CONSTRUCTION DESIGN

OBJECT: **ASTRONOMICAL OBSERVATORY**

LOCATION: .....
.....

INVESTOR: .....
.....

DESIGN OFFICE:

Obserwatoria Astronomiczne
ScopeDome sky observatory
ul. Jaśminowa 29, 76-200 Słupsk

DESIGNED BY:

architect Aleksandra Narkowicz-Pala, MSc

Aleksandra Narkowicz-Pala
ARCHITEKT
upr. proj. nr BK. II F. 7342/64/94
U.W. w Słupsku

electrical engineer Zbigniew Wójcik, MSc

BRANŻA ELEKTRYCZNA
PROJEKTANT
mgr inż. Zbigniew Wójcik
upr. SP ust. 207 t ust. 1 pkt. 4 lit. a
nr AN/0345/172/66 WBPP Słupsk

Słupsk, 30 Jan 2009

CONTENTS

PRIMARY NOTES

1. Rules of adaptation.

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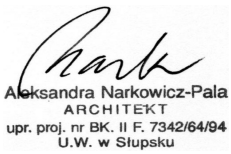
Commercial use requires a permit issued by desing office: **"Obserwatoria Astronomiczne, ScopeDome sky observatory ", ul. Jaśminowa 29, 76-200 Słupsk, kom.: +48 602136289, tel.:+48 59 8410191, www.scopedome.com.**

In most situations this projects requires to be adapted to local conditions as well as to local law regulations.

2. Allowed changes.

Any design engineer is allowed to prepare mirror version of this design as well as to introduce following changes, without asking for an author permit:

- change of foundations or ground floor level
- floor height
- stairs or other communication fittings
- ceiling type
- wall structure
- colors and finish
- installations
- change of windows or doors



TECHNICAL CHARACTERISTICS

3. Subject of elaboration.

Hereby engineering specification contains a construction design for a small astronomical observatory building.

4. Site conditions.

Water table is assumed to be below foundation level and the grounds at foundation base have supportive ability. Assumed base compression (base failure) is 150 kPa.
Foundation level at 1,0 m below field level around the building. The foundation shall be adapted to local conditions considering water table and ground sustainability.

5. General description.

The building performs technical function, in a form of a tower base supporting an astronomical dome.
Observatory is served remotely and automatically. Technical room is placed at ground floor level, containing peripheral fix-up of the telescope. The interior of cupola constitutes real observatory. Access on level of cupola through internal stairs (timber or steel one, folding). Object is meant for individual use, it does not require constant staff.

4. Basic data.

Surface of building: 9,10 m2

Usable area of building: 7,0 m2

Gross floor area: 18,2 m2

Cubature: 28,4 m3

5. Room list.

no	name	area (m2)
1	TECHNICAL ROOM	3,5
2	OBSERVATORY	3,5
	total:	**7,00**

6. General structure characteristics.

Designed building is one-storeyed, with no basement, in a form of rounded tower. It has masonry structure. The walls carry precast 3,0m diameter astrodome, made of synthetics (manufactured by ScopeDome).
The foundation consists of reinforced concrete strips, 30 cm high and 40cm wide, reinforcement is 4#12, and Ø6 each 30cm. The structure of reinforced concrete column base - according to drawing descriptions.
Designed foundation walls structure made of concrete blocks, width 24cm, with outer styrofoam insulation panels, 5-8 cm thick. The walls above the ground masonry made of aerated concrete blocks, with outer styrofoam insulation panels, 10 cm thick, coated with thin external plaster.
Pier column and pier foundation 60x60cm and 40x40cm made of reinforced concrete, reinforcement #12, according to drawing descriptions.
The lintels made of poured concrete. The ceiling construction: beam-framed floor, made of wooden beams 8x16 cm.
The stairs are ladder-type or folded, made of wood or steel.

7. Finish.

Internal coatings of calcium-cement plaster. The ceiling – is an open floor with underside finished with flaxboard, chipboard or plywood. The ceiling can also be insulated inside and finished with PCV panels. It is not recommended to use gypsum plates as any coatings.
The floors made of anty-glide tiles.
Windowsills, sheet facings made of coated tinplates, light gray or light blue colors.

8. Coloring.

External walls coated with external plaster (eg. silica), sand or ivory color.
Wall plinth and wall fragments coated with roughcast, gray or beige color.
Woodwork – designed window openings filled with glass-block, blue-gray or transparent.
Door made of PCV or aluminum, thermally insulated, white.

9. Protections.

Steel elements shall be protected against rust – cleared and then painted 2-3 x with anti corrosive paint and primary ground, if necessary. Protection of wood elements – impregnate with complex chemical preparation against fire, fungi and insects.

10. Thermal and humidity characteristics.

The building has simple structure. It was assumed to be locate in I climate zone (Mid and Eastern Europe area). The objects has no permanent heating system, but can be equipped in an optional emergency electrical heater (for electronic devices protection against low temperatures and frost).
Thermal penetrability coefficient is 0,29 W/K*m2 for walls and 0,50 W/K*m2 for non-insulated ceiling.

11. Installations

Ventilation by gravity – air flow through stairs and astrodome. Electric energy supply from main electric connection outside the building. Rainfall onto field outside the building. The object does not require any sanitary fittings.

11.1. Energy supply cable 0,4kV.
The observatory is to be supplied from a cable line, its parameters shall be adapted to the distance from main power supply connection outside the observatory.

11.2. Control panel.
Control panel TG placed as on drawing no E-03. Control panel equipment based on TH-35 rail (e.g. HAGER). The panel shall be mounted in a niche inside the wall, with upper side at 1,8 m over the floor. Fittings according to scheme no E-01.

11.3. Lights, outlets 230 V and 400 V.
Internal electrical installations by YDY cable placed under plaster. Sockets placed on a central pier column shall be mounted at the column surface.

11.4. Anti-shock protection.
All installations are equipped with electric shock protection. Additional protection supports automatic disconnection system. The system consists of differential switches I_{dn}=0,03A and excess switches.
The receiving installation is based on TN-S pattern. All one-phase outlets/sockets shall be bipolar and have protective bolt.

The main equalizing rail shall be placed close to control panel TG. The rail shall be connected to observatory equipment made of metal, which normally are not under voltage. Equalizing cables made of copper LY10mm^2 w RVS 18 p/t. Main rod shall be grounded.

11.5. Lightning rod installation.
The necessity of installing a lightning conductor depends upon local conditions and shall be determined by an electrician. Electric installation shall be shielded as a protection in case of thunder.

11.6. Calculations.

Control panel TG – ground floor

no	Fitting name	Installed power Pi (kW)
G1	outlets 230V	2,0
G2	outlets 230V	2,0
G3	outlets 230V	2,0
G4	outlets 230V	2,0
GE	Electric heater socket	2,0
O1	Lighting	0,2
	total Pi	10,2

TG control panel peak power:

$$Psz=\sum kj*Pi$$

$kj=0,3$

$Psz=0,3*10,2kW=3,1kW$

$Isz=Psz/(1,73*U*\cos\varphi)=3,1kW/(1,73*0,4*0,93)=4,8A$

TG panel protection - disconnecting insulated switch with safety catch 20A. Protection devices shall be mounted close to main supply conduit exit.

