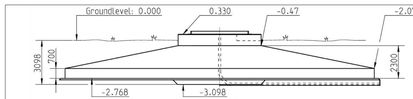
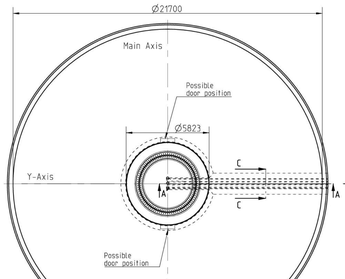
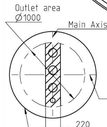


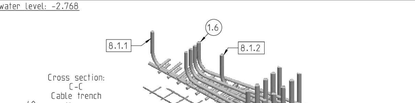


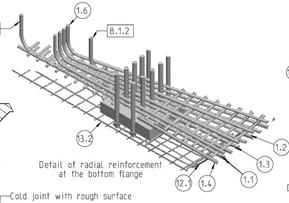


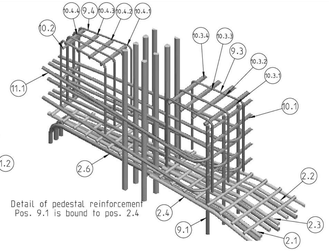
Foundation top view:

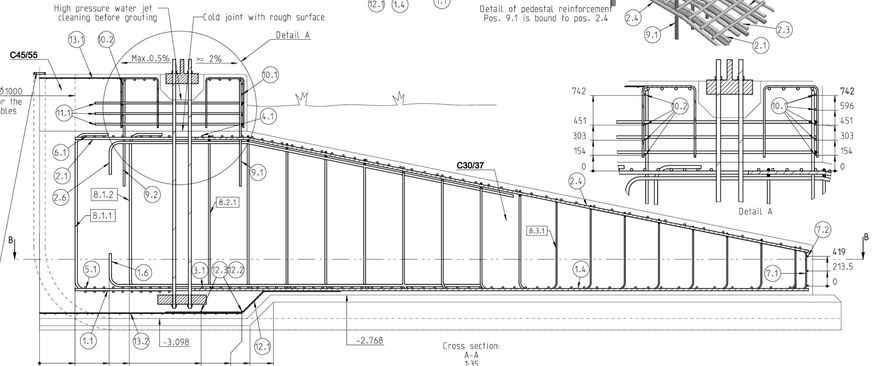
Topview: Piping detail at the pedestal
All cable outlets must be aligned with the Main Axis within the outlet area

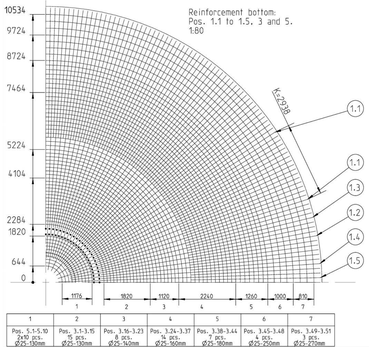
Max. tube height above top of concrete level: 25mm (see decription 0017-5653). Precaution to be taken to prevent damage of HV-cables (e.g. during tube cutting) and to prevent concrete / water intrusion into tubes.





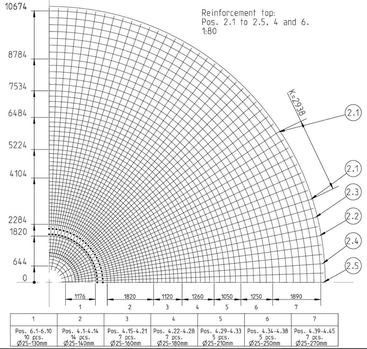






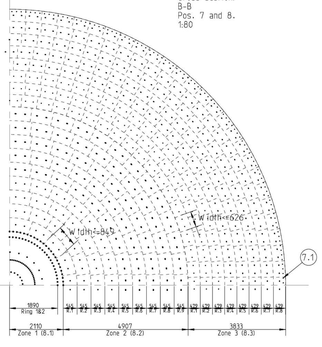
Reinforcement bottom:
Pos. 1.1 to 1.5, 3 and 5.
1:80

