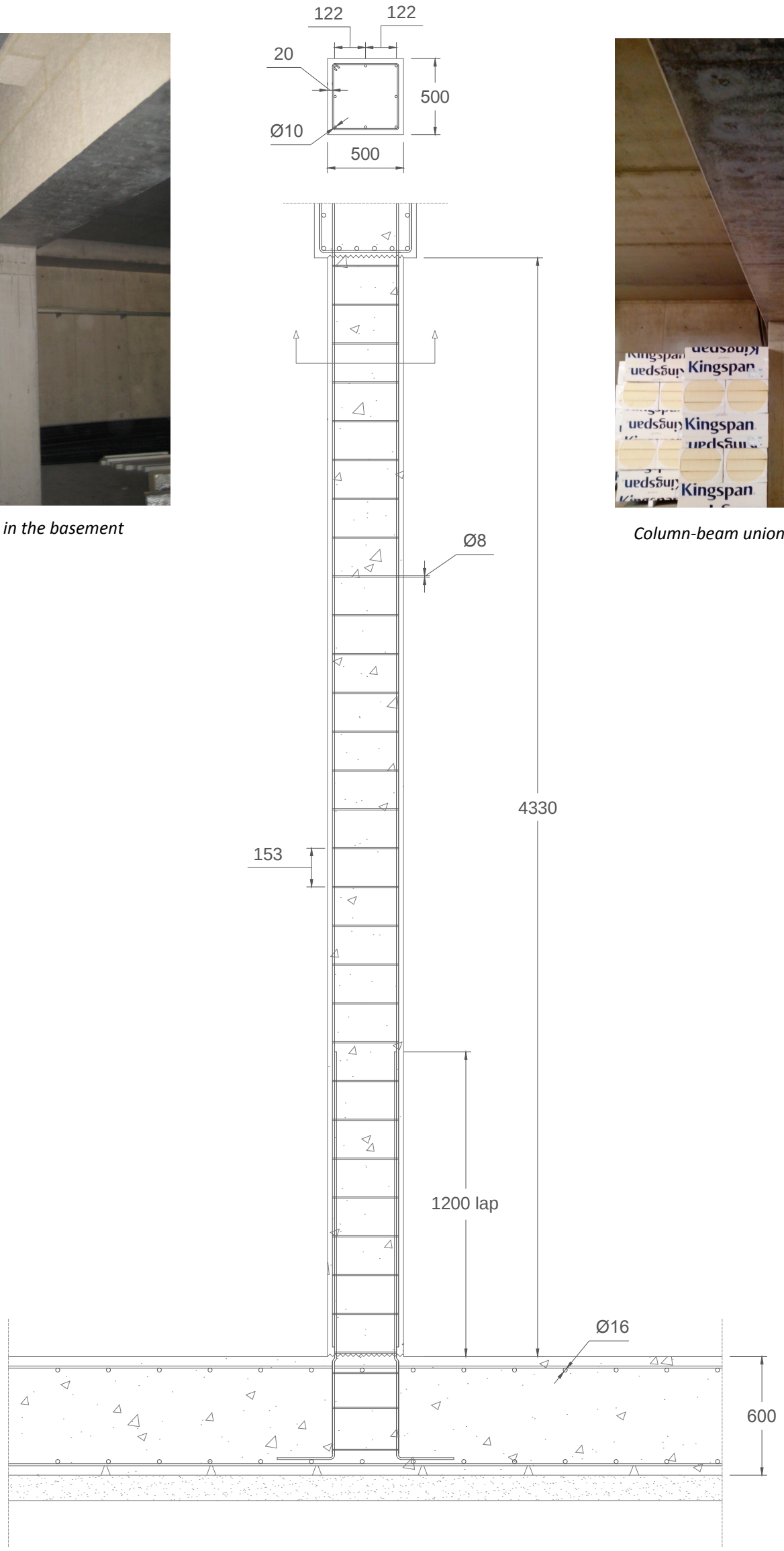
DRAWING: Implementation of a precast column	
STUDENT: LUIS LATORRE ZAPLANA	SCALE: 1/60
PLANE No. 12	DATE: 17/06/2015

n situ concrete column in the basement



Column-beam union

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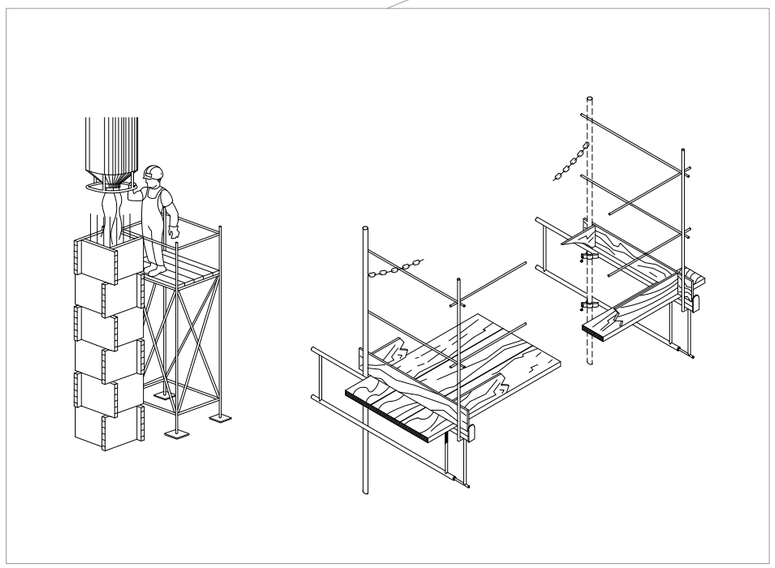
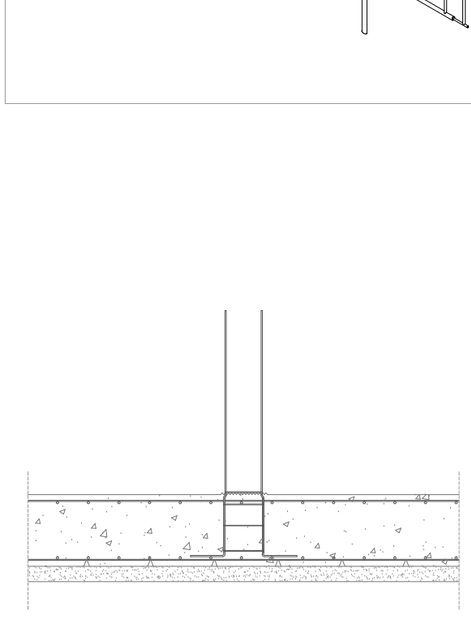
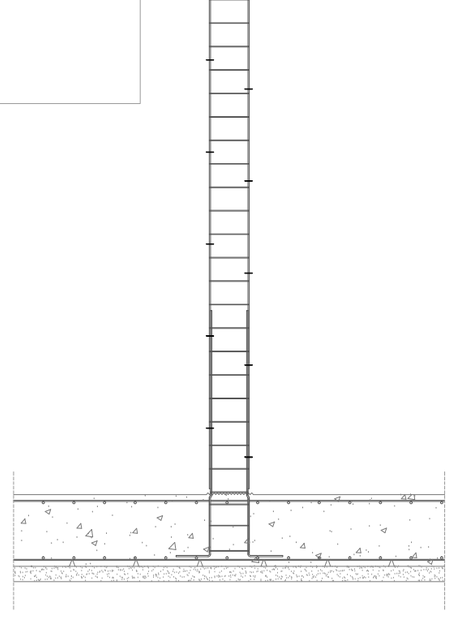
DRAWING: "In situ" concrete column	
STUDENT: LUIS LATORRE ZAPLANA	SCALE: 1/20
PLANE No. 13	DATE: 17/06/2015

