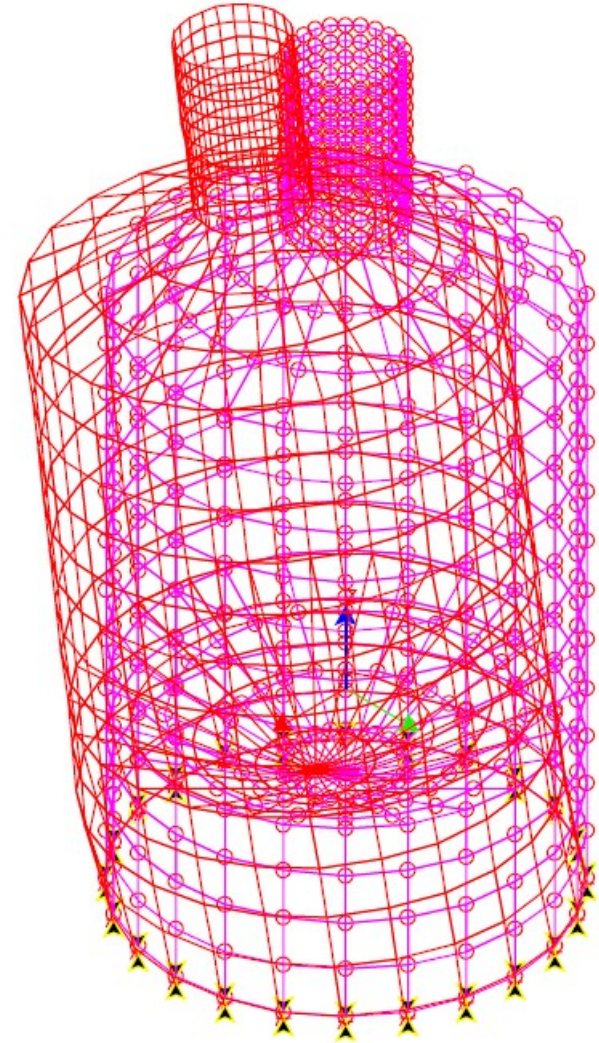
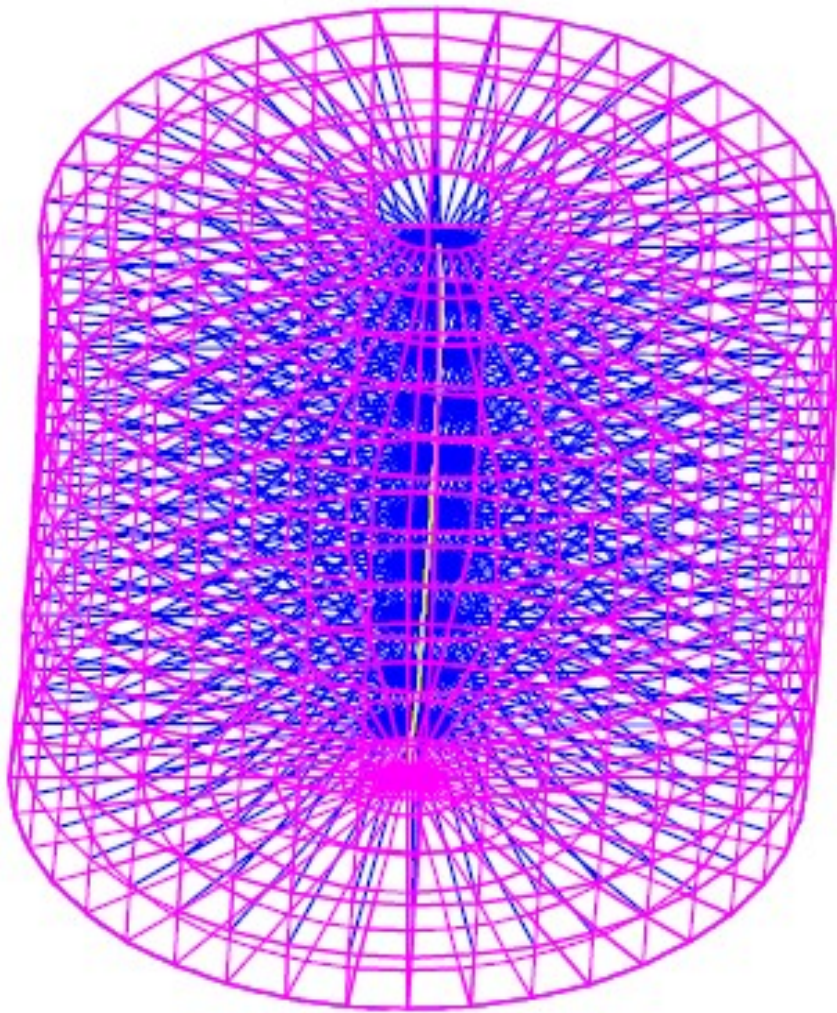
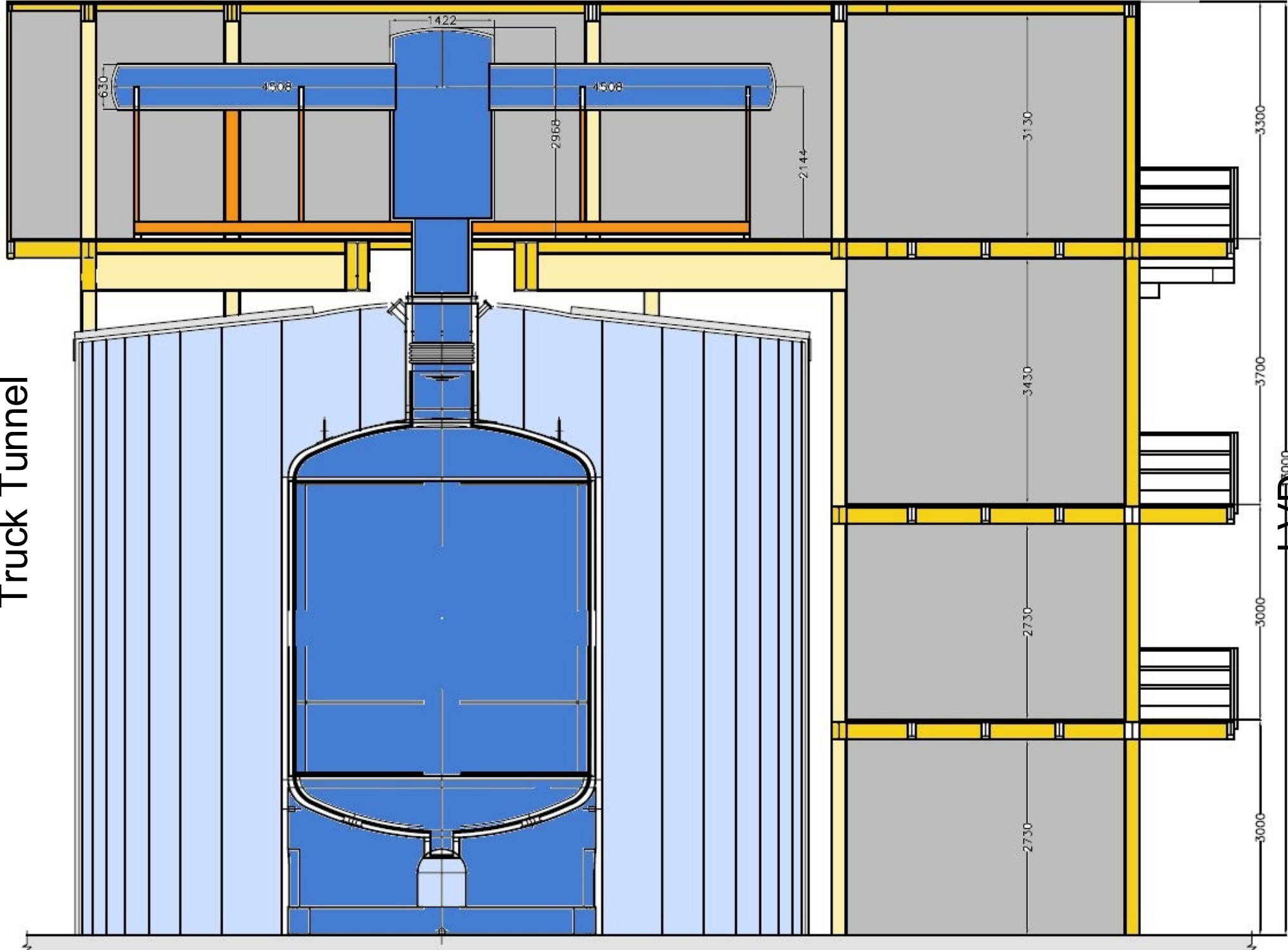