Wiring and protection calculations

Permissible conduit sizes and their max protection charge limits (according to PN-IEC 60364-5-523:2001 standard):

CONDUCTORS AND SAFETY				
No	Conduit type	section [mm2]	Long term load [A]	Max permissible protection[A]
1	YDY	5x2,5	24	20
2	YDY	4x1,5	17,5	16
3	YDY	3x1,5	19,5	16
4	YDY	2x1,5	19,5	16
5	YDY	3x2,5	27	25

12. Fire protection.

The observatory is a low, simple structure building, technical function. Designed walls, ceilings and finishes fulfill fire protection requirements. It is recommended to fit the building with a fire extinguisher 2 kg (or 3 dm3).

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author:

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electrical engineer Zbigniew Wójcik, MSc

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PROJEKTANT
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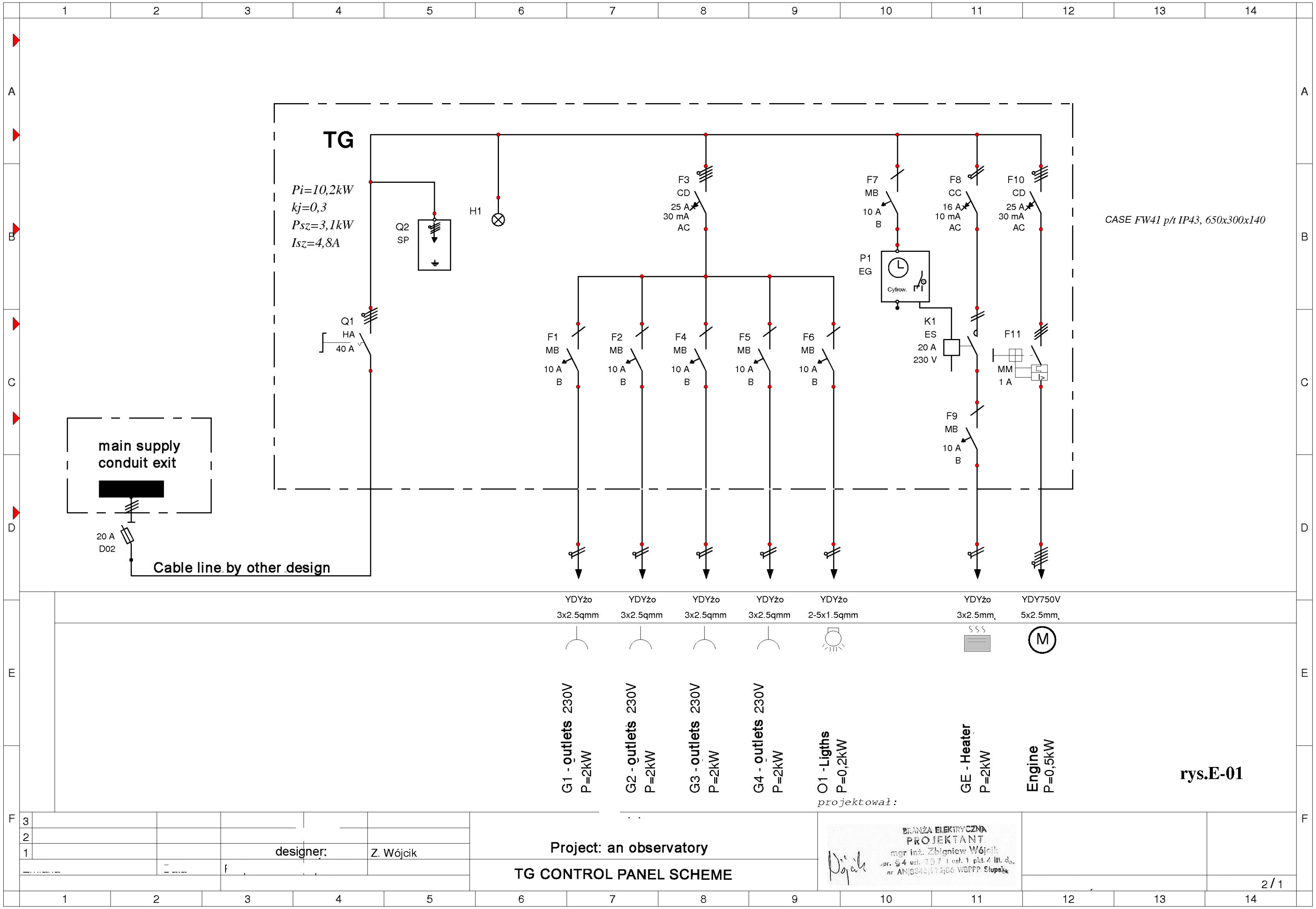
Słupsk, 30 Jan 2009 r.

WOOD ELEMENTS LIST – FLOOR

NO	SYMBOL	ELEMENT NAME	quantity szt	lenght cm	section size b* h cm	cm	VOLUME m3
No store for trim included – add aprox. 10 cm when placing an order							
1	B1	BEAM	1	115	8	16	0,0147
2	B2	BEAM	1	165	8	16	0,0211
3	B3	BEAM	2	250	8	16	0,0640
4	W1	TRIMMER	2	50	8	16	0,0128
5	W2	TRIMMER	2	60	8	16	0,0154
				TOTAL		**m3**	**0,1280**


TG
Pi=10,2kW
kj=0,3
Psz=3,1kW
Isz=4,8A
Q1
HA
40 A
Q2
SP
H1
F3
CD
25 A
30 mA
AC
F7
MB
10 A
B
F8
CC
16 A
10 mA
AC
F10
CD
25 A
30 mA
AC
P1
EG
K1
ES
20 A
230 V
F11
MM
1 A
F9
MB
10 A
B
F1
MB
10 A
B
F2
MB
10 A
B
F4
MB
10 A
B
F5
MB
10 A
B
F6
MB
10 A
B
CASE FW41 p/t IP43, 650x300x140
main supply
conduit exit
20 A
D02
Cable line by other design
YDYżo 3x2.5qmm
YDYżo 2-5x1.5qmm
YDYżo 3x2.5mm
YDY750V 5x2.5mm
G1 - outlets 230V P=2kW
G2 - outlets 230V P=2kW
G3 - outlets 230V P=2kW
G4 - outlets 230V P=2kW
O1 -Ligths P=0,2kW
GE - Heater P=2kW
Engine P=0,5kW
rys.E-01
projektował:
BRANŻA ELEKTRYCZNA
PROJEKTANT
mgr inż. Zbigniew Wójcik
designer:
Z. Wójcik
Project: an observatory
TG CONTROL PANEL SCHEME
2 / 1