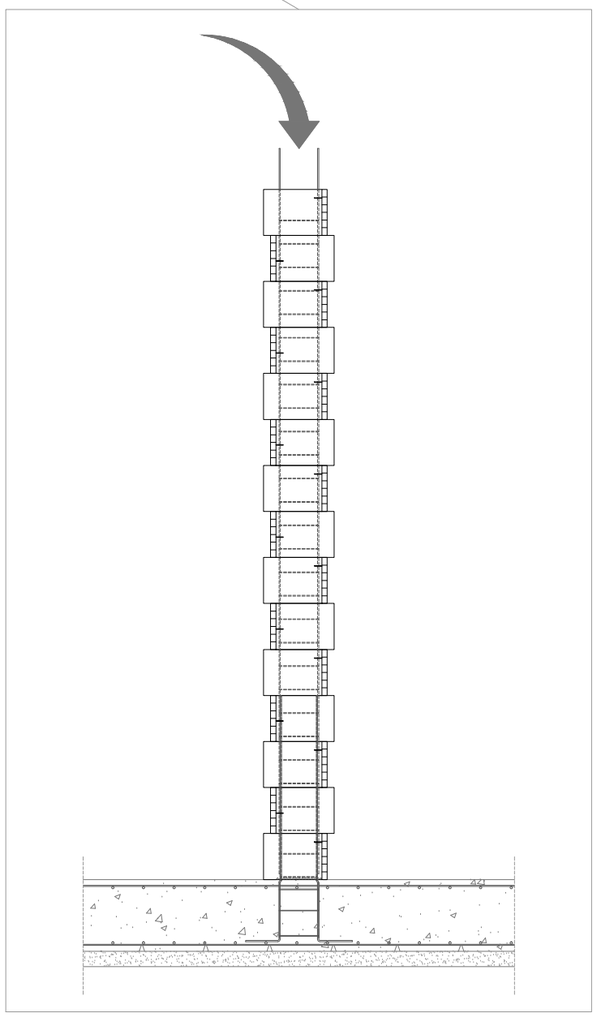




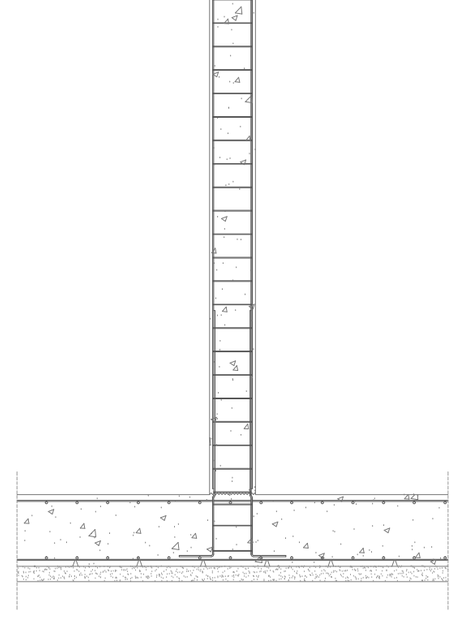
1) When the workers execute the foundation slab, they put four waiting bars for the future column.



2) Once the slab has hardened the steelfixers place the reinforcement of the column and fix it to the wainting bars.
After that, the workers put some rings pacers before assembling the formwork.



3) Then, with the aid of a scaffolding,the workers assemble the whole formwork of the column.
Coming up next, one of the workers pours the concrete with a concrete pump from the top of the scaffold and vibrates it to avoid segregation.



4) Finally, they remove the formwork from top to bottom and after that the scaffold.
The bars of the column will be showed on the top to fix the column to a future concrete beam.

