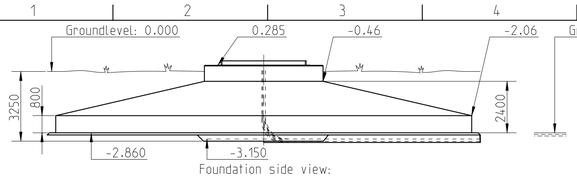
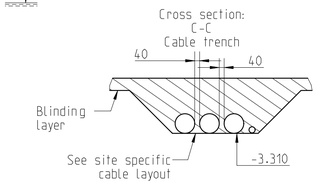
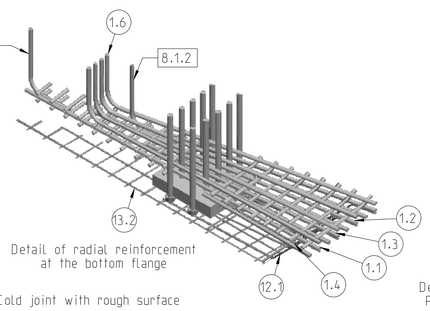
RESTRICTED

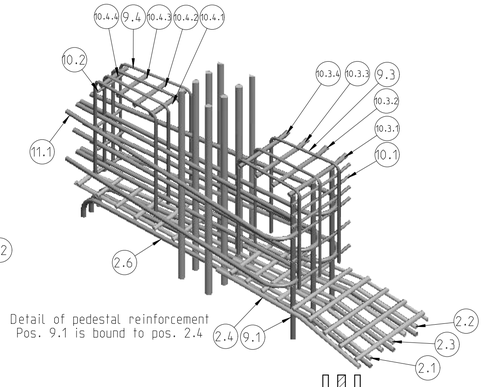


Foundation side view:

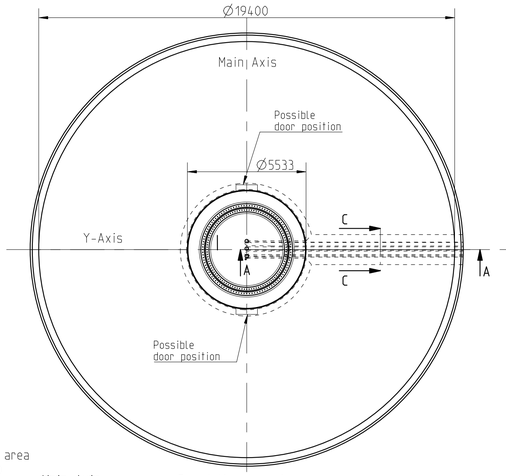




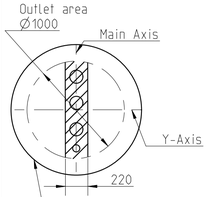
Detail of radial reinforcement at the bottom flange