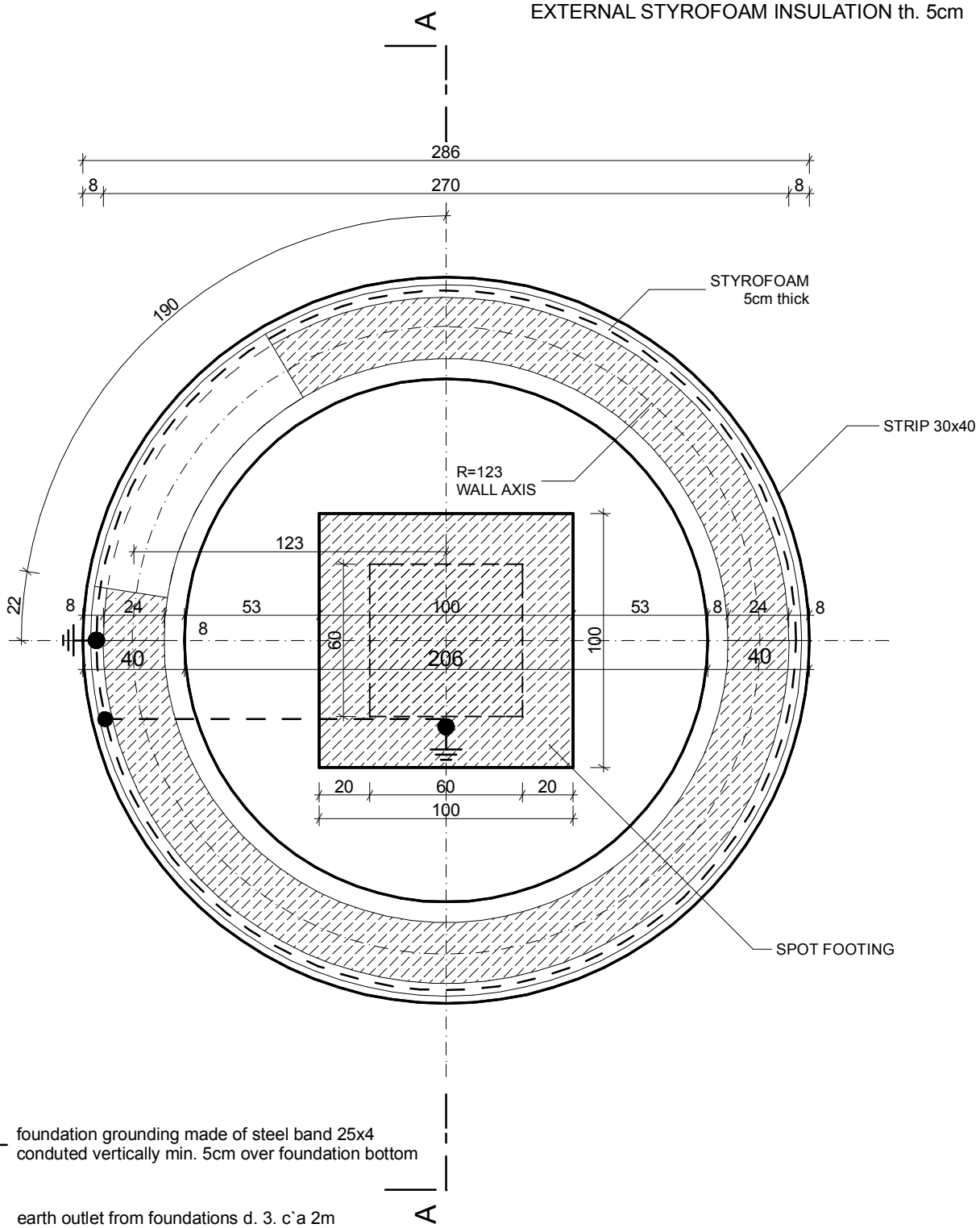
TG Control Panel element list:

symbol	Name	Descrription	Quantity	manufacturer
F1	MB110A	Excess breaker/switch, 6kA, B, 1-polar, 10A	1	HAGER
F2	MB110A	Excess breaker/switch, 6kA, B, 1-polar, 10A	1	HAGER
F3	CD426J	Differential switch 25A, 30mA, 4-polar, AC type	1	HAGER
F4	MB110A	Excess breaker/switch, 6kA, B, 1-polar, 10A	1	HAGER
F5	MB110A	Excess breaker/switch, 6kA, B, 1-polar, 10A	1	HAGER
F6	MB110A	Excess breaker/switch, 6kA, B, 1-polar, 10A	1	HAGER
F7	MB110A	Excess breaker/switch, 6kA, B, 1-polar, 10A	1	HAGER
F8	CC217J	Differential switch 16A, 10mA, 2-polar, AC type	1	HAGER
F9	MB110A	Excess breaker/switch, 6kA, B, 1-polar, 10A	1	HAGER
F10	CD426J	Differential switch 25A, 30mA, 4-polar, AC type	1	HAGER
F11	MM506N	Engine switch 1,0-1,6 A	1	HAGER
F12	L73H	Breaker switch, insulated, D02, 3 x 63A	1	HAGER
H1	SVN127	Signal lamp, triple, red 230V AC	1	HAGER
K1	ES220	Contact 230V, 2Z/25A	1	HAGER
P1	EG071	7-day digital clock//timer, 1P/16A. 1 mod.	1	HAGER
Q1	HA402	overcharge breaker switch, modular, 4-polar, 40A	1	HAGER
Q2	SPN415	over voltage shield switch, C, 4-polar, TN-S cabling	1	HAGER

FOUNDATION LEVEL: 1,0 m
BELOW GROUND AROUND THE BUILDING

FOUNDAMENT STRIPS AND SPOT FOOTING:
CONCRETE B20
STEEL A-III (34GS), A-0 (St0S)

FOUNDAMENT WALLS:
CONCRETE B20
OR COCRETE BLOCKS WITH
EXTERNAL STYROFOAM INSULATION th. 5cm



foundation grounding made of steel band 25x4
conduted vertically min. 5cm over foundation bottom

earth outlet from foundations d. 3. c`a 2m

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STRUCTURE:				01/2009 1:25
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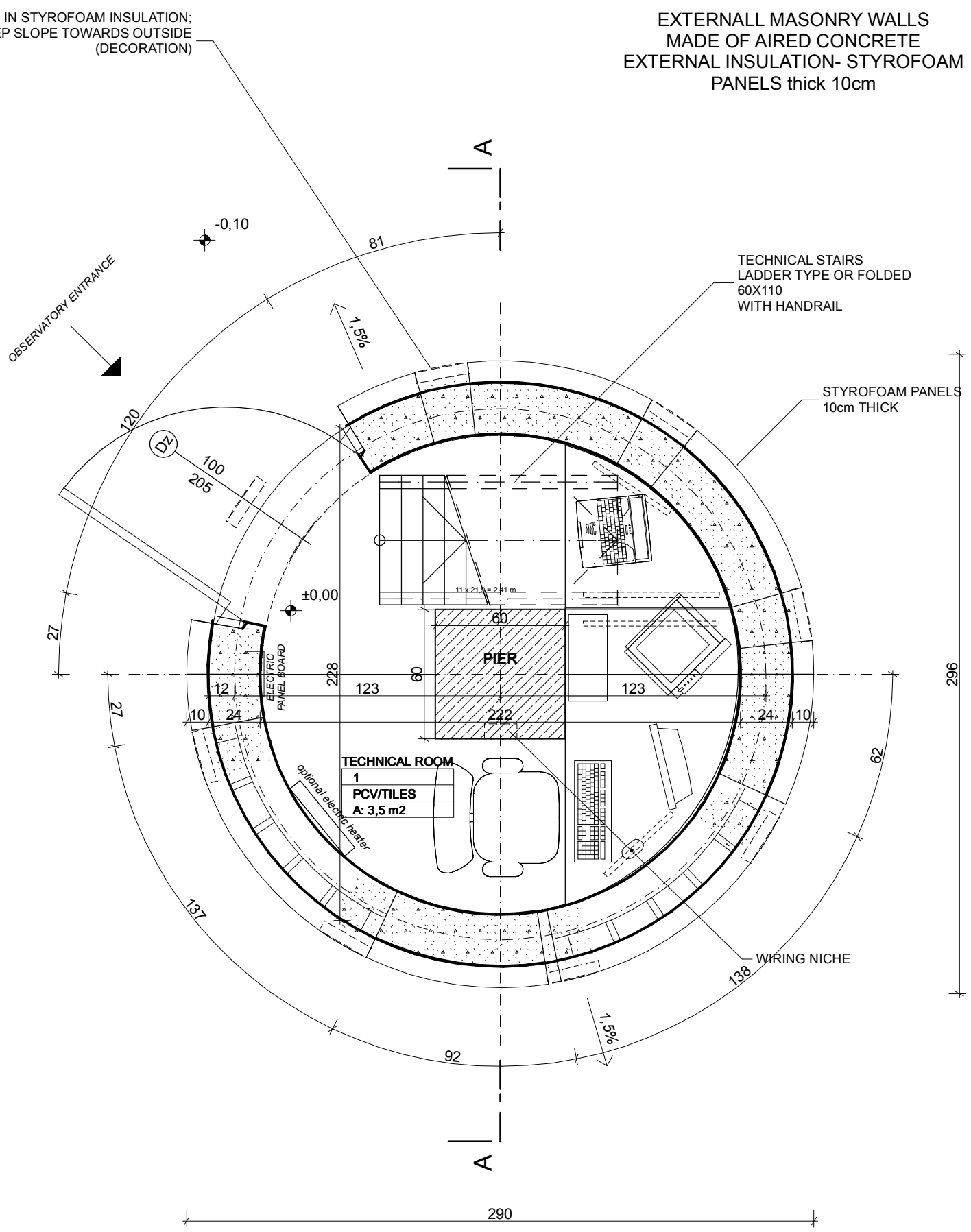
LICENSE:	AN 8346/172/86, POM/IE/5424/01			