FINAL BACHELOR PROJECT: STUDY AND CONSTRUCTIVE ANALYSIS OF DEINZE'S NEW CITY HALL

odgee UNIVERSITAT POLITÈCNICA DE VALÈNCIA

ESCUELA TÉCNICA SUPERIOR INGENIERÍA DE EDIFICACIÓN

STRABAG

DRAWING: Implementation of a "in situ" column	
STUDENT: LUIS LATORRE ZAPLANA	SCALE: 1/40
PLANE No. 14	DATE: 17/06/2015

	"In situ" column		Precast column	
Material and equipment	Material: -Structural concrete -Metal bars -Spacers -Wire	Equipment: -Tower crane -Truck mixer -Vibrator -Formwork -Scaffold -Concrete pump -Plumb -Pliers -Hose (curing) -Slings	Material: -Precast column	Equipment: -Tower crane -Concrete pump -Slings
Pricing (1 column)				
Pros & Cons	Pros: -Rigidity of the system -Joints better solved -Adaptation to more complex forms -Great structural strength	Cons: -Necessary formwork -It depend on weather conditions -Large amount of waste generated -Timeout during setting and curing	Pros: -Construction industrialized -Geometric accuracy -Good quality tested and steady -Reductions in deadlines -Not necessary formworks -Great structural strength -Reduction of spenses for hours/man -No depend on weather conditions -Fairly accurate cost control -More ecological (minimize waste, energy...) -Possibility of delivery in 24h -Unskilled labour to be an assembly line	Cons: -Troubles at the joints -Low stiffness to the horizontal forces (wind) -Collection, handling, transport and erection may affect structural strength -Availability of heavy equipment for handling and maneuvering space -It requires transport to work
Conclusions	As shown in the pricing, purchase, transportation and placement of precast columns is more expensive than a concrete column made "in situ". However, the execution of prefabricated pillars is much faster and requires less manpower, therefore lowering costs. Being a construction in which 90% of the columns are prefabricated, this option is more viable respect of the "in situ" columns, in addition to difficulty that would be (in terms of formwork and form) doing that columns prefabricated.			

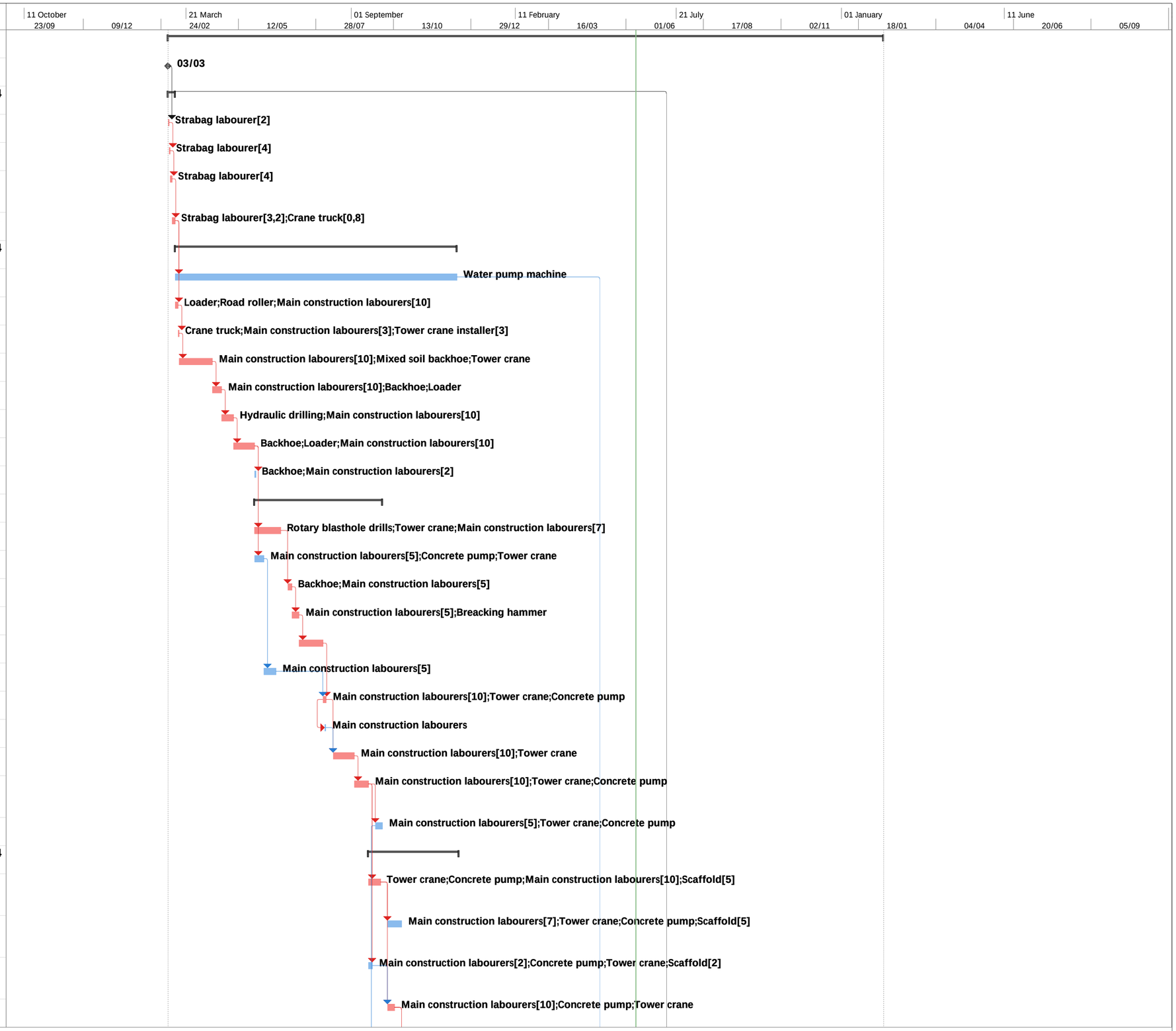
"In situ" column (1column-0,389m³)	Units	Unit price	Total
Buy concrete (€/m³)	1,08m³	58 (€/m³)	62,64
Pouring concrete+reinforcement(€/m³)	1,08m³	30 (€/m³)	32,4
Transport concrete(€/m³)	1,08m³	18,2(€/m³)	19,656
Renting formwork (€/m²)	8,66m²	10(€/m²)	86,6
Transport formwork (€/kg)	260kg	0,01(€/kg)	2,6
Placing formwork(€/m²)	2,60m²	25(€/m²)	65
Buy metal bars (incl.transp) (€/kg)	86,40kg	0,55(€/kg)	47,52
		Σ=	316,416

*Dimensions of the in situ column: 0,5x0,5x4,33m=1,08m³ / =8,66m²

Pecast column (1piece)	Units	Unit price (€/u)	Total
Buy columns (€/piece)	1	450	450,00 €
Transport (€/piece)	1	12,5	12,50 €
Placing (€/piece)	1	125	125,00 €
Fill holes (€/piece)	1	45	45,00 €
		Σ=	587,50 €