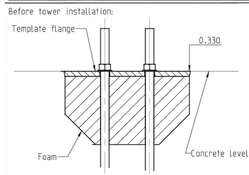
1	2	3	4	5	6	7
Pos. 1.1-5.10 2x10 pcs. Ø25 -130mm	Pos. 1.1-3.15 15 pcs. Ø25 -130mm	Pos. 1.16-3.23 8 pcs. Ø25 -140mm	Pos. 1.24-3.37 14 pcs. Ø25 -160mm	Pos. 1.38-3.44 7 pcs. Ø25 -180mm	Pos. 3.45-3.48 4 pcs. Ø25 -250mm	Pos. 3.49-3.51 3 pcs. Ø25 -270mm

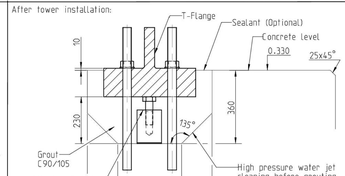


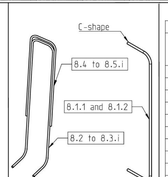
Reinforcement top:
Pos. 2.1 to 2.5, 4 and 6.
1:80

1	2	3	4	5	6	7
Pos. 6.1-6.10 10 pcs. Ø25 -130mm	Pos. 4.1-4.14 14 pcs. Ø25 -140mm	Pos. 4.15-4.21 7 pcs. Ø25 -160mm	Pos. 4.22-4.28 7 pcs. Ø25 -180mm	Pos. 4.29-4.33 5 pcs. Ø25 -250mm	Pos. 4.34-4.38 5 pcs. Ø25 -270mm	Pos. 4.39-4.45 7 pcs. Ø25 -270mm









Number and height of C-shaped bars, shear Locks and hair pins (see also Cut and Bending List)

	Zone 1 C-shape Ø32			Zone 2 Ø25				Zone 3 Ø16			
	Number	Pos.	C-shape Height	Number	Shear Locks Height Pos. 8.2.i		Hairpins Height Pos. 8.4.i	Number	Shear Locks Height Pos. 8.3.i		Hairpins Height Pos. 8.5.i
Ring 1	23	8.1.1	2212	18	1	2116	1	1476	73	1	1231	1	593
Ring 2	23	8.1.2	2212	22	2	2113	2	1476	78	2	1135	2	593
Ring 3	-	-		26	3	2003	3	1476	82	3	1038	3	593
Ring 4	-	-		30	4	1893	4	1476	87	4	942	4	593
Ring 5	-	-		34	5	1783	5	1476	92	5	845	5	593
Ring 6	-	-		38	6	1673	6	1476	97	6	748	6	593
Ring 7	-	-		42	7	1563	7	1476	102	7	652	7	593
Ring 8	-	-		46	8	1453	8	1405	106	8	555	8	580
Ring 9	-	-		50	9	1344	9	1295	0	-	-	-	-
Ring 10	-	-		0	-	-	-	-	0	-	-	-	-
Ring 11	-	-		0	-	-	-	-	0	-	-	-	-
Ring 12	-	-		0	-	-	-	-	0	-	-	-	-

Information for design approver:
Loads: 0074-8846, calculation: 0075-1449.V02

Soil condition to be fulfilled:
Assumed characteristic soil parameters: friction angle 30° or undrained shear strength 55 KN/m².
Min. density of soil 18 / 8 KN/m³, density of back filling 18 / 8 KN/m³.
Weight of backfilling is included in stability and shall not be removed.
Max. ground water level: 2.768 m under terrain
No drainage required.
Required rotational stiffness: min. 100 GNm/rad according to load report 0074-8846
Max. allowable filling of the foundation due to permanent settlements: 3 mm/m
Max. plastic design soil pressure: 193 KN/m², constant over substitute area, with a PSF of 1.35 on wind, 0.9 on tower weight and backfilling, 1.0 on foundation weight
Max. elastic soil pressure 223 KN/m² with PSF equal to 1.0 for all loads.
Soil investigations at the site shall be in accordance with EN 1997-1:2004, section 2-4, and must show compliance with the design assumption.