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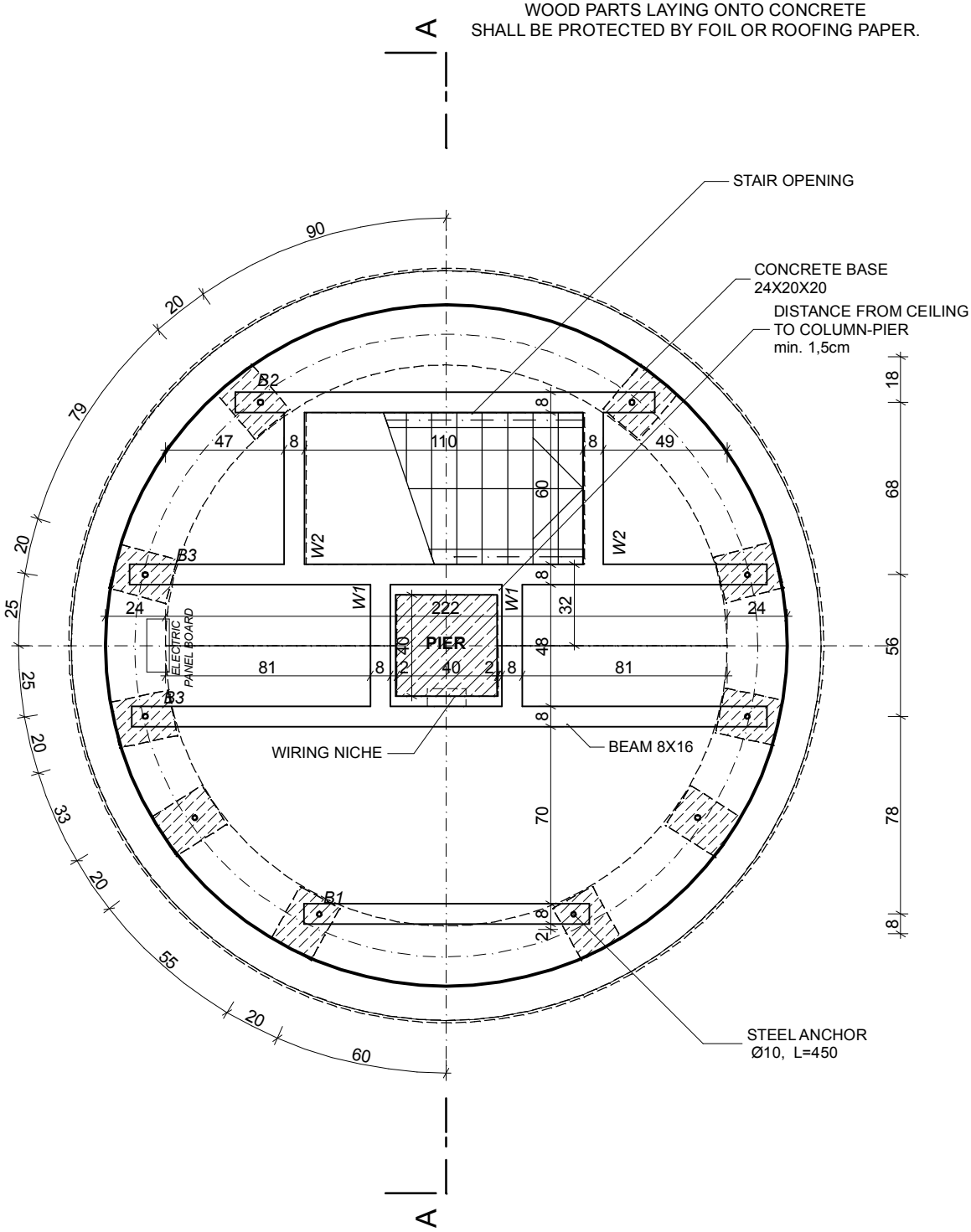
WOOD CATEGORY K27.

CONCRETE BASES 20cm THICK, WITH ANCHORS Ø 10
REQUIRED UNDER BEAMS

WOOD ELEMENTS CONNECTIONS PRECAST
BMF (Simpson Strong-Tie)

WOOD PARTS LAYING ONTO CONCRETE
SHALL BE PROTECTED BY FOIL OR ROOFING PAPER.



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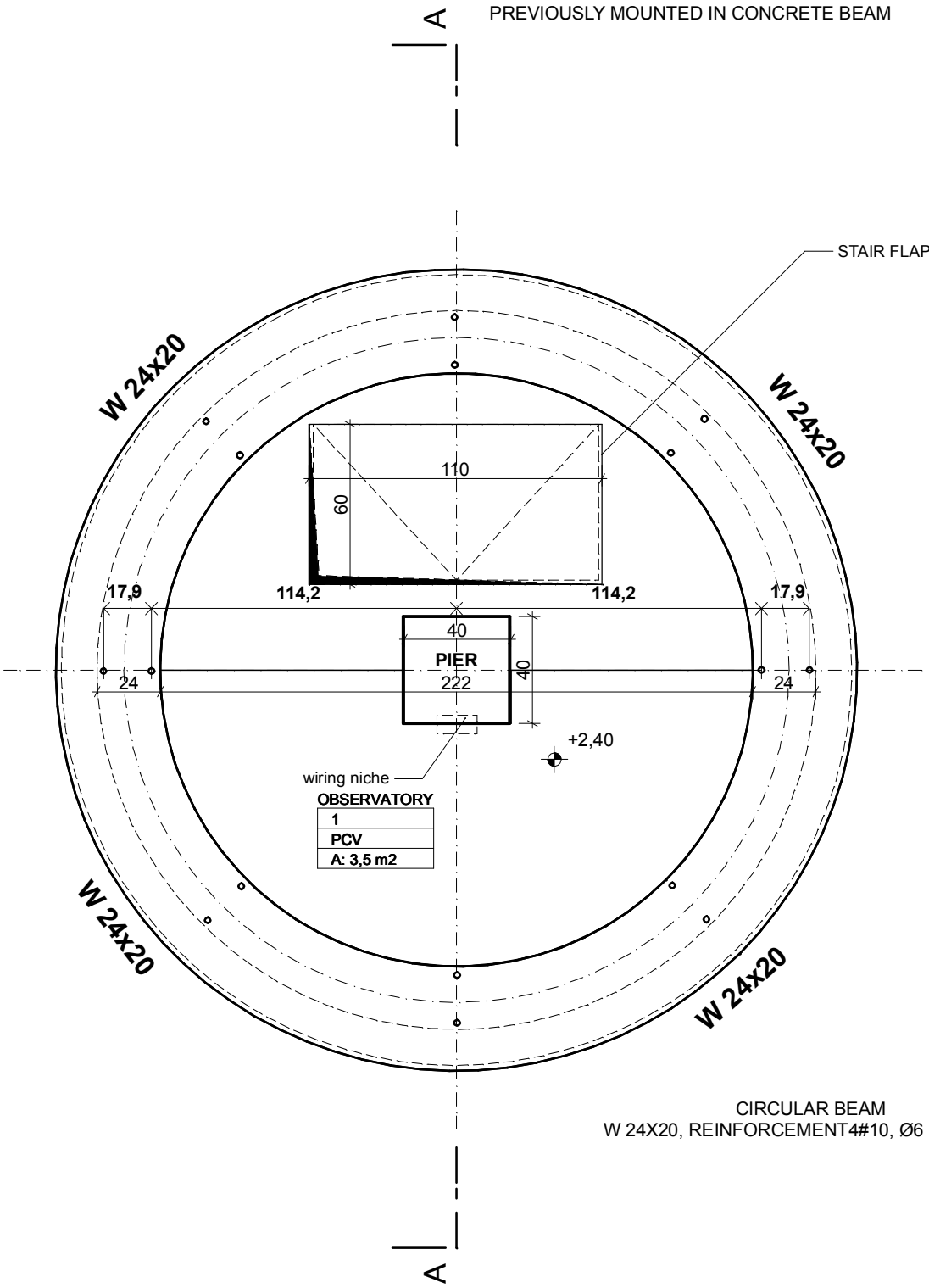
ANCHOR A DOME AT MIN. 6 POINTS OF WALLS
- RECOMMENDED - AT 8 POINTS.