PART 6. SCHEDULING. GANTT CHART

ID	Task Name	Duration	Start	Finish
1	**Deinze's new city hall**	**437,88 days**	**Mon 03/03/14**	**Thu 11/02/16**
2	START	0 days	Mon 03/03/14	Mon 03/03/14
3	**1 Implanting**	**5 days**	**Mon 03/03/14**	**Mon 10/03/14**
4	1.1 Fenced and signaling	1 day	Mon 03/03/14	Tue 04/03/14
5	1.2 Cleaning surface	1 day	Tue 04/03/14	Wed 05/03/14
6	1.3 Electrical installation, plumbing,and sanitation of temporary facilities	2 days	Wed 05/03/14	Fri 07/03/14
7	1.4 Placement of temporary facilities in site huts	1 day	Fri 07/03/14	Mon 10/03/14
8	**2 Earthwork**	**174 days**	**Mon 10/03/14**	**Mon 15/12/14**
9	2.1 Water pumping	200 days	Mon 10/03/14	Mon 15/12/14
10	2.2 Crushed stones backfill	3 days	Mon 10/03/14	Thu 13/03/14
11	2.3 Tower crane installation	1 day	Thu 13/03/14	Fri 14/03/14
12	2.4 Retaining walls (mixed soil)	23 days	Fri 14/03/14	Wed 16/04/14
13	2.5 Digging Lv.1 (+5,30m)	7 days	Wed 16/04/14	Fri 25/04/14
14	2.6 Drilling ground anchors	8 days	Fri 25/04/14	Wed 07/05/14
15	2.7 Digging Lv.2 (+3,00m)	15 days	Wed 07/05/14	Wed 28/05/14
16	2.8 Digging lift pit	1 day	Wed 28/05/14	Thu 29/05/14
17	**3 Foundation**	**72 days**	**Wed 28/05/14**	**Thu 02/10/14**
18	3.1 Foundation piles(drilling, reinforcement and concreting)	18 days	Wed 28/05/14	Mon 23/06/14
19	3.2 Cleaning concrete 10cm	7 days	Wed 28/05/14	Fri 06/06/14
20	3.3 Digging of the pile heads	4 days	Mon 30/06/14	Fri 04/07/14
21	3.4 Breackage of the head of piles	5 days	Fri 04/07/14	Fri 11/07/14
22	3.5 Impedance test	1 day	Fri 11/07/14	Mon 04/08/14
23	3.6 Pits and pipes	7 days	Fri 06/06/14	Wed 18/06/14
24	3.7 Foundation slab 50cm	3 days	Mon 04/08/14	Thu 07/08/14
25	3.8 Earth connection	1 day	Tue 05/08/14	Wed 06/08/14
26	3.9 Assemly of the formwork (retaining walls)	15 days	Thu 14/08/14	Thu 04/09/14
27	3.10 "In situ" concrete retaining walls (insulation, reinforcement and concreting)	10 days	Thu 04/09/14	Thu 18/09/14
28	3.11 Coronation beam (insulation, reinforcement and concreting)	5 days	Thu 25/09/14	Thu 02/10/14
29	**4 Basement**	**62 days**	**Thu 18/09/14**	**Wed 17/12/14**
30	4.1 "In situ" columns (reinforcement, formwork and concreting)	8 days	Thu 18/09/14	Tue 30/09/14
31	4.2 "In situ" concrete beams (formwork, reinforcement and concreting)	10 days	Tue 07/10/14	Tue 21/10/14
32	4.3 Sm-"In situ" concrete columns (reinforcement, formwork and concreting)	2 days	Thu 18/09/14	Mon 22/09/14
33	4.4 Cavity walls (placing and concreting)	5 days	Tue 07/10/14	Tue 14/10/14



Project: Strabag

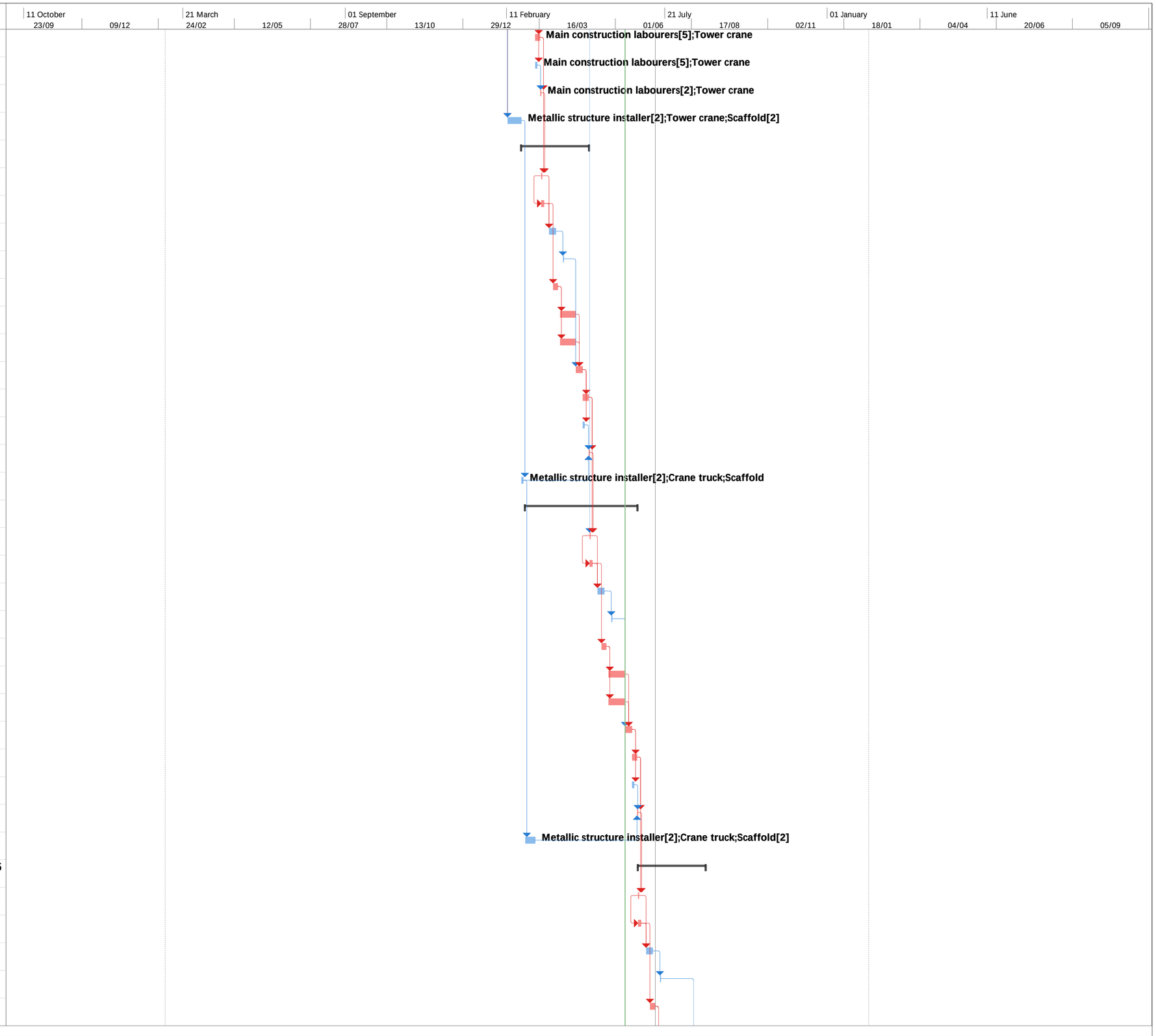
Task	Summary	Inactive Milestone	Duration-only	Start-only	External Milestone	Critical Split
Split	Project Summary	Inactive Summary	Manual Summary Rollup	Finish-only	Deadline	Progress
Milestone	Inactive Task	Manual Task	Manual Summary	External Tasks	Critical	Manual Progress