Detail of pedestal reinforcement
Pos. 9.1 is bound to pos. 2.4

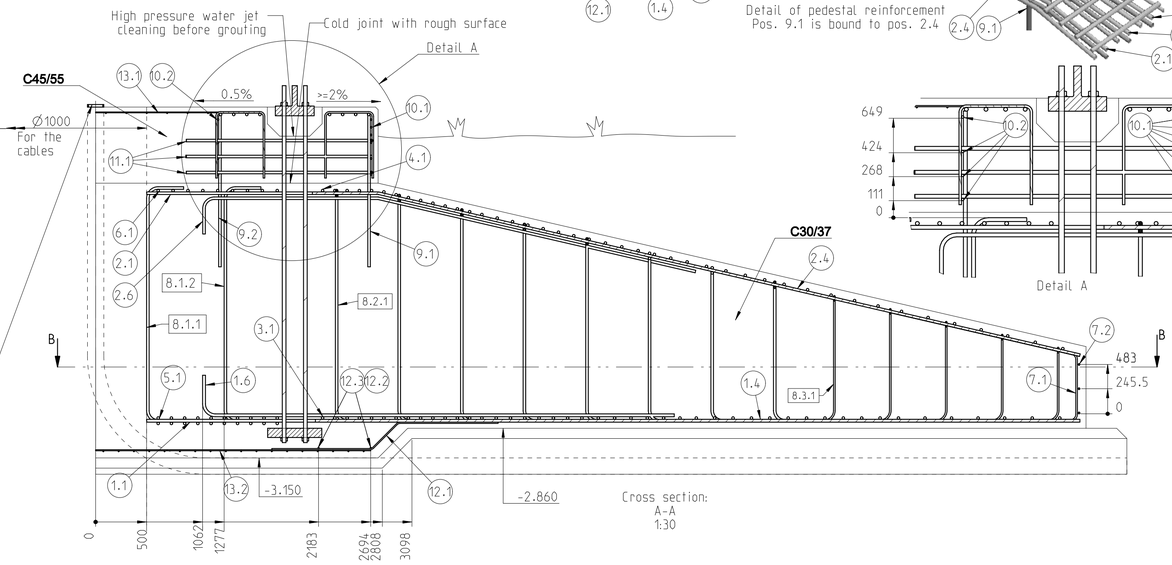


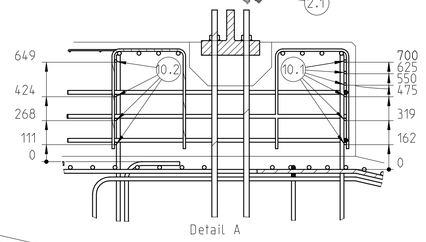
Foundation top view:



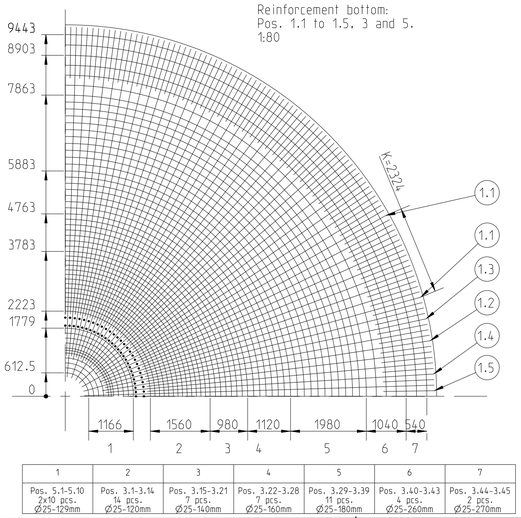
Topview: Piping detail at the pedestal
All cable outlets must be aligned with the Main Axis within the outlet area

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



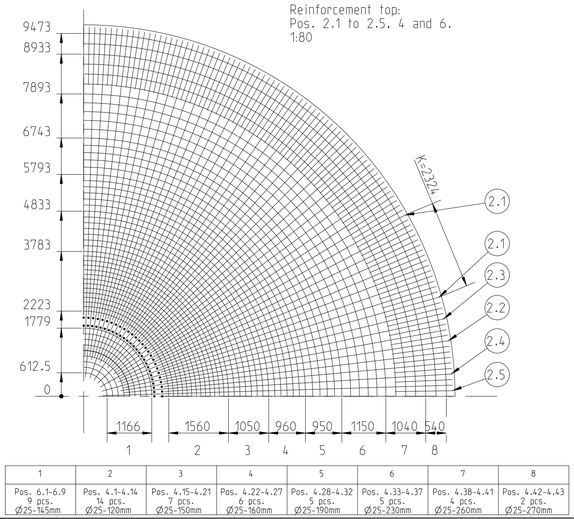


Detail A



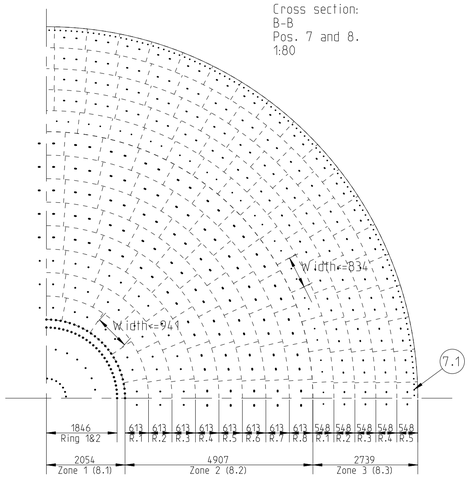
Reinforcement bottom:
Pos. 1.1 to 1.5, 3 and 5.
1:80