PREMISSED ANCHOR TYPES:

1. PRECAST STRETCHER ANCHORS
   MINIMAL DIAMETER Ø10, MINIMAL ANCHOR DEPTH 15cm.
2. SYSTEM PRECAST HILTI CONCRETE ANCHORS
   HY 150+HAS-E M10x90/21
3. STEEL ANCHORS MADE OF SCREWED ROD Ø10-12,
   PREVIOUSLY MOUNTED IN CONCRETE BEAM



CIRCULAR BEAM
W 24X20, REINFORCEMENT4#10, Ø6 each 30cm

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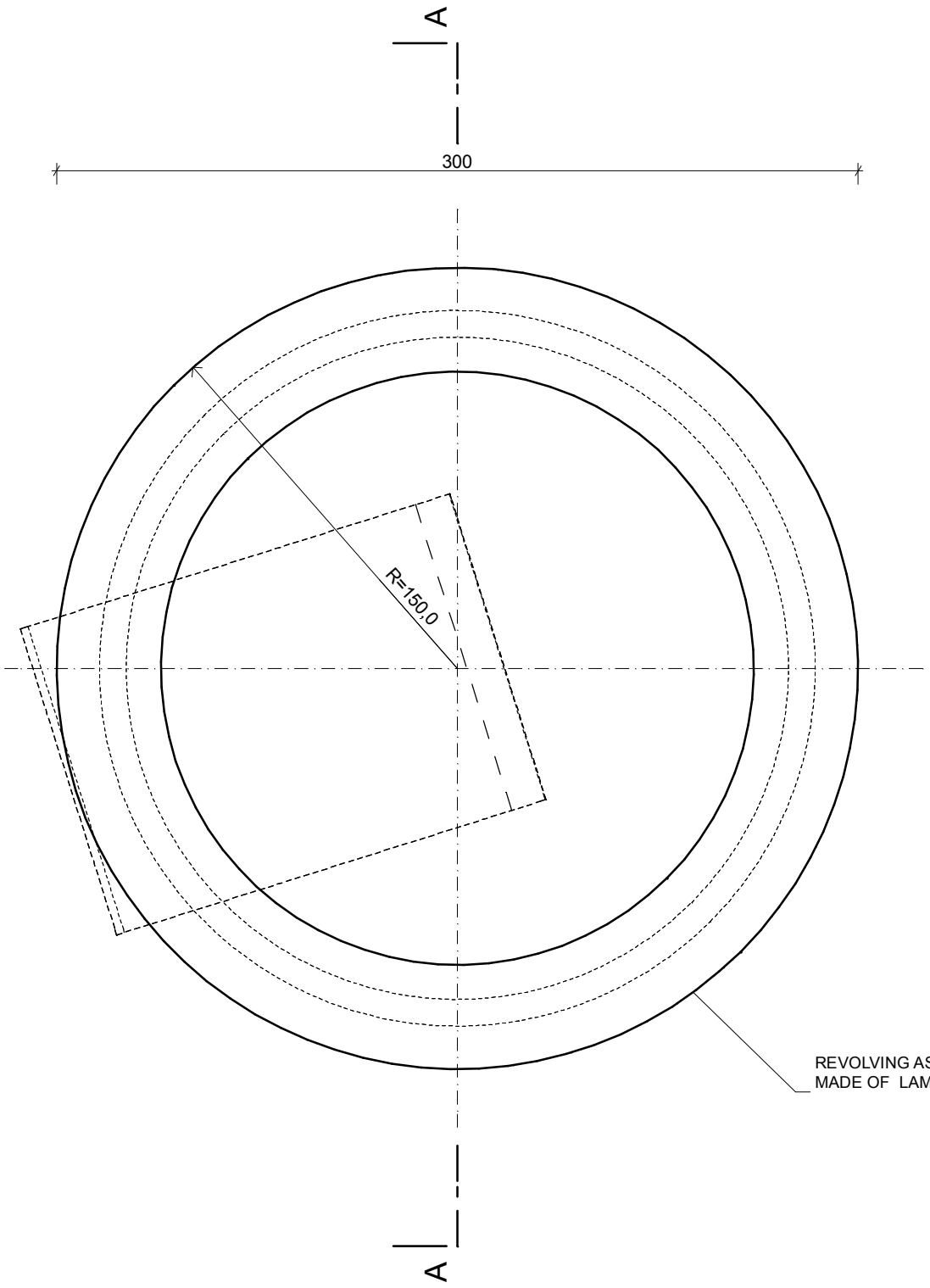