Specifications:
All works carried out acc. to EN 1992-1-1/AC:2010 Design of Concrete Structures, EN 1997-1/AC:2009" Geotechnical Design, general rules, EN 1997-2/AC:2010 Geotechnical Design, investigation and testing. General description: 0005-8491. Design life time: 20 years.

Anchor cage, approval drawing 0074-9532.V04:
The anchor cage incl. adjustment feet is provided by Vestas as loose parts or assembled.
The anchor cage shall be set upon the blinding layer and adjusted to the correct position vertically and horizontally by using the adjustment feet at the lower flange. During casting, which must be done simultaneously inside and outside the cage, great care must be taken to ensure that the cage does not displace and that the lower flange is in full contact with compacted concrete, below and above flange. Max. vertical deviation after concreting +/- 4 mm.
Weight of anchor cage, app. 19600 kg total.
Anchors shall be post tensioned according to approval drawing 0074-9532.V01

Concrete:
Concrete works acc. to EN 13670:2009 "Execution of concrete structures".
The concrete must be composed, mixed and prepared according to EN 206-1 in the strength class: C30/37 for plate, C45/55 for pedestal. Exposure class: XC4 / XD1 / XF3 / XA1
Maximum aggregate size in the area of the bottom and top reinforcement: 16mm (in other areas max. 32mm)
Blinding layer min. 100 mm and dimension is not represented in the drawing.
Low-creeping and low-shrink concrete for exterior buildings units, low heat of hydration
Min. required density of concrete due to stability: 2338 kg/m3.
Covering: Cnom = 60 mm against form work or blinding layer, Cnom = 110 mm against soil (no formwork).
Concrete quality control according to EN 206-1.

Reinforcement:
Steel bars S500 ductility class B or C according to EN 10080 with min Fyk = 500 N/mm².

Grout:
Non-shrink grout, min. compression strength C90/105
Min. compression strength at time of post tension 64 N/mm² and after 1 day: 10 N/mm².
Post tension force: 828 KN equal to 50% of fsk for the Gr 10.9 anchors and an elongation of 3.4 to 9.7 mm.

Cable conduits (PVC tubes) – NOT a Vestas delivery:
See general discription in "Switchgear installation as foundation tubes" 0017-5653.
See site specific cable layout for actual number and size of conduits.

Earthing:
See "Vestas Earthing System", esp. description 0019-2575 "Earthing on anchor cage foundation" incl. copper conductors, bolts, nuts and washers delivered with the anchor cage.

Reinforcement Cut and Bending List: 0075-1456.V02

Radial bars, bottom part:
1.1 23 pcs. Ø32 x 10290 mm, through anchors.
1.2 23 pcs. Ø32 x 9816 mm, through anchors.
1.3 46 pcs. Ø32 x 9331 mm, through anchors.
1.4 92 pcs. Ø32 x 8606 mm, outside anchors.
1.5 184 pcs. Ø20 x 5019 mm, outside anchors.
1.6 92 pcs. Ø32 x 5593 mm, above 1.1-1.3.

Radial bars, top part:
2.1 23 pcs. Ø32 x 10448 mm, through anchors.
2.2 23 pcs. Ø32 x 9974 mm, through anchors.
2.3 46 pcs. Ø32 x 9459 mm, through anchors.
2.4 92 pcs. Ø32 x 8764 mm, outside anchors.
2.5 N/A
2.6 92 pcs. Ø32 x 6110 mm, below 2.1-2.3.

Concentric bars outside anchors, bottom part:
3.1 ø25 ring Ø4568, 3 pcs. L=5743 mm, outer ring no. 1.
3.51 ø25 ring Ø21068, 6 pcs. L=11890 mm, outer ring no. 51.
See table in Cut & Bending List.

Concentric bars outside anchors, top part:
4.1 ø25 ring Ø4568, 3 pcs. L=6154 mm, outer ring no. 1.
4.45 ø25 ring Ø21340, 7 pcs. L=10951 mm, outer ring no. 45.
See table in Cut & Bending List.