1	2	3	4	5	6	7
Pos. 5.1-5.10 2x10 pcs. Ø25-129mm	Pos. 3.1-3.14 14 pcs. Ø25-120mm	Pos. 3.15-3.21 7 pcs. Ø25-140mm	Pos. 3.22-3.28 7 pcs. Ø25-160mm	Pos. 3.29-3.39 11 pcs. Ø25-180mm	Pos. 3.40-3.43 4 pcs. Ø25-260mm	Pos. 3.44-3.45 2 pcs. Ø25-270mm

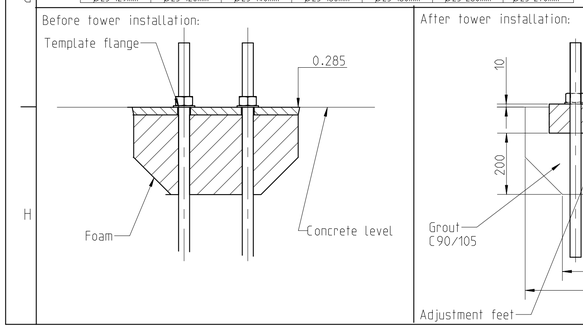


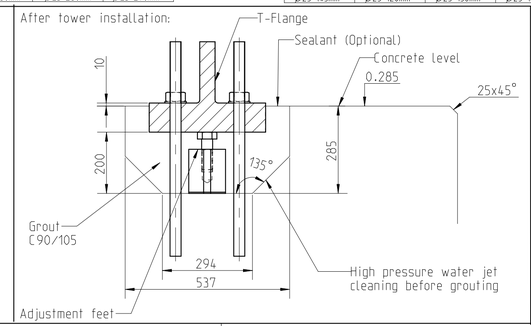
Reinforcement top:
Pos. 2.1 to 2.5, 4 and 6.
1:80

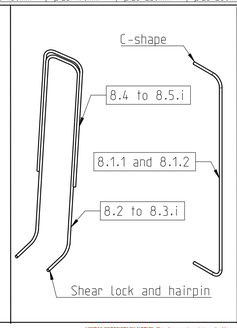
1	2	3	4	5	6	7	8
Pos. 6.1-6.9 9 pcs. Ø25-145mm	Pos. 4.1-4.14 14 pcs. Ø25-120mm	Pos. 4.15-4.21 7 pcs. Ø25-150mm	Pos. 4.22-4.27 6 pcs. Ø25-160mm	Pos. 4.28-4.32 5 pcs. Ø25-190mm	Pos. 4.33-4.37 5 pcs. Ø25-230mm	Pos. 4.38-4.41 4 pcs. Ø25-260mm	Pos. 4.42-4.43 2 pcs. Ø25-270mm



Cross section:
B-B
Pos. 7 and 8.
1:80







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

	Zone 1 C-shape Ø25			Zone 2 Ø25					Zone 3 Ø16				
	Number	Pos.	C-shape Height	Number	i	Shear locks Height Pos. 8.2.i	i	Hairpins Height Pos. 8.4.i	Number	i	Shear locks Height Pos. 8.3.i	i	Hairpins Height Pos. 8.5.i
Ring 1	26	8.1.1	2305	16	1	2227	1	1476	54	1	1187	1	593
Ring 2	26	8.1.2	2305	20	2	2179	2	1476	59	2	1060	2	593
Ring 3	-	-		24	3	2038	3	1476	63	3	934	3	593
Ring 4	-	-		28	4	1896	4	1476	67	4	808	4	593
Ring 5	-	-		32	5	1754	5	1476	71	5	681	5	593
Ring 6	-	-		36	6	1613	6	1476	0	-	-	-	-
Ring 7	-	-		40	7	1471	7	1412	0	-	-	-	-
Ring 8	-	-		44	8	1330	8	1270	0	-	-	-	-
Ring 9	-	-		0	-	-	-	-	0	-	-	-	-
Ring 10	-	-		0	-	-	-	-	0	-	-	-	-
Ring 11	-	-		0	-	-	-	-	0	-	-	-	-
Ring 12	-	-		0	-	-	-	-	0	-	-	-	-