Gerda Superstructure and Seismic Analysis



Truck Tunnel



LVD

3300

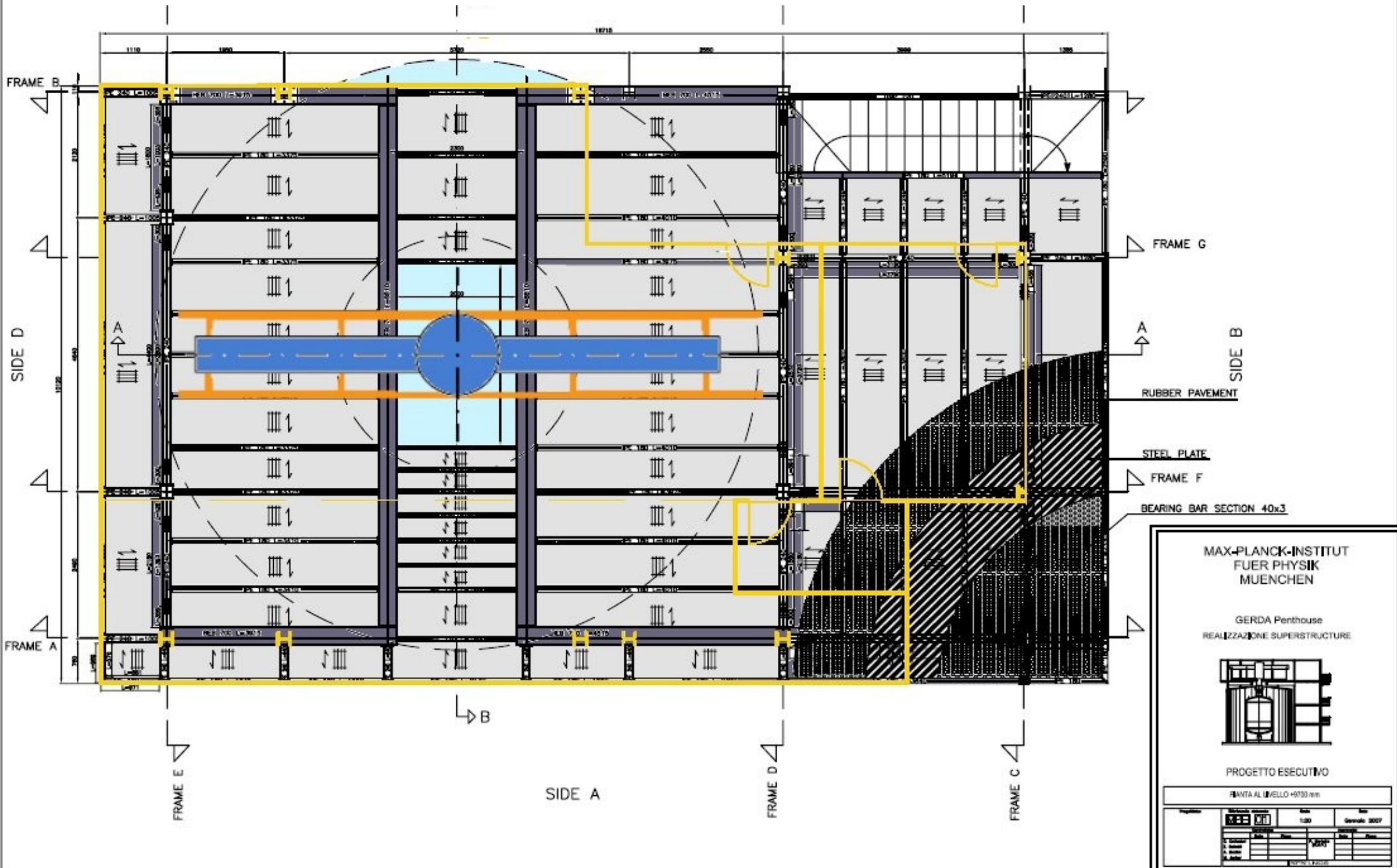
3700

3000

3000

3000