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STRUCTURE:				01/2009	1:25
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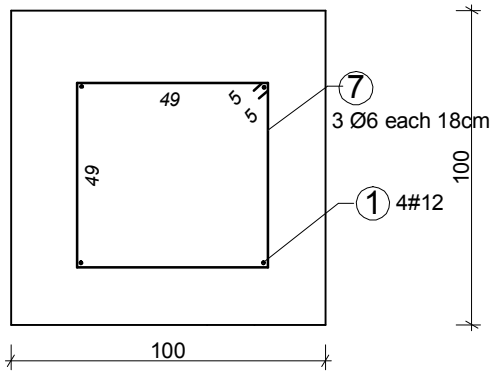
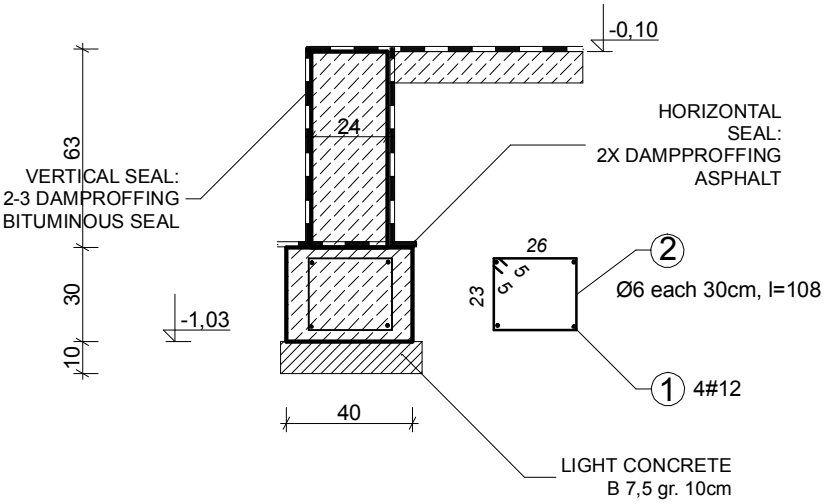
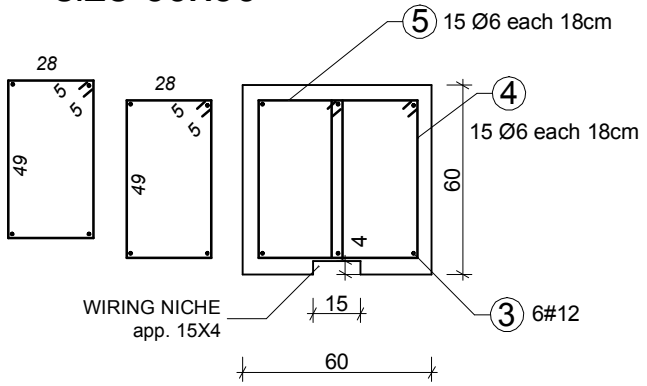
column (pier) spot footing 100x100X60



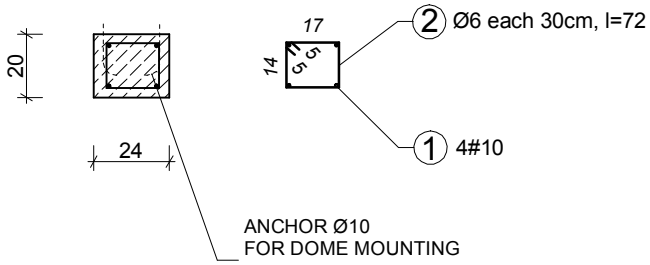
strip foundation size 30x40



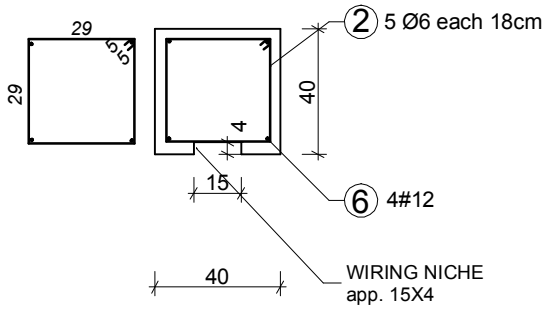
column (pier) bottom part size 60x60



circular beam W size 24x20



column (pier) upper part size 40x40



SYMB.	reinforcement rod		shape	Steel
1	4#12	l=1330	20 1310	A-III
2	5 Ø6	l=126	29 29	A-0
3	6#12	l=2600	2600	A-III
4	15 Ø6	l=164	28 49	A-0
5	15 Ø6	l=164	28 49	A-0
6	4#12	l=1464	14 1450	A-III
7	3 Ø6	l=206	49 49	A-0

CONCRETE B20
STEEL A-III (34GS)
A-0 (St0S)

ARCHITECTURE:	arch.Aleksandra Narkowicz-Pala		CONSTRUCTION DETAILS	DATE: 01/2009 — 6 — 1:25
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				ARCH-STRUCTURE ELECTRICITY

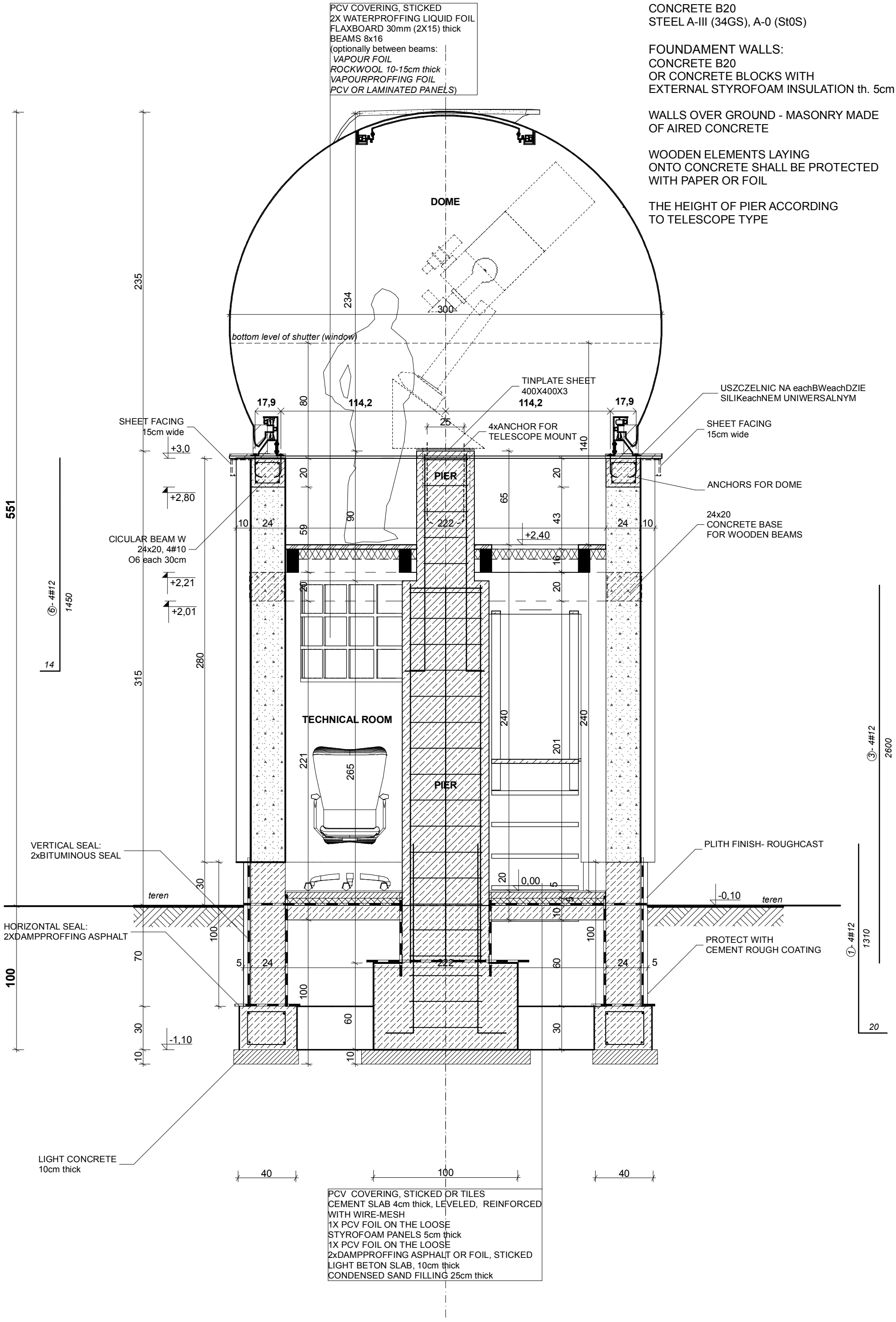
FOUNDAMENT STRIPS AND SPOT FOOTING:
CONCRETE B20
STEEL A-III (34GS), A-0 (St0S)