Information for design approver:

Loads: 0056-0555, calculation: 0056-1168.V00

Soil condition to be fulfilled:

Assumed characteristic soil parameters: friction angle 30° or undrained shear strength 70 KN/m².
Min. density of soil I8 / 8 KN/m³, density of back filling I8 / 8 KN/m³.
Weight of backfilling is included in stability and shall not be removed.
Max. ground water level: 2.86 m under terrain
No drainage required.
Required rotational stiffness: min. 40 GNm/rad according to load report 0056-0555
Max. allowable tilting of the foundation due to permanent settlements: 3 mm/m
Max. plastic design soil pressure: 230 KN/m², constant over substitute area, with a PSF of 1.1 on wind, 0.9 on tower weight and backfilling, 1.0 on foundation weight
Max. elastic soil pressure 258 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 0056-1180.V00:

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. 13000 kg total.
Anchors shall be post tensioned according to approval drawing 0056-1180.V00

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 / XS1 / 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.
Low-creeping and low-shrink concrete for exterior buildings units, low heat of hydration
Min. required density of concrete due to stability: 2200 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 76 N/mm² and after 1 day: 10 N/mm².
Post tension force: 466 KN equal to 51% of Fuk for the Gr 10.9 anchors and an elongation of 7.4 to 8.6 mm.

Cable conduits (PVC tubes) - NOT a Vestas delivery:

See general discription in "Switchgear installation xx 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: 0056-1173

Radial bars, bottom part:

1.1 26 pcs. Ø28 x 9140 mm, through anchors.
1.2 26 pcs. Ø28 x 8663 mm, through anchors.
1.3 52 pcs. Ø28 x 8150 mm, through anchors.
1.4 104 pcs. Ø28 x 7488 mm, outside anchors.
1.5 208 pcs. Ø16 x 1331 mm, outside anchors.
1.6 104 pcs. Ø28 x 4937 mm, above 1.1-1.3.

Radial bars, top part:

2.1 26 pcs. Ø25 x 9320 mm, through anchors.
2.2 26 pcs. Ø25 x 8844 mm, through anchors.
2.3 52 pcs. Ø25 x 8331 mm, through anchors.
2.4 104 pcs. Ø25 x 7697 mm, outside anchors.
2.5 208 pcs. Ø16 x 1542 mm, outside anchors.
2.6 104 pcs. Ø25 x 5191 mm, below 2.1-2.3.

Concentric bars outside anchors, bottom part:

3.1 ø25 ring Ø4446, 3 pcs. L=5610 mm, outer ring no. 1.
3.45 ø25 ring Ø18886, 6 pcs. L=10903 mm, outer ring no. 45.
See table in Cut & Bending List.

Concentric bars outside anchors, top part:

4.1 ø25 ring Ø4446, 3 pcs. L=6124 mm, outer ring no. 1.
4.43 ø25 ring Ø18946, 6 pcs. L=11389 mm, outer ring no. 43.
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 Ø1225, 2 x 1 = 2 pcs. L=4837 mm, ring no. 1.
5.10 ø25 ring Ø3557, 2 x 2 = 4 pcs. L=6576 mm, ring no. 10.
5.1 ø25 ring Ø966 + 259 • 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 Ø1225, 1 x 1 = 1 pcs. L=5260 mm, ring no. 1.
6.9 ø25 ring Ø3557, 1 x 3 = 3 pcs. L=5137 mm, ring no. 9.
6.1 ø25 ring Ø934 + 292 • i, i = 1-9, ring no. i. Total number of rings: 9. See Cut & Bending list.