Concentric bars inside anchors, bottom part, 1 layer below and 1 layer above pos 1:
5.1 ø25 ring Ø1288, 2 x 1 = 2 pcs. L=5035 mm, ring no. 1.
5.10 ø25 ring Ø3639, 2 x 2 = 4 pcs. L=5704 mm, ring no. 10.
5.i ø25 ring Ø1027 + 261 * i, i = 1-10, ring no. i. Total number of rings: 20. See Cut & Bending list.

Concentric bars inside anchors, top part, 1 layer above pos 2:
6.1 ø25 ring Ø1288, 2 x 1 = 2 pcs. L=5458 mm, ring no. 1.
6.10 ø25 ring Ø3639, 1 x 3 = 3 pcs. L=5222 mm, ring no. 10.
6.i ø25 ring Ø1027 + 261 * i, i = 1-10, ring no. i. Total number of rings: 10. See Cut & Bending list.

Vertical bars at edge
7.1 368 pcs ø16 x 932 mm, vertical bars at outer edge.
7.2 3 rings ø16 x Ø21544, 3 x 6 = 18 pcs L=11855 mm, horizontal rings at outer edge (at pos. 7.1).

Shear locks and hair pins – see Cut and Bending list for correct lengths
8.1 46 pcs ø32 x 2966 mm, shear locks inside anchor cage (zone 1) – C-shaped.
8.2 306 pcs ø25 x approx. 4671 mm (mean value), shear locks in punching zone (zone 2).
8.3 711 pcs ø16 x approx. 2697 mm (mean value), shear locks in shear zone (zone 3).
8.4 306 pcs ø25 x approx. 2910 mm (mean value), hair pins for all zone 2.
8.5 711 pcs ø16 x approx. 1469 mm (mean value), hair pins for zone 3.

Vertical bars and bows in pedestal
9.1 92 pcs ø25 x 1474 mm, vertical bar outside anchors.
9.2 23 pcs ø25 x 1474 mm, vertical bar inside anchors.
9.3 92 pcs ø20 x 1806 mm, outer bows, see Cut & Bending list.
9.4 92 pcs ø20 x 1796 mm, inner bows, see Cut & Bending list.

Horizontal rings in pedestal
10.1 5 rings ø20 x Ø5683, 5 x 3 = 15 pcs L=6952 mm, at outer vertical bars pos 9.1.
10.2 4 rings ø20 x Ø2338, 4 x 1 = 4 pcs L=8346 mm, at inner vertical bars pos 9.2.
10.3.1 1 ring ø25 x Ø5623, 1 x 3 = 3 pcs L=7300 mm, ring 1 under bow pos 9.3.
10.3.2 1 ring ø25 x Ø5342, 1 x 3 = 3 pcs L=7006 mm, ring 2 under bow pos 9.3.
10.3.3 1 ring ø25 x Ø5062, 1 x 3 = 3 pcs L=6712 mm, ring 3 under bow pos 9.3.
10.3.4 1 ring ø25 x Ø4781, 1 x 3 = 3 pcs L=6418 mm, ring 4 under bow pos 9.3.
10.4.1 1 ring ø25 x Ø3219, 1 x 2 = 2 pcs L=4448 mm, ring 1 under bow pos 9.4.
10.4.2 1 ring ø25 x Ø2945, 1 x 2 = 2 pcs L=4038 mm, ring 2 under bow pos 9.4.
10.4.3 1 ring ø25 x Ø2672, 1 x 2 = 2 pcs L=3628 mm, ring 3 under bow pos 9.4.
10.4.4 1 ring ø25 x Ø2398, 1 x 1 = 1 pcs L=8945 mm, ring 4 under bow pos 9.4.

Hooks under grout trench (splitting bars)
11.1 138 pcs ø25 x 3989 mm, bended 184.2 deg., see Cut & Bending list.

Z-Bars under the anchor flange
12.1 92 pcs ø12 x 2567 mm, under base flange, see Cut & Bending list for detailed geometry.
12.2 1 ring ø12 x Ø5678, 1 x 3 = 3 pcs. L=6366mm, ring placed on 2 bows pos. 12.1.
12.3 1 ring ø12 x Ø4768, 1 x 3 = 3 pcs. L=5441mm, ring placed on 2 bows pos. 12.1.