FOUNDAMENT WALLS:
CONCRETE B20
OR CONCRETE BLOCKS WITH
EXTERNAL STYROFOAM INSULATION th. 5cm

WALLS OVER GROUND - MASONRY MADE
OF AIRED CONCRETE

WOODEN ELEMENTS LAYING
ONTO CONCRETE SHALL BE PROTECTED
WITH PAPER OR FOIL

THE HEIGHT OF PIER ACCORDING
TO TELESCOPE TYPE



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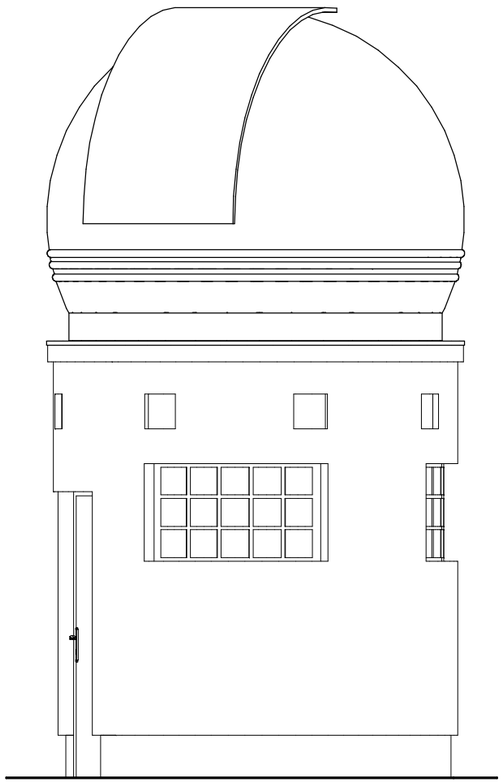
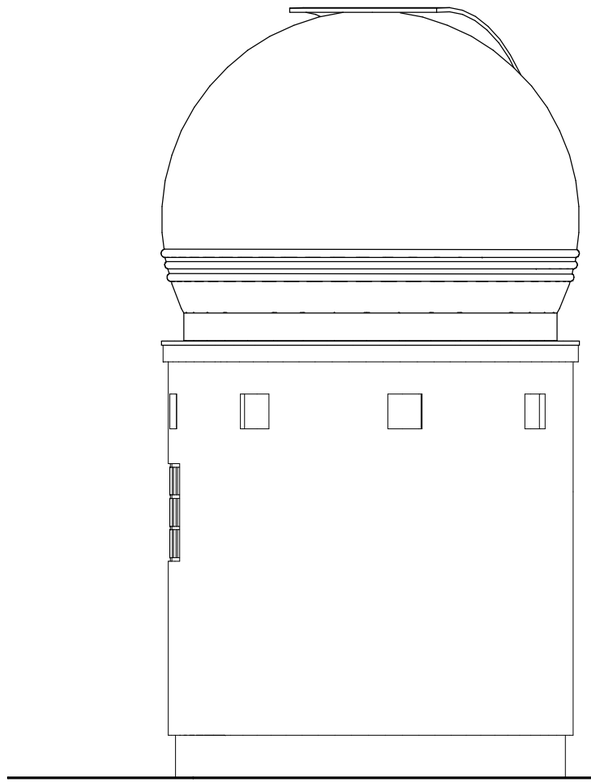
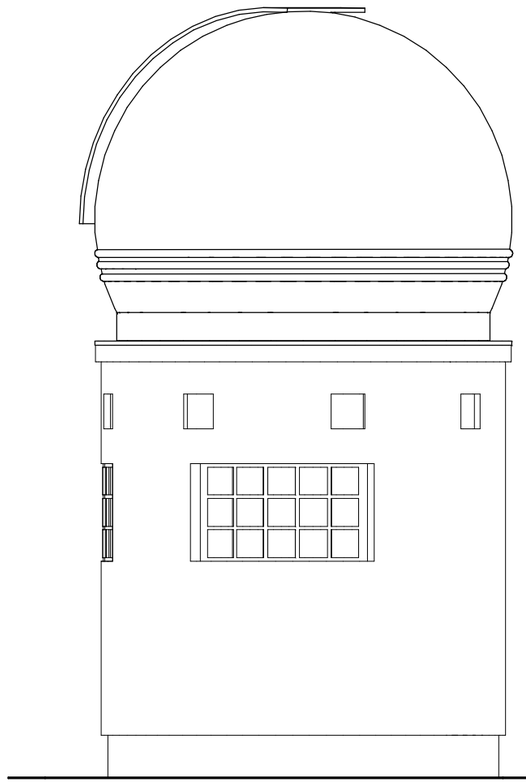