Vertical bars at edge

7.1 416 pcs ø20 x 1127 mm, vertical bars at outer edge.
7.2 3 rings ø16 x Ø19264, 3 x 6 = 18 pcs L=10647 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 52 pcs ø25 x 2894 mm, shear locks inside anchor cage (zone 1) - C-shaped.
8.2 240 pcs ø25 x approx. 4755 mm (mean value), shear locks in punching zone (zone 2).
8.3 314 pcs ø16 x approx. 2178 mm (mean value), shear locks in shear zone (zone 3).
8.4 240 pcs ø25 x approx. 2850 mm (mean value), hair pins for all zone 2.
8.5 314 pcs ø16 x approx. 1471 mm (mean value), hair pins for zone 3.

Vertical bars and bows in pedestal

9.1 104 pcs ø25 x 1480 mm, vertical bar outside anchors.
9.2 26 pcs ø25 x 1480 mm, vertical bar inside anchors.
9.3 104 pcs ø16 x 1715 mm, outer bows, see Cut & Bending list.
9.4 104 pcs ø16 x 1716 mm, inner bows, see Cut & Bending list.

Horizontal rings in pedestal

10.1 6 rings ø16 x Ø5397, 6 x 3 = 18 pcs L=6452 mm, at outer vertical bars pos 9.1.
10.2 4 rings ø16 x Ø2400, 4 x 1 = 4 pcs L=8340 mm, at inner vertical bars pos 9.2.
10.3.1 1 ring ø25 x Ø5349, 1 x 3 = 3 pcs L=7013 mm, ring 1 under bow pos 9.3.
10.3.2 1 ring ø25 x Ø5094, 1 x 3 = 3 pcs L=6746 mm, ring 2 under bow pos 9.3.
10.3.3 1 ring ø25 x Ø4838, 1 x 3 = 3 pcs L=6478 mm, ring 3 under bow pos 9.3.
10.3.4 1 ring ø25 x Ø4583, 1 x 3 = 3 pcs L=6211 mm, ring 4 under bow pos 9.3.
10.4.1 1 ring ø25 x Ø3217, 1 x 2 = 2 pcs L=6465 mm, ring 1 under bow pos 9.4.
10.4.2 1 ring ø25 x Ø2961, 1 x 2 = 2 pcs L=6062 mm, ring 2 under bow pos 9.4.
10.4.3 1 ring ø25 x Ø2704, 1 x 2 = 2 pcs L=5660 mm, ring 3 under bow pos 9.4.
10.4.4 1 ring ø25 x Ø2448, 1 x 2 = 2 pcs L=5257 mm, ring 4 under bow pos 9.4.

Hooks under grout trench (splitting bars)

11.1 156 pcs ø25 x 3489 mm, bended 184.4 deg., see Cut & Bending list.

Z-Bars under the anchor flange

12.1 104 pcs ø12 x 2320 mm, under base flange, see Cut & Bending list for detailed geometry.
12.2 1 ring ø12 x Ø5388, 1 x 3 = 3 pcs. L=6063mm, ring placed on Z-bows pos. 12.1.
12.3 1 ring ø12 x Ø4516, 1 x 3 = 3 pcs. L=5149mm, ring placed on Z-bows pos. 12.1.

Shrinkage mesh, cut to match cable conduits and adjustment feet

13.1 ø2441 mm top reinforcement mesh ø10 / 150 mm or equivalent with min. 524 mm²/m
13.2 ø5388 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: Ls = 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.

Bonding- and overlap lengths, bending diameters:

Size	Anchor	Overlap	Bending Ø	Remark
Ø28	922	1290	n.a.	Bottom radial bar (pos 1)
Ø25	1129	1581	450	Top radial bar (pos 2)
Ø25	724	1014	175	Bottom concentric ring outside anchors (pos 3)
Ø25	1049	1468	175	Top concentric ring outside anchors (pos 4)
Ø25	706