ID	Task Name	Duration	Start	Finish
34	4.5 Precast stairs	1 day	Tue 21/10/14	Wed 22/10/14
35	4.6 Concrete masonry	10 days	Tue 21/10/14	Tue 04/11/14
36	4.7 Brick work	10 days	Tue 21/10/14	Tue 04/11/14
37	4.8 Precast walls	12 days	Tue 04/11/14	Mon 24/11/14
38	4.9 Septic 15.000L	1 day	Mon 24/11/14	Tue 25/11/14
39	4.10 Acces ramp	7 days	Tue 25/11/14	Thu 04/12/14
40	4.11 Precast columns	1 day	Tue 04/11/14	Wed 05/11/14
41	4.12 Placement of props	5 days	Thu 04/12/14	Thu 11/12/14
42	4.13 Precast panels	3 days	Thu 11/12/14	Tue 16/12/14
43	4.14 Precast platforms	2 days	Thu 11/12/14	Mon 15/12/14
44	4.15 Universal beams (placement)	1 day	Tue 16/12/14	Wed 17/12/14
45	**5 Ground floor**	**22,88 days**	**Wed 17/12/14**	**Fri 30/01/15**
46	5.1 Composite slab (reinforcement and concreting)	1 day	Wed 17/12/14	Thu 18/12/14
47	5.2 Perimeter beam (formwork, reinforcement and concreting)	3 days	Wed 17/12/14	Mon 22/12/14
48	5.3 Cavity walls (insulation, placing and concreting)	11 days	Thu 25/12/14	Fri 09/01/15
49	5.11 Precast stairs	1 day	Mon 19/01/15	Mon 19/01/15
50	5.4 Precast columns	5 days	Mon 29/12/14	Mon 05/01/15
51	5.5 Concrete masonry	10 days	Mon 05/01/15	Mon 19/01/15
52	5.6 Brickwork	10 days	Mon 05/01/15	Mon 19/01/15
53	5.7 Placement of props	5 days	Tue 20/01/15	Mon 26/01/15
54	5.8 Precast panels	3 days	Tue 27/01/15	Thu 29/01/15
55	5.9 Precast platforms	2 days	Tue 27/01/15	Wed 28/01/15
56	5.10 Universal beams (placement)	1 day	Fri 30/01/15	Fri 30/01/15
57	5.12 Sm-"In situ" concrete columns (reinforcement, formwork and concreting)	4 days	Thu 25/12/14	Tue 06/01/15
58	5.13 Placement of the formwork (corridor)	3 days	Tue 27/01/15	Thu 29/01/15
59	**6 First floor**	**33 days**	**Fri 30/01/15**	**Tue 17/03/15**
60	6.1 Composite slab (reinforcement and concreting)	1 day	Mon 02/02/15	Mon 02/02/15
61	6.2 Perimeter beam (formwork, reinforcement and concreting)	3 days	Mon 02/02/15	Wed 04/02/15
62	6.3 Corridor (reinforcement and concreting)	2 days	Fri 30/01/15	Mon 02/02/15
63	6.4 Cavity walls (insulation, placing and concreting)	5 days	Tue 10/02/15	Mon 16/02/15
64	6.5 Precast stairs	1 day	Tue 24/02/15	Tue 24/02/15
65	6.6 Precast columns	5 days	Thu 12/02/15	Wed 18/02/15
66	6.7 Concrete masonry	10 days	Thu 19/02/15	Wed 04/03/15
67	6.8 Brickwork	10 days	Thu 19/02/15	Wed 04/03/15
68	6.9 Placement of props	5 days	Thu 05/03/15	Wed 11/03/15

Project: Strabag

Task | Split | Milestone | Summary | Project Summary | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | External Tasks | External Milestone | Deadline | Critical | Critical Split | Progress | Manual Progress