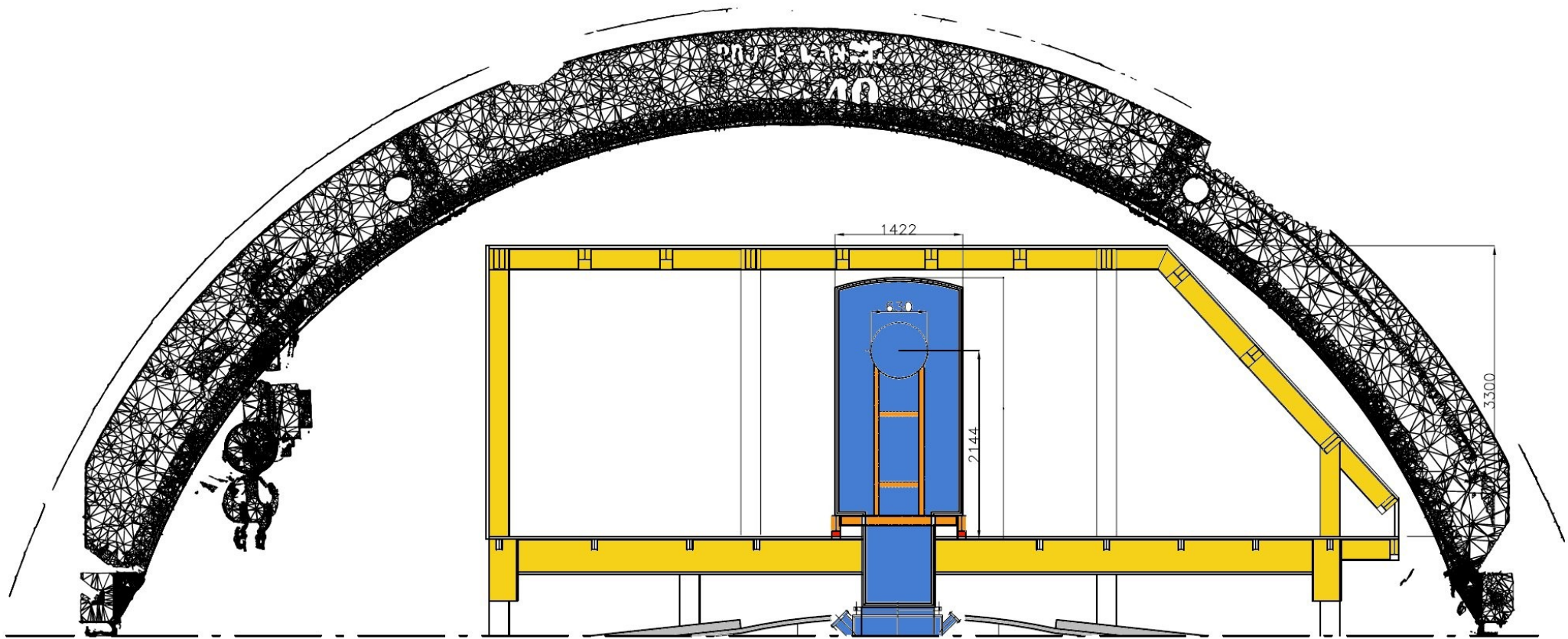
Platform with Cleanroom and Lock



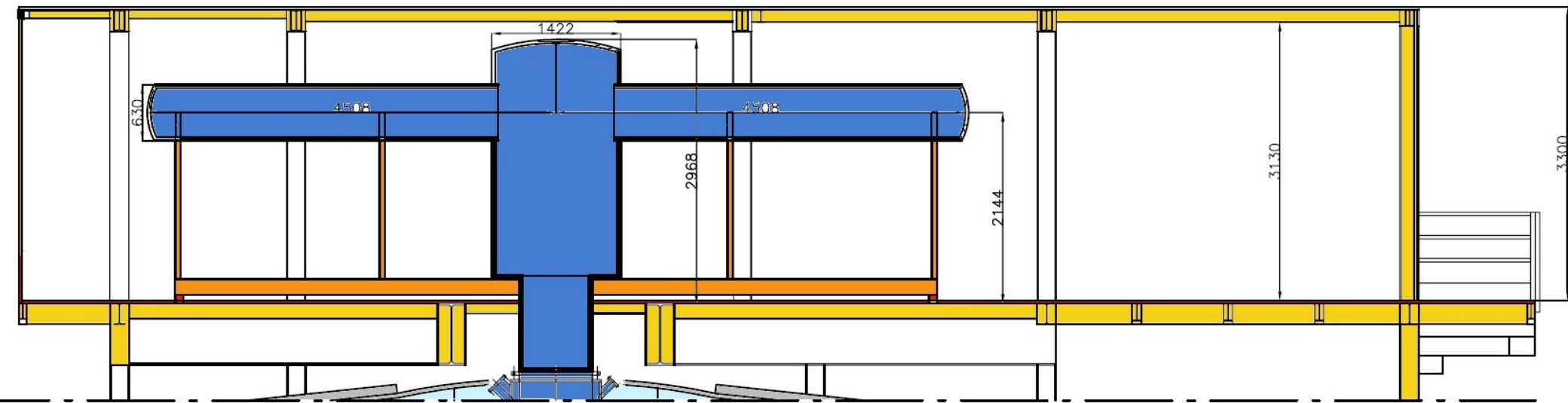
12.012007 Gerda Meeting
Schloss Ringberg