Shrinkage mesh, cut to match cable conduits and adjustment feet
13.1 ø2383 mm top reinforcement mesh ø10 / 150 mm or equivalent with min. 524 mm²/m
13.2 ø5618 mm bottom reinforcement mesh ø10 / 150 mm or equivalent with min 524 mm²/m

Tolerances:
All non specified tolerances: +/- 10 mm

Remarks:
Dimensions in mm. Reinforcement shall be tied with steel wire per 500 mm minimum, no welding permitted.
The anchor cage is rotated to place the door in the right direction.
Basic anchorage length for C30/37: Lb = 35.74 x Ø for good conditions.
Basic anchorage length for C30/37: Lb = 51.06 x Ø for other conditions.
Lap length: Ll = 1.4 x Lb. Bending diameters: 7 x Ø for Ø >= 20 mm, 4 x Ø for Ø < 20 mm.
All overlap of bars shall be staggered.

Bending- and overlap lengths, bending diameters:

Size	Anchor	Overlap	Bending Ø	Remark
Ø32	1031	1443	n.a.	Bottom radial bar (pos 1)
Ø32	1472	2061	740	Top radial bar (pos 2)
Ø25	685	959	N/A	Bottom concentric ring outside anchors (pos 3)
Ø25	979	1370	N/A	Top concentric ring outside anchors (pos 4)
Ø25	706	988	N/A	Bottom concentric ring inside anchors (pos 5)
Ø25	1008	1412	N/A	Top concentric ring inside anchors (pos 6)
Ø20	715	1001	N/A	Concentric ring in pedestal (pos 10)
Ø20	500	701	80	Rings at foundation edge (pos 7.2)

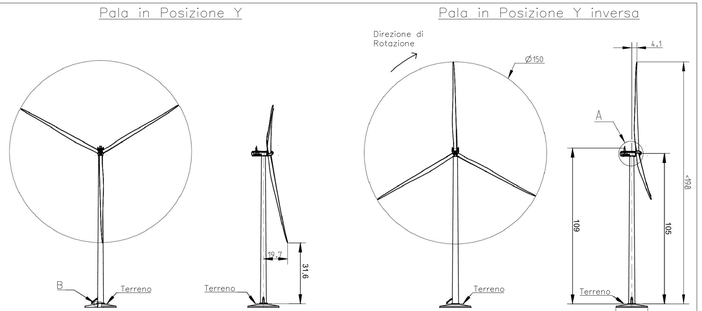
Blinding layer 40 m3, concrete 553 m3, grout 1.75 m3, reinforcement 68 t, reinforcement ratio 123 kg/m3

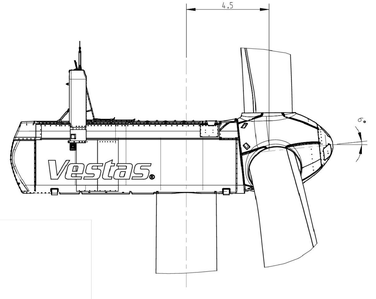
PARTICOLARE DEI SISTEMI DI ANCORAGGIO
SCALE VARIE

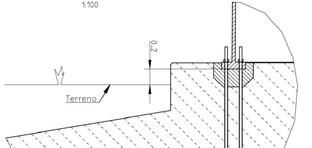
Tutte le dimensioni sono espresse in mm.

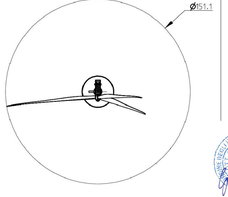
SEZIONE TIPO DEGLI AEROGENERATORI
SCALA 1:1500

Tutte le dimensioni sono espresse in metri.









Il diametro della fondazione è indicativo e dipende dalle effettive condizioni del sito.

P+A INGEGNERIA
Signed: ING. GIOVANNI DI SANTO
Association Number No N° 1895

D							DATE	SCALE Varie
C							10/18	DRAWN F4
B							10/18	CHECKED XXX
A	22/10/2018	XXX	XXX	XXX	INDICATE MODIFICATION		10/18	REVISED-EDPR XXX
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renewables
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