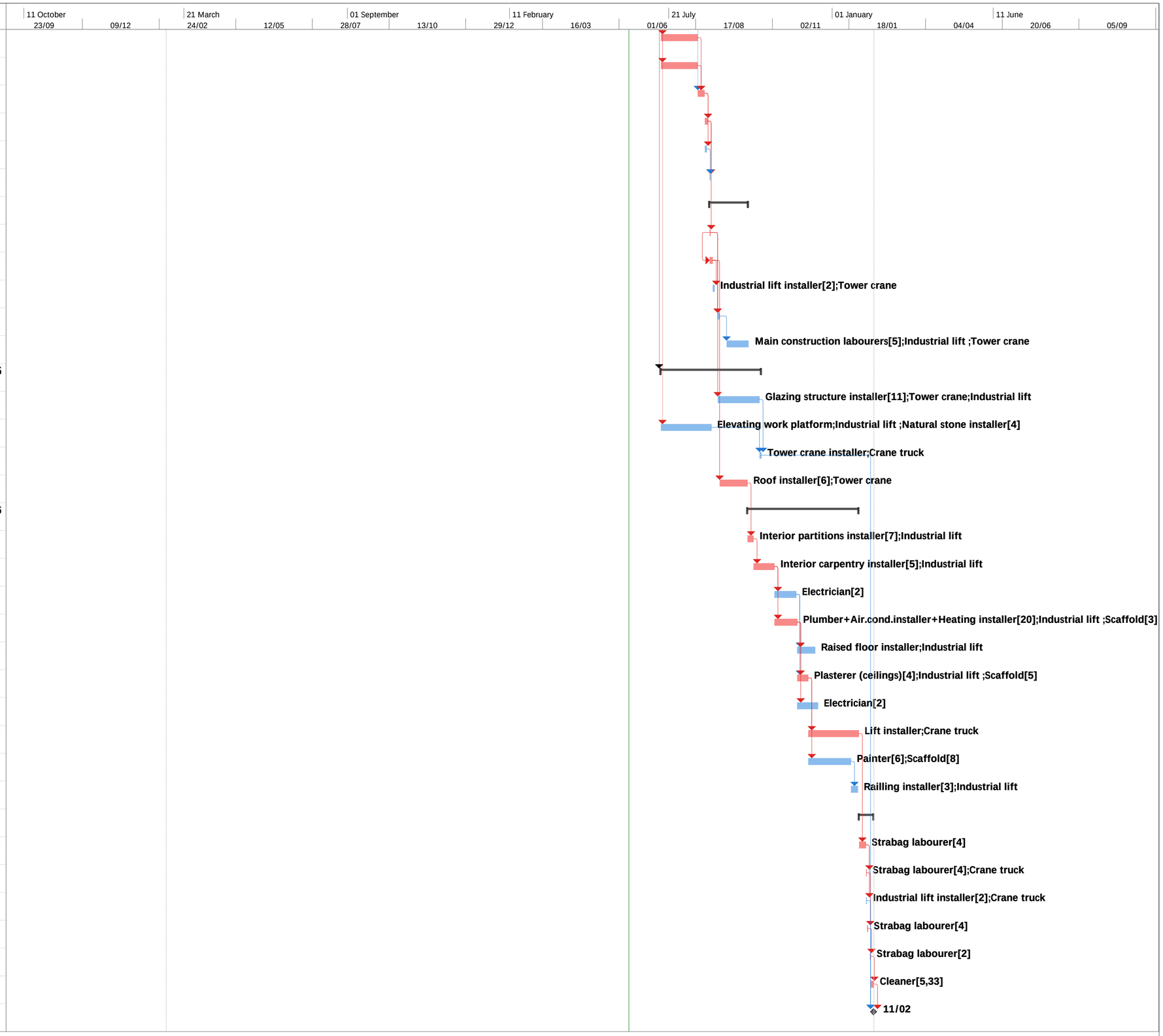
ID	Task Name	Duration	Start	Finish
69	6.10 Precast panels	3 days	Thu 12/03/15	Mon 16/03/15
70	6.11 Precast platforms	2 days	Thu 12/03/15	Fri 13/03/15
71	6.12 Universal beams (placement)	1 day	Tue 17/03/15	Tue 17/03/15
72	6.13 Sm-Metallic structure (assembly and fixation)	10 days	Thu 12/02/15	Wed 25/02/15
73	**7 Second floor**	**46 days**	**Thu 26/02/15**	**Tue 05/05/15**
74	7.1 Composite slab (reinforcement and concreting)	1 day	Wed 18/03/15	Wed 18/03/15
75	7.2 Perimeter beam (formwork, reinforcement and concreting)	3 days	Wed 18/03/15	Fri 20/03/15
76	7.3 Cavity walls (insulation, placing and concreting)	5 days	Thu 26/03/15	Wed 01/04/15
77	7.4 Precast stairs	1 day	Thu 09/04/15	Thu 09/04/15
78	7.5 Precast columns	5 days	Mon 30/03/15	Fri 03/04/15
79	7.6 Concrete masonry	10 days	Mon 06/04/15	Tue 21/04/15
80	7.7 Brickwork	10 days	Mon 06/04/15	Tue 21/04/15
81	7.8 Placement of props	5 days	Wed 22/04/15	Tue 28/04/15
82	7.9 Precast panels	3 days	Wed 29/04/15	Mon 04/05/15
83	7.10 Precast platforms	2 days	Wed 29/04/15	Thu 30/04/15
84	7.11 Universal beams (placement)	1 day	Tue 05/05/15	Tue 05/05/15
85	7.12 Corridor (roofing corrugated sheet)	2 days	Thu 26/02/15	Fri 27/02/15
86	**8 Third floor**	**76 days**	**Mon 02/03/15**	**Tue 23/06/15**
87	8.1 Composite slab (reinforcement and concreting)	1 day	Wed 06/05/15	Wed 06/05/15
88	8.2 Perimeter beam (formwork, reinforcement and concreting)	3 days	Wed 06/05/15	Fri 08/05/15
89	8.3 Cavity walls (insulation, placing and concreting)	5 days	Thu 14/05/15	Wed 20/05/15
90	8.4 Precast stairs	1 day	Thu 28/05/15	Thu 28/05/15
91	8.5 Precast columns	5 days	Mon 18/05/15	Fri 22/05/15
92	8.6 Concrete masonry	10 days	Mon 25/05/15	Wed 10/06/15
93	8.7 Brickwork	10 days	Mon 25/05/15	Wed 10/06/15
94	8.8 Placement of props	5 days	Thu 11/06/15	Wed 17/06/15
95	8.9 Precast panels	3 days	Thu 18/06/15	Mon 22/06/15
96	8.10 Precast platforms	2 days	Thu 18/06/15	Fri 19/06/15
97	8.11 Universal beams (placement)	1 day	Tue 23/06/15	Tue 23/06/15
98	8.12 Sm-Roofing (corrugated sheet)	8 days	Mon 02/03/15	Wed 11/03/15
99	**9 Fourth floor**	**32 days**	**Wed 24/06/15**	**Mon 31/08/15**
100	9.1 Composite slab (reinforcement and concreting)	1 day	Wed 24/06/15	Wed 24/06/15
101	9.2 Perimeter beam (formwork, reinforcement and concreting)	3 days	Wed 24/06/15	Fri 26/06/15
102	9.3 Cavity walls (insulation, placing and concreting)	5 days	Thu 02/07/15	Wed 08/07/15
103	9.4 Precast stairs	1 day	Thu 16/07/15	Thu 16/07/15
104	9.5 Precast columns	5 days	Mon 06/07/15	Fri 10/07/15