Matthias Junker
Laboratori Nazionali del Gran Sasso

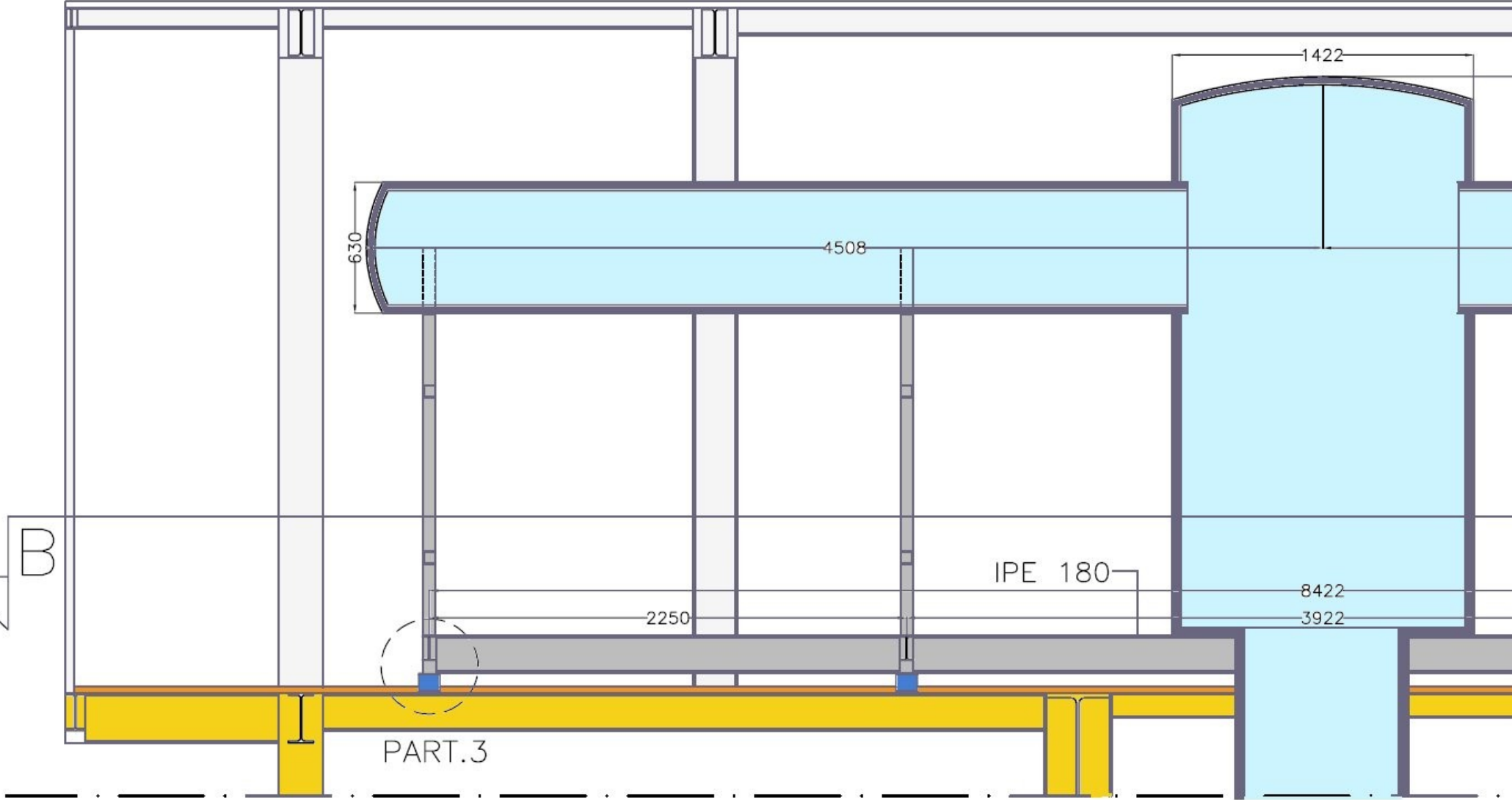
Section of Penthouse with Crane



Lock in the Cleanroom with Support

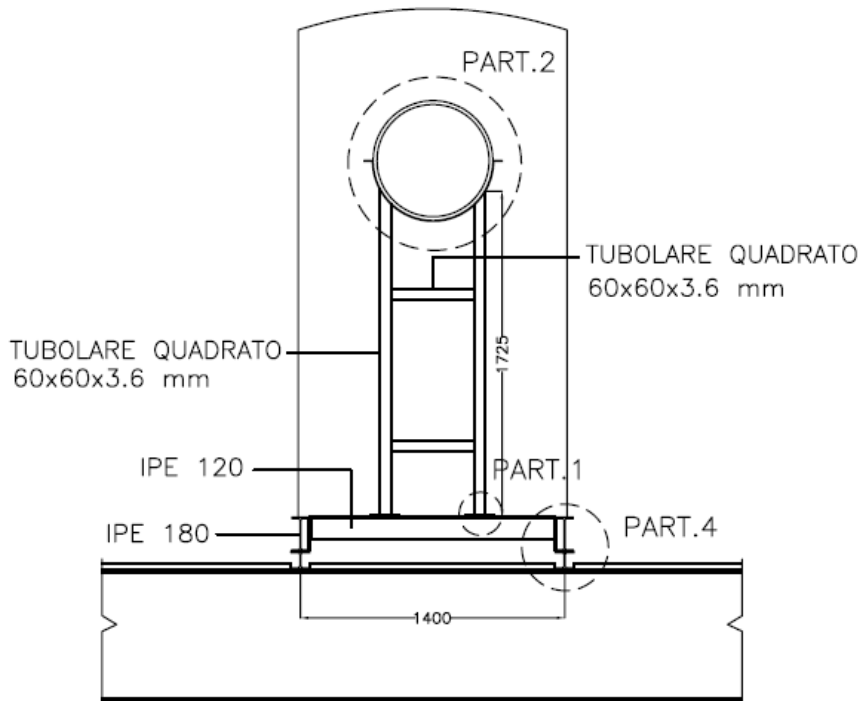


Support Details



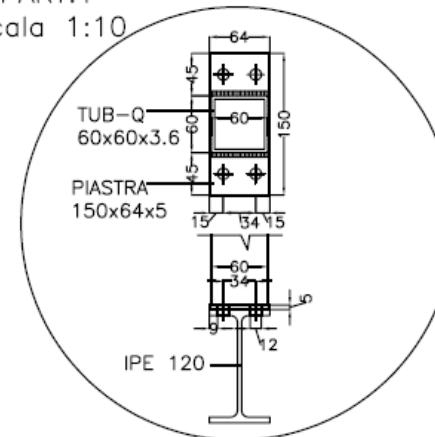
Lock Fixation... Details

SEZIONE C-C
Scala 1:50

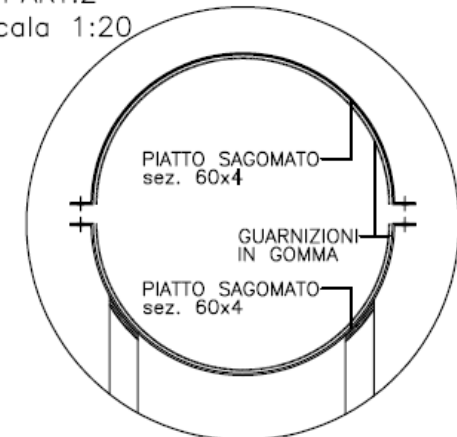


PARTICOLARI

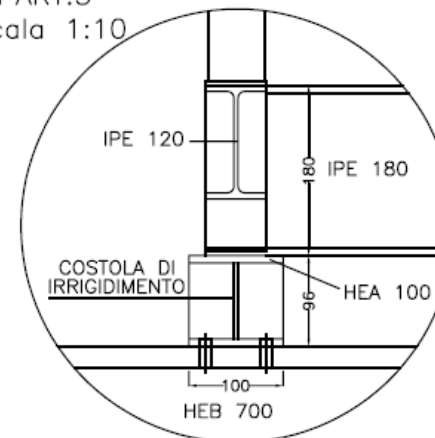
PART.1
Scala 1:10



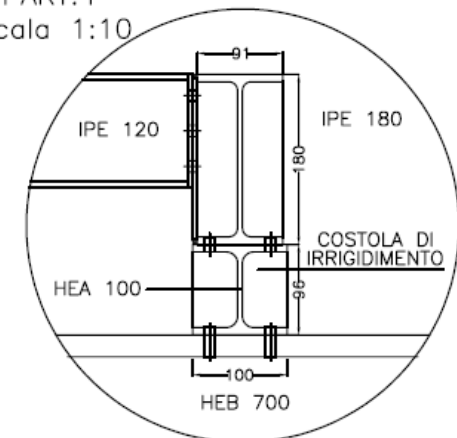
PART.2
Scala 1:20



PART.3
Scala 1:10



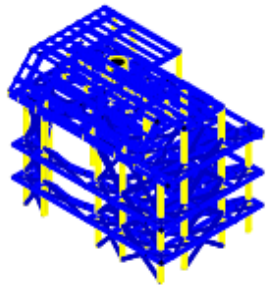
PART.4
Scala 1:10



Seismic Analysis

**MAX-PLANCK-INSTITUT
FUER PHYSIK
MUENCHEN**

GERDA Experiment
ANALISI SISMICA DEL SISTEMA STRUTTURALE

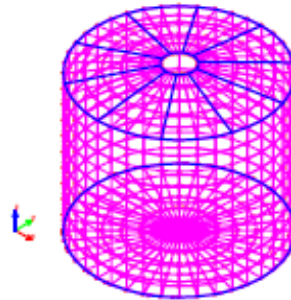


SINTESI ANALISI SISMICA SUPERSTRUCTURE

Consulente:
Ing. Giuseppe Pace

**MAX-PLANCK-INSTITUT
FUER PHYSIK
MUENCHEN**

GERDA Experiment
ANALISI SISMICA DEL SISTEMA STRUTTURALE

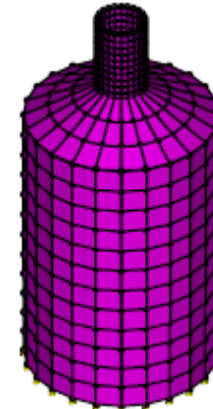