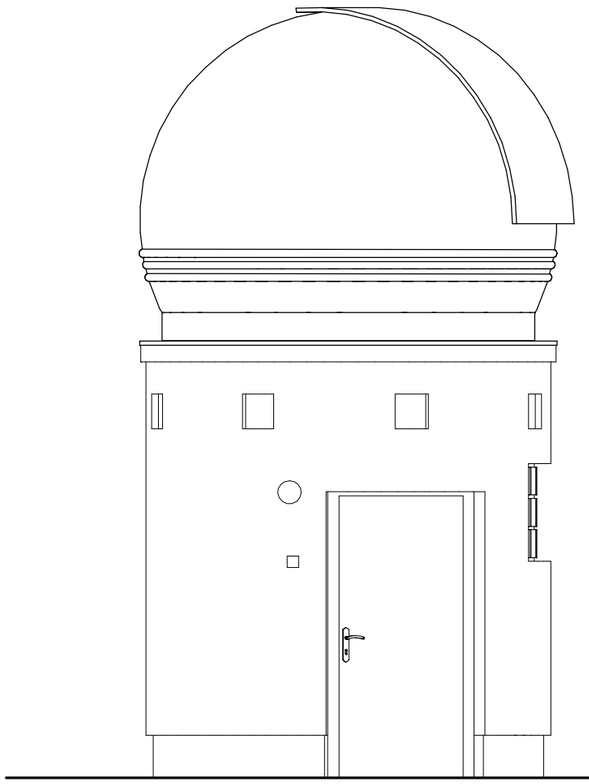
SIDE VIEW



SIDE VIEW



BACK VIEW



FRONT VIEW

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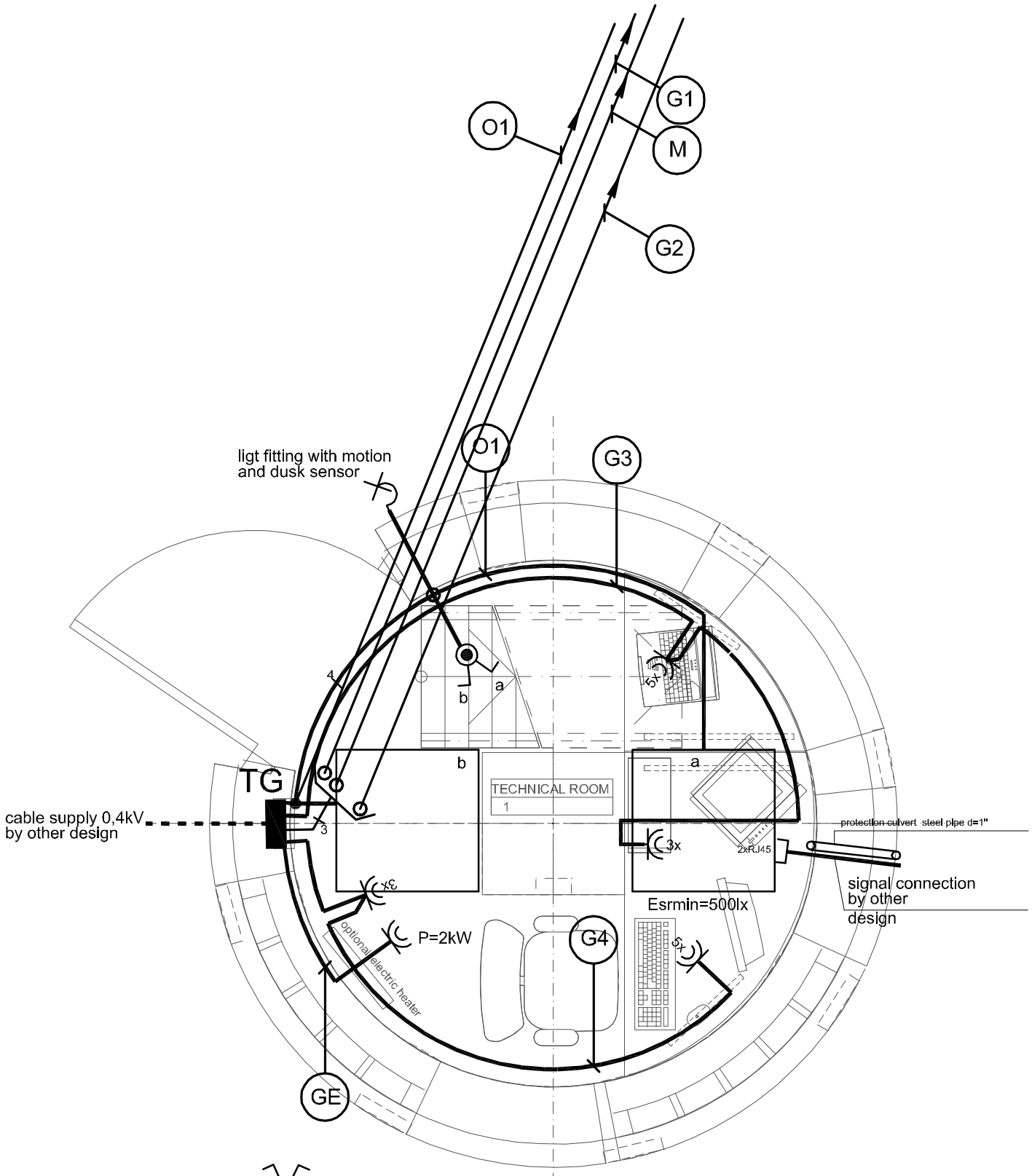


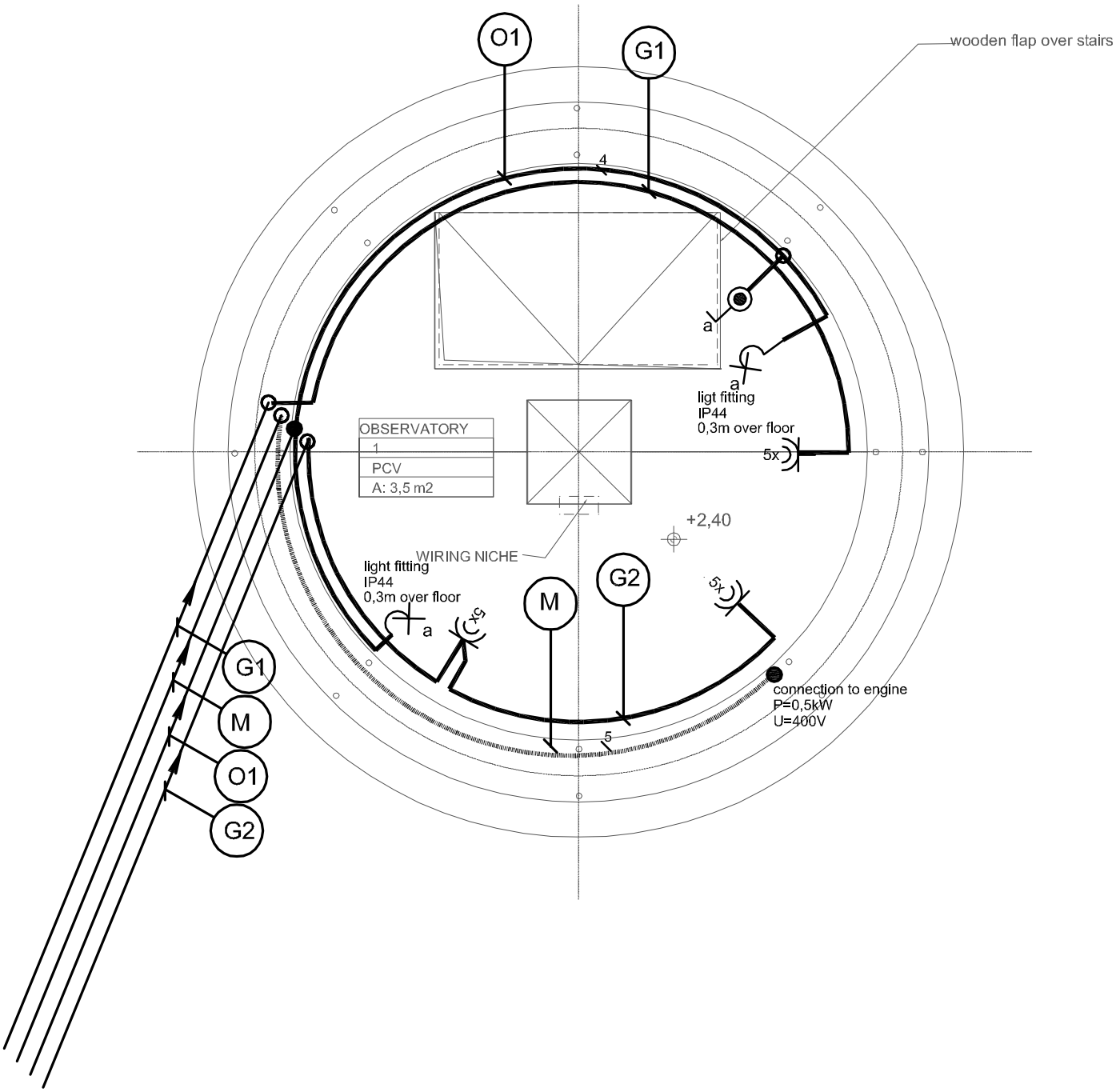
- candle stick connector
- connector, 1-polar
- x5 — 5 outlets - 0,9m over floor
- x3 — 3 outlets - 0,9m over floor
- heater socket - 0,3m over floor
- candle stick- ligt fitting IP44
- light fitting 4x18W (min. IP23)

			GROUND FLOOR electrical installations	DATE: 01/2009 — 9 — 1:25
			OBSERVATORY	CONSTRUCTION DESIGN
ELECTRICITY	electr.eng Zbigniew Wójcik			ELECTRICITY
license no	AN 8346/172/86, POM/IE/5424/01			

connector, 1-polar

x5 5 outlets - 0,3m over floor

candle stick- ligt fitting IP44, placed 0,3m over floor



			DOME LEVEL electrical installations	DATE: 10
				01/2009 1:25
			OBSERVATORY	CONSTRUCTION DESIGN
ELECTRICITY	electr.eng Zbigniew Wójcik			ELECTRICITY
license no	AN 8346/172/86, POM/IE/5424/01			