Project: Strabag

Task	Summary	Inactive Milestone	Duration-only	Start-only	External Milestone	Critical Split
Split	Project Summary	Inactive Summary	Manual Summary Rollup	Finish-only	Deadline	Progress
Milestone	Inactive Task	Manual Task	Manual Summary	External Tasks	Critical	Manual Progress

ID	Task Name	Duration	Start	Finish
105	9.6 Concrete masonry	10 days	Mon 13/07/15	Tue 18/08/15
106	9.7 Brickwork	10 days	Mon 13/07/15	Tue 18/08/15
107	9.8 Placement of props	5 days	Wed 19/08/15	Tue 25/08/15
108	9.9 Precast panels	3 days	Wed 26/08/15	Fri 28/08/15
109	9.10 Precast platforms	2 days	Wed 26/08/15	Thu 27/08/15
110	9.11 Universal beams (placement)	1 day	Mon 31/08/15	Mon 31/08/15
111	**10 Fifth floor**	**29 days**	**Mon 31/08/15**	**Thu 08/10/15**
112	10.1 Composite slab (reinforcement and concreting)	1 day	Mon 31/08/15	Mon 31/08/15
113	10.2 Perimeter beam (formwork, reinforcement and concreting)	3 days	Mon 31/08/15	Wed 02/09/15
114	10.3 Industrial lift assembly	2 days	Thu 03/09/15	Fri 04/09/15
115	10.4 Cavity walls (insulation, placing and concreting)	2 days	Tue 08/09/15	Wed 09/09/15
116	10.5 Utility room (assembly)	16 days	Thu 17/09/15	Thu 08/10/15
117	**11 Building envelope**	**56 days**	**Mon 13/07/15**	**Wed 21/10/15**
118	11.1 Glazing structure	30 days	Tue 08/09/15	Mon 19/10/15
119	11.3 Stone facing	37 days	Mon 13/07/15	Tue 01/09/15
120	11.5 Remove tower crane	2 days	Tue 20/10/15	Wed 21/10/15
121	11.6 Roofs	20 days	Thu 10/09/15	Wed 07/10/15
122	**12 Interior finish**	**68 days**	**Thu 08/10/15**	**Wed 27/01/16**
123	12.1 Interior partitions	4 days	Thu 08/10/15	Tue 13/10/15
124	12.2 Wooden carpentry	15 days	Wed 14/10/15	Tue 03/11/15
125	12.3 Electrical installation	15 days	Wed 04/11/15	Wed 25/11/15
126	12.4 Air conditioning + Water + Heating installation	17 days	Wed 04/11/15	Thu 26/11/15
127	12.5 Raised floors + carpet	12 days	Fri 27/11/15	Mon 14/12/15
128	12.6 Suspended ceilings	7 days	Fri 27/11/15	Mon 07/12/15
129	12.7 Telecoms	15 days	Fri 27/11/15	Thu 17/12/15
130	12.8 Lift installation	37 days	Tue 08/12/15	Wed 27/01/16
131	12.9 Paint	20 days	Tue 08/12/15	Tue 19/01/16
132	12.10 Railings	5 days	Wed 20/01/16	Tue 26/01/16
133	**13 Others**	**11 days**	**Thu 28/01/16**	**Thu 11/02/16**
134	13.1 Outdoor constructions	5 days	Thu 28/01/16	Wed 03/02/16
135	13.2 Remove site huts	1 day	Thu 04/02/16	Thu 04/02/16
136	13.3 Remove industrial lift	1 day	Thu 04/02/16	Thu 04/02/16
137	13.4 Remove temporary installations	1 day	Fri 05/02/16	Fri 05/02/16
138	13.5 Remove fenced	1 day	Mon 08/02/16	Mon 08/02/16
139	13.6 Cleaning	3 days	Tue 09/02/16	Thu 11/02/16
140	END	0 days	Thu 11/02/16	Thu 11/02/16



Project: Strabag

Task	Summary	Inactive Milestone	Duration-only	Start-only	External Milestone	Critical Split
Split	Project Summary	Inactive Summary	Manual Summary Rollup	Finish-only	Deadline	Progress
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PICTURES TAKEN IN THE SITE

-General view of the site and surroundings:

Main building

Small building

Canal next to the site

Corridor that connects both buildings

View from the roof of the main building

-Organisation of the site:

Vehicular Access 1 + Pedestrians Access 1

Vehicular Access 2

Worksite huts

Pedestrians Access 2

Tower crane

Stockpile

-Precast columns:

Precast columns

Metal bars to connect columns and prefabricated platforms

Concrete pouring holes

Precast column with a tube to drain the roof

-*In situ* columns and beams:

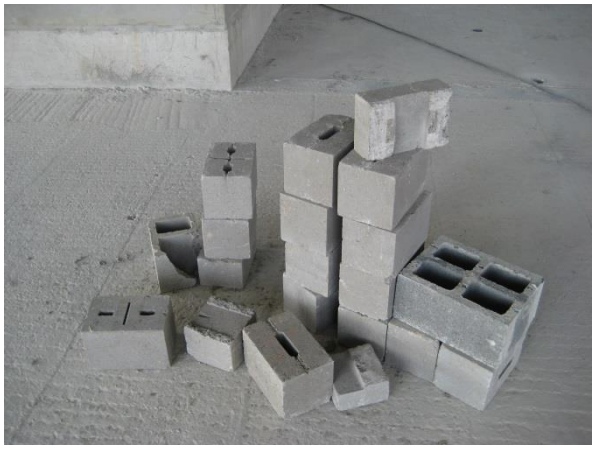
-Composite beams:

Boyd beam reinforced with metal bars and concrete

-Brickwork and concrete masonry:

Porotherm bricks

Brickwork



Concrete blocks

Concrete masonry

-Precast walls:

Precast/bearing walls in the lift and stairs module

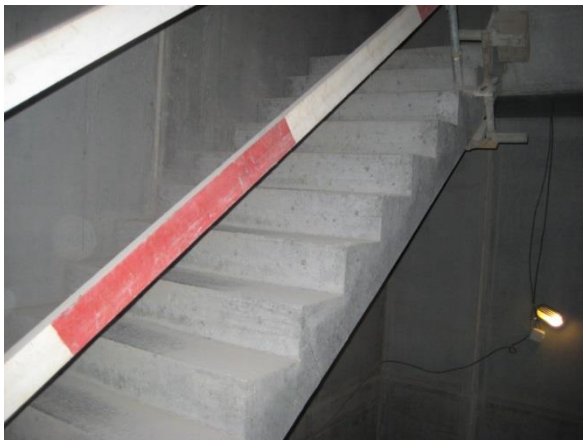
Metal bars to connect cavity walls

Placement with the tower crane

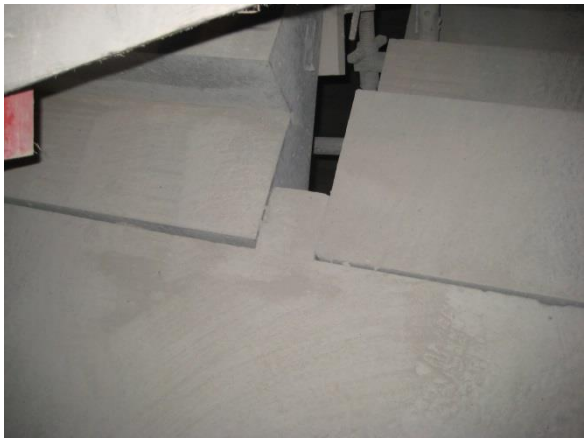
Base of a cavity wall

-Precast stairs:

Precast stairs in the small building



Precast stairs in the main building



Supporting of the precast stairs in a landing

-Metallic structure (small building):

Universal beams and rectangular hollow profiles that hold the roof

Corridor

-Aluminium carpentry:

Carpentry in the light well

Fixation of the carpentry

-Roof:

Small building's roof

Main building's roof

Raised floor with cut to length spacers (main building)

Sheet metal panels and concrete base to place installations on it

-Insulation/waterproofing:

PIR insulation and polyethylene membrane (retaining walls)

PIR insulation and polyethylene membrane (retaining walls)

Rockwool in partitions

Bitumen membrane applied with torch

Acoustic and thermal insulation panels "stertekt" for ceilings in the basement

PUR insulation and PE sheet in the basement

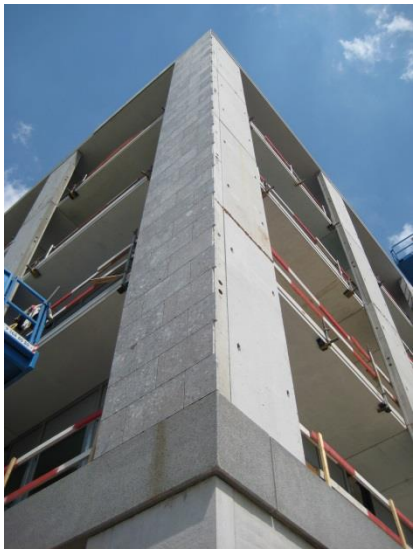
-Other elements:

Ramp to access to the basement

Cantilever in one access of the small building

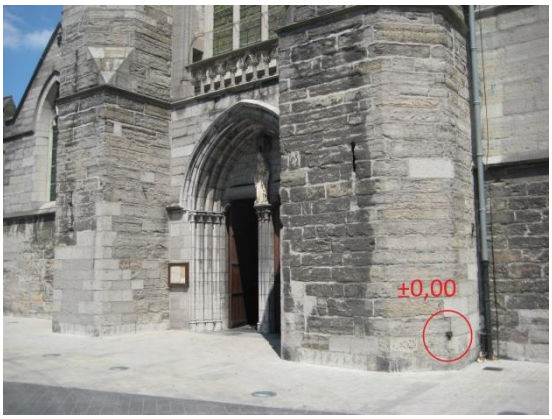
Air conditioning tubes

Heating



Columns with and without natural stone lining

Industial lift (two of the in the site)



MSL (mean sea level) – XIX century

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- PIR insulation IKO Enetherm - http://www.enertherm.eu/
- Bitumen membrane De Boer DeboRek - http://goo.gl/EbQUch
- Porotherm bricks Wienerberger - http://www.wienerberger.be/binnenmuur
- Concrete blocks Coeck - http://www.coeck.be/
- YONG blocks - http://www.ytong.es/#_sub1544
- False ceiling tiles OWA - http://www.owa.de/nl/
- Stremaform plate Plaka Nederland - http://plakagroup.com/nl-NL/PLAKA-Nederland/
- Concrete connection Schock Isokorb - http://www.schock-us.com/en_us/solutions/isokorb--189
- Precast concrete elements - http://prefaxis.be/
- Rock wool KNAUF - http://www.knauf.be/
- Glazing Mosa Glas - http://www.mosaglas.nl/
- Containers Vindevogel (renting) - http://www.containers-vindevogel.be/
- Fenced Sulmon - http://www.sulmon.com/
- Working huts Rob Units - http://www.robunits.be/
- Acoustic and thermal insulation Stertekt panels - http://www.stertekt.com/