SINTESI ANALISI SISMICA WATER TANK

Consulente:
Ing. Giuseppe Pace

**MAX-PLANCK-INSTITUT
FUER PHYSIK
MUENCHEN**

GERDA Experiment
ANALISI SISMICA DEL SISTEMA STRUTTURALE

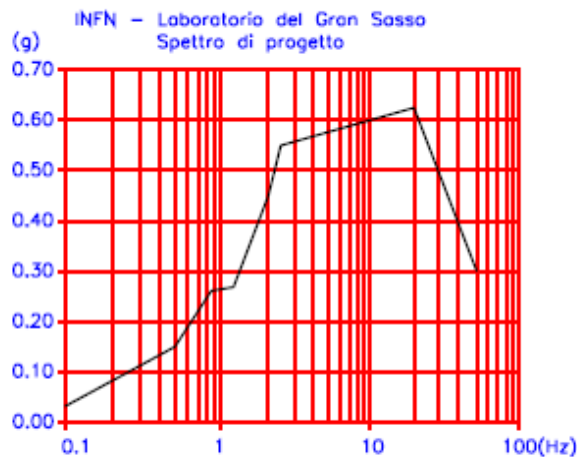


SINTESI ANALISI SISMICA CRIOSTATO

Consulente:
Ing. Giuseppe Pace

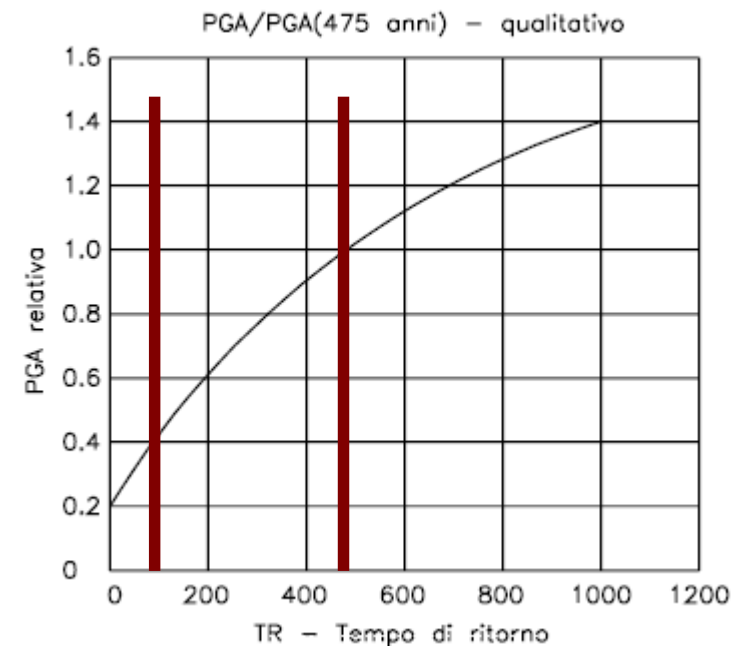
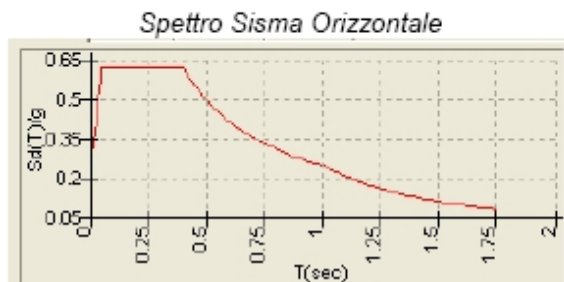
Seismic Analysis (2)

Per il progetto si utilizza lo spettro di risposta al sisma di "Faccioli" che viene di seguito riportato in grafico.



Nello spettro di risposta del programma di calcolo vengono inseriti i seguenti valori per un Tempo di Ritorno di 475 anni:

TB	=	0.05	
TC	=	0.40	
TD	=	1.00	
q	=	1	(coeff. di struttura)



Seismic Analysis Superstructure

PESO PROPRIO DELLA STRUTTURA

Determinato automaticamente dal programma di calcolo in base ai profilati utilizzati per i vari elementi strutturali.

Peso specifico acciaio = 7850 daN /m³

PRIMO E SECONDO SOLAIO:

Permanenti

Grigliato 25x3 = 45 daN /m²

Lamina in acciaio = 40 daN /m²

Pavimento in gomma = 15 daN /m²

TOTALE PERMANENTI 100 daN /m²

Accidentali

Carico accidentale sui solai = 600 daN /m²

Carico accidentale sui ballatoi e sulla scala = 400 daN /m²

TERZO SOLAIO

Permanenti

Grigliato 25x3 = 45 daN /m²

Lamina in acciaio = 40 daN /m²

Pavimento in gomma = 15 daN /m²

Tramezzature, arredi ecc. = 200 daN /m²

TOTALE PERMANENTI 300 daN /m²

Accidentali

Carico accidentale sui solai = 300 daN /m²

Carico accidentale sui ballatoi e sulla scala = 400 daN /m²

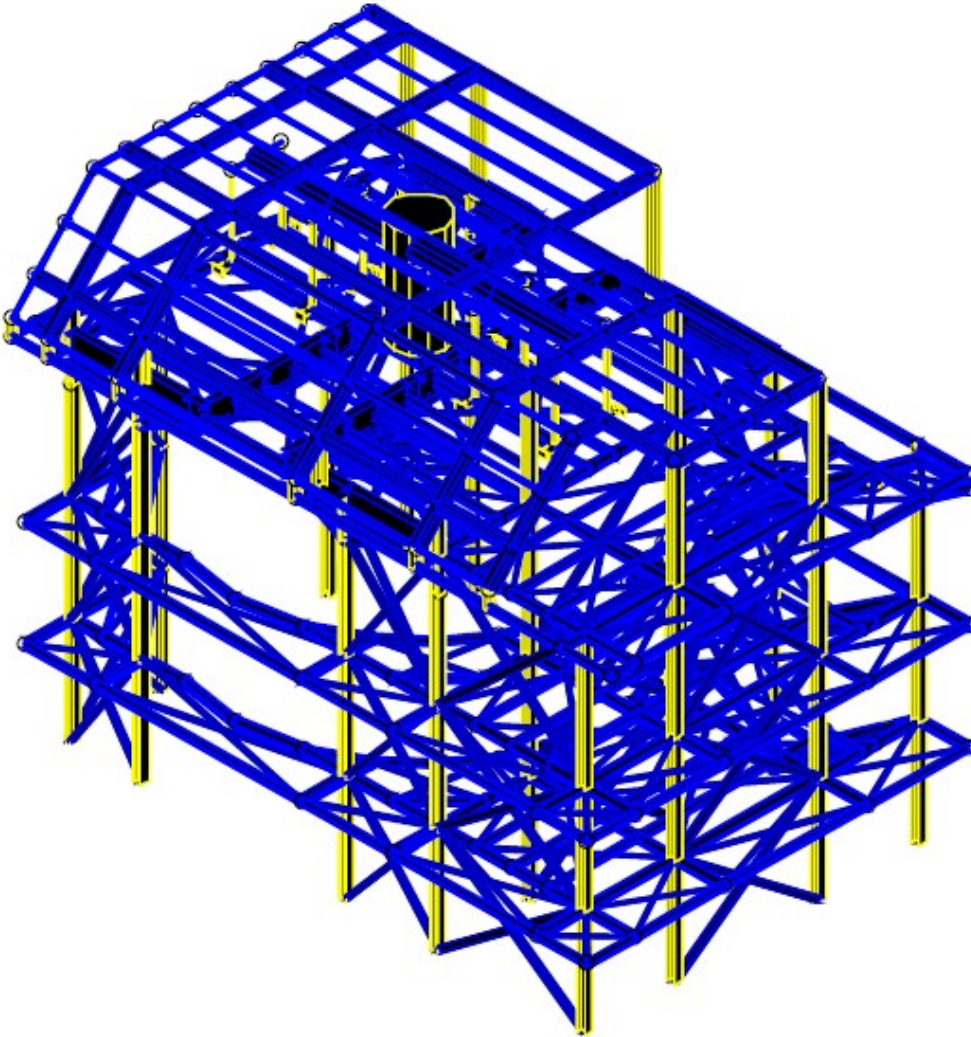
SOLAIO DI COPERTURA:

Permanenti

Pannelli di chiusura = 30 daN /m²

Accidentali

Carico accidentale = 100 daN /m²



Cond	Peso proprio	Permanenti	Accidentali	Permanenti clear room	Accidentali clear room	Permanenti su copertura	Accidentali su copertura	Sisma 0°	Sisma 90°	Sisma 180°	Sisma 270°	Sisma -1 (verticale)c
Comb	Coefficienti moltiplicativi della condizione per le varie combinazioni											
Statica	1.4000	1.4000	1.5000	1.4000	1.5000	1.4000	1.5000	0.0000	0.0000	0.0000	0.0000	0.0000
0 / 90 -1	1.0000	1.0000	0.5000	1.0000	0.3000	1.0000	0.0000	1.0000	0.3000	0.0000	0.0000	0.3000
0 / 270 -1	1.0000	1.0000	0.5000	1.0000	0.0000	1.0000	0.3000	1.0000	0.0000	0.0000	0.3000	0.3000
90 / 0 -1	1.0000	1.0000	0.5000	1.0000	1.0000	1.0000	0.0000	0.3000	1.0000	0.0000	0.0000	0.3000
90 / 180 -1	1.0000	1.0000	0.5000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000	0.3000	0.0000	0.3000
180 / 90 -1	1.0000	1.0000	0.5000	1.0000	0.3000	1.0000	0.0000	0.0000	0.3000	1.0000	0.0000	0.3000
180 / 270 -1	1.0000	1.0000	0.5000	1.0000	0.0000	1.0000	0.3000	0.0000	0.0000	1.0000	0.3000	0.3000
270 / 0 -1	1.0000	1.0000	0.5000	1.0000	0.0000	1.0000	1.0000	0.3000	0.0000	0.0000	1.0000	0.3000
270 / 180 -1	1.0000	1.0000	0.5000	1.0000	0.0000	1.0000	1.0000	0.0000	0.0000	0.3000	1.0000	0.3000
Verticale	1.0000	1.0000	0.5000	1.0000	0.3000	1.0000	0.0000	0.3000	0.3000	0.0000	0.0000	1.0000
Verticale	1.0000	1.0000	0.5000	1.0000	0.3000	1.0000	0.0000	0.3000	0.3000	0.0000	0.0000	-1.0000
Verticale	1.0000	1.0000	0.5000	1.0000	0.0000	1.0000	0.3000	0.3000	0.0000	0.0000	0.3000	1.0000
Verticale	1.0000	1.0000	0.5000	1.0000	0.0000	1.0000	0.3000	0.3000	0.0000	0.0000	0.3000	-1.0000
Verticale	1.0000	1.0000	0.5000	1.0000	0.3000	1.0000	0.0000	0.0000	0.3000	0.3000	0.0000	1.0000
Verticale	1.0000	1.0000	0.5000	1.0000	0.3000	1.0000	0.0000	0.0000	0.3000	0.3000	0.0000	-1.0000
Verticale	1.0000	1.0000	0.5000	1.0000	0.0000	1.0000	0.3000	0.0000	0.0000	0.3000	0.3000	1.0000
Verticale	1.0000	1.0000	0.0000	1.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.3000	0.3000	-1.0000

Tempo di ritorno 475 anni

SPOSTAMENTI ALLA BASE DEL LOCK

Comb.	Ux [mm]	Uy [mm]	Uz [mm]	Rx [°]	Ry [°]	Rz [°]	
1	0.028	-0.480	-11.261	0.01	0.02	0.00	Statica
2	11.270	6.443	-7.118	-0.00	-0.03	-0.03	0 / 90 -1
3	9.503	-1.951	-6.780	0.00	-0.03	-0.01	0 / 270 -1
4	5.988	14.436	-8.444	-0.01	0.01	-0.03	90 / 0 -1
5	-0.306	12.912	-8.612	-0.01	0.04	-0.02	90 / 180 -1
6	-9.710	1.361	-7.679	0.00	0.06	0.01	180 / 90 -1
7	-11.477	-7.033	-7.341	0.01	0.05	0.03	180 / 270 -1
8	0.098	-13.542	-7.317	0.02	-0.01	0.03	270 / 0 -1
9	-6.196	-15.067	-7.486	0.02	0.01	0.04	270 / 180 -1
10	3.723	4.408	-10.104	0.00	0.01	-0.01	Verticale
11	4.306	5.140	-2.134	-0.00	-0.01	-0.02	Verticale
12	1.956	-3.986	-9.766	0.01	0.00	0.01	Verticale
13	2.539	-3.253	-1.796	0.00	-0.02	-0.00	Verticale
14	-2.571	2.883	-10.272	0.00	0.03	0.00	Verticale
15	-1.988	3.616	-2.302	-0.00	0.01	-0.01	Verticale
16	-4.338	-5.511	-9.934	0.01	0.03	0.02	Verticale
17	-3.787	-4.680	-1.874	0.00	0.01	0.01	Verticale

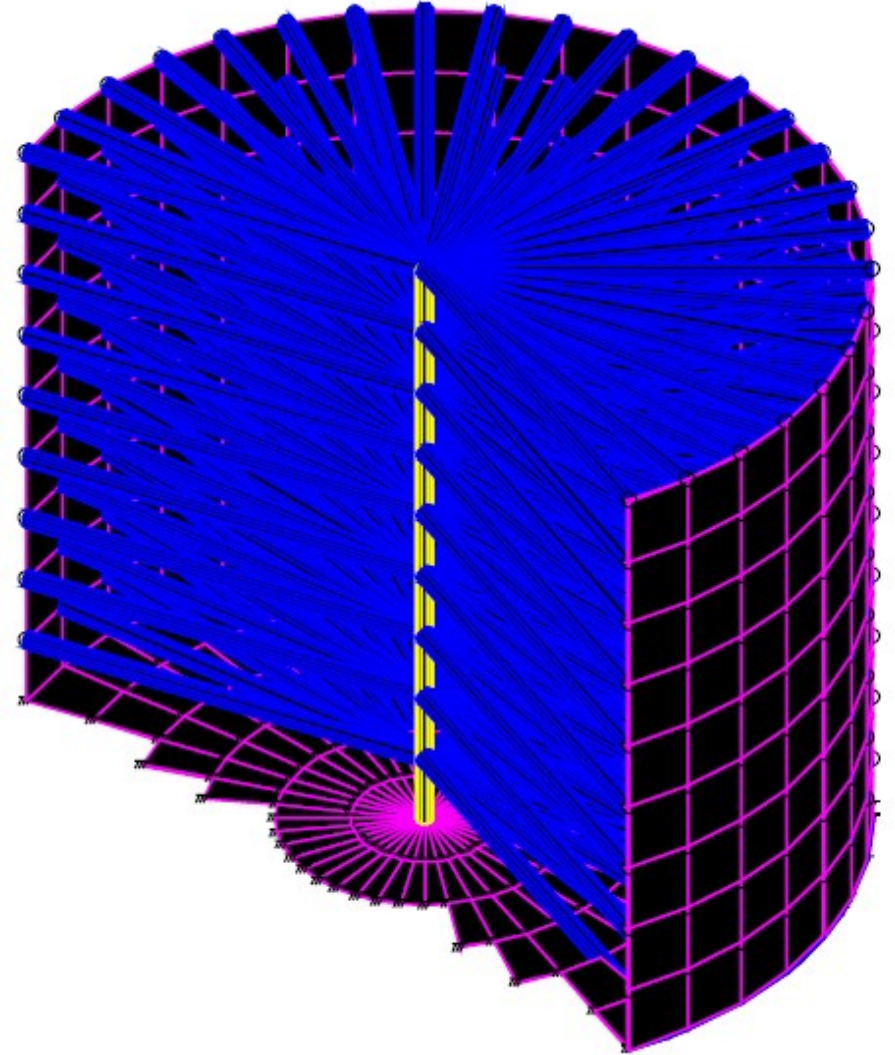
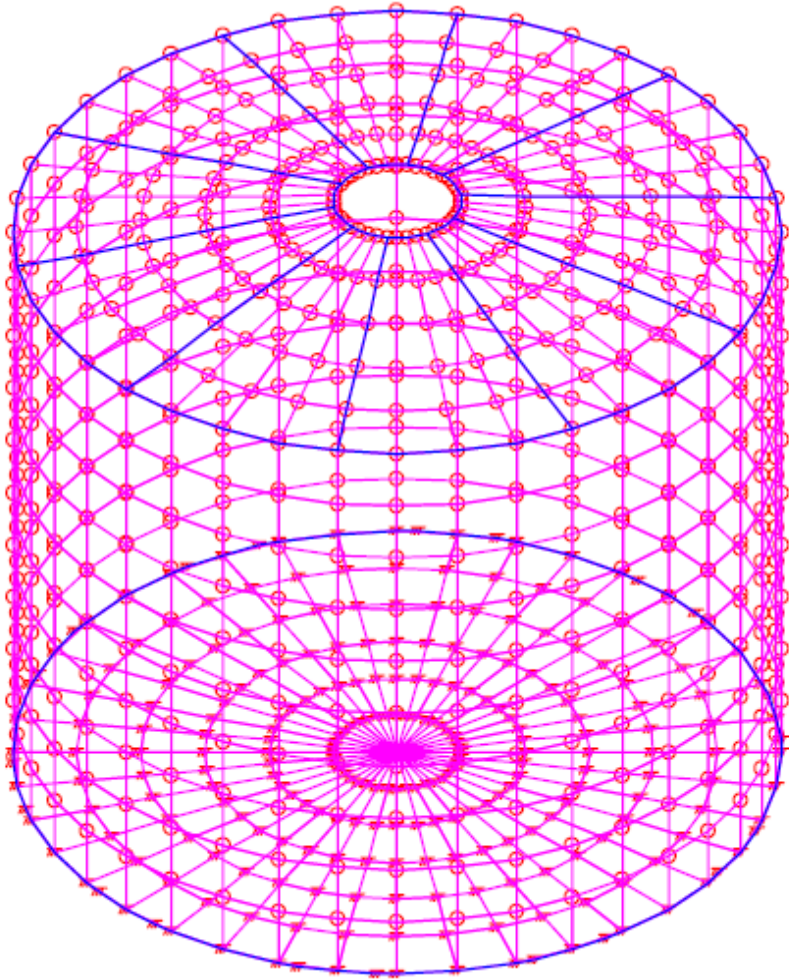
Spostamento massimo:

Comb 9: $U = \sqrt{U_x^2 + U_y^2} = \sqrt{6.196^2 + 15.067^2} = 16.291 \text{ mm}$

Comb 9: $U = \sqrt{U_x^2 + U_y^2} = \sqrt{2.490^2 + 6.144^2} = 6.629 \text{ mm}$

Tempo di ritorno 100 anni

Seismic Analysis- Water Tank



Seismic Analysis – Watertank: Results)

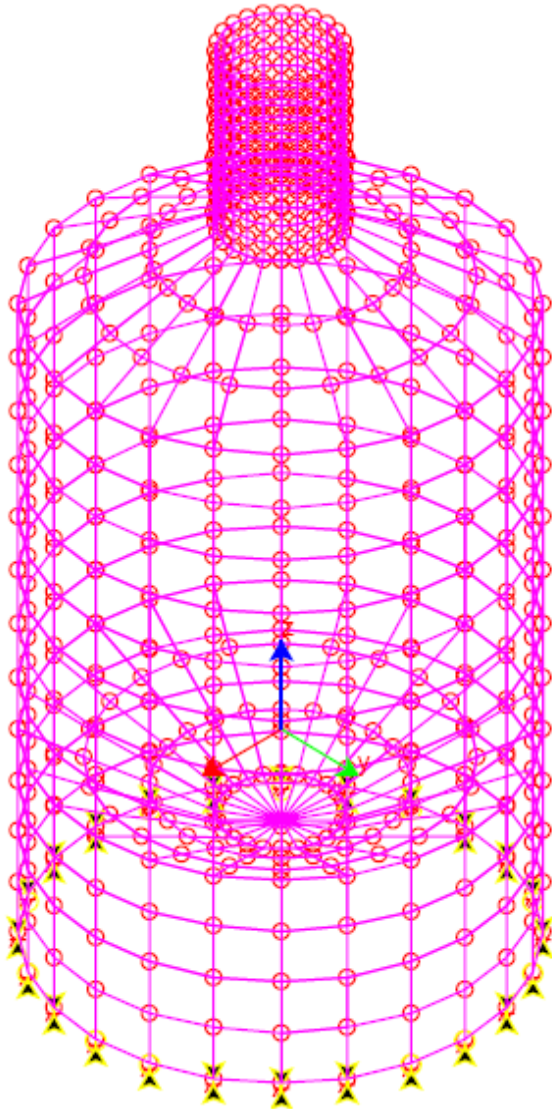
TR 475 anni

Cond	Peso proprio (serbatoio + acqua + criostato)	Spinta idro sulle pareti	Sisma idro sul fondo	Sisma 0	Sisma 90	Sisma 180	Sisma 270
Comb	Coefficienti moltiplicativi della condizione per le varie combinazioni						
1	1.4000	1.4000	1.4000	0.0000	0.0000	0.0000	0.0000
2	1.0000	0.0000	0.0000	1.0000	0.3000	0.0000	0.0000
3	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.3000
4	1.0000	0.0000	0.0000	0.3000	1.0000	0.0000	0.0000
5	1.0000	0.0000	0.0000	0.0000	1.0000	0.3000	0.0000
6	1.0000	0.0000	0.0000	0.0000	0.3000	1.0000	0.0000
7	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.3000
8	1.0000	0.0000	0.0000	0.3000	0.0000	0.0000	1.0000
a	1.0000	0.0000	0.0000	0.0000	0.0000	0.3000	1.0000

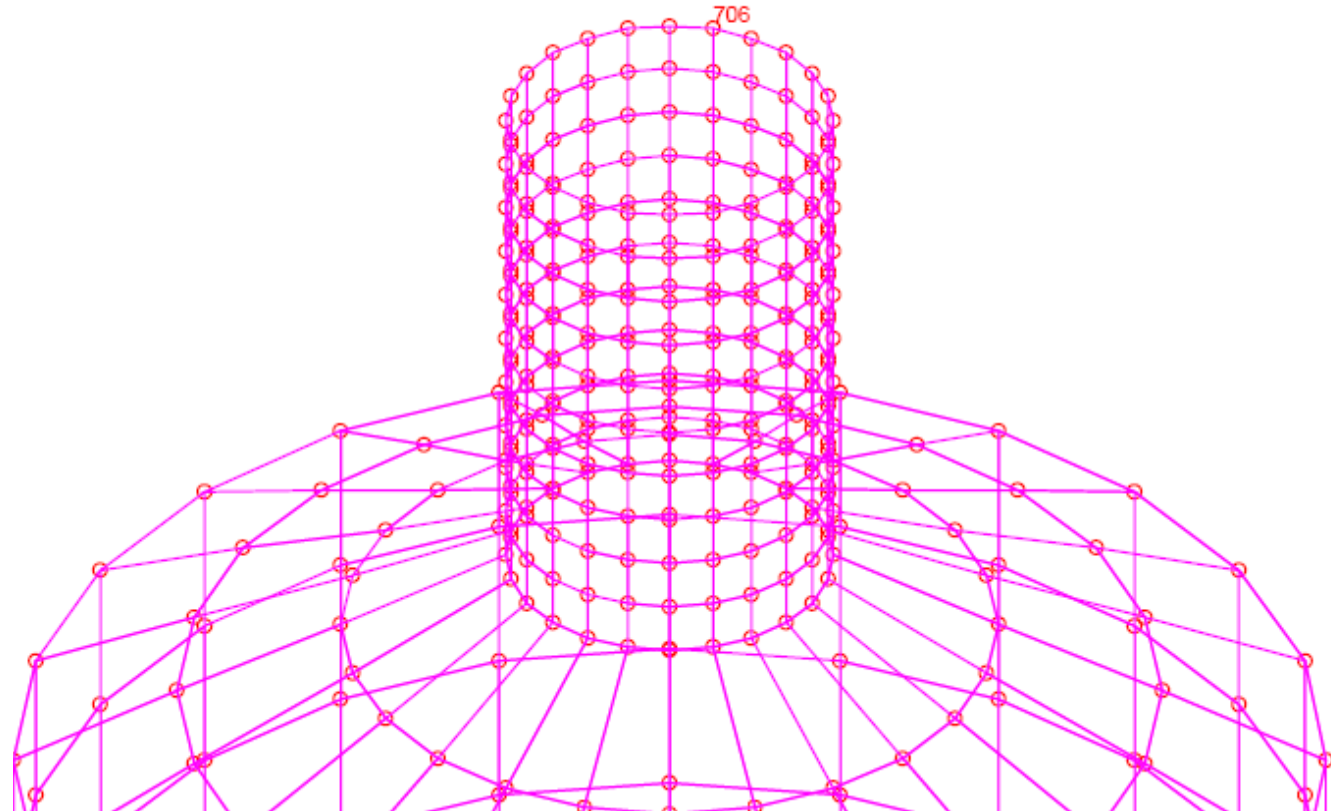
Spostamento massimo:

$$\text{Comb 2: } U = \sqrt{U_x^2 + U_y^2} = \sqrt{3.564^2 + 1.037^2} = 3.712 \text{ mm}$$

Seismic Analysis - Cryostat



$$U = \sqrt{U_x^2 + U_y^2} = \sqrt{1,132^2 + 0,339^2} = 1,182 \text{ mm}$$



Reassuming of Seismic Analysis

- Displacements of
 - Top of Cryostat: +/- 1,182 mm
 - Top of Watertank: +/- 3,712 mm
 - Lock on Superstructure: +/- 16,291 (6,629) mm
- Compensator between Lock and Cryostat (HKS GmbH Hamburg)
 - lateral flexibility: +/- 20 mm
 - axial flexibility: +/- 80 mm
 - axial 73 N/mm, lateral 268 N/mm, Tol. +/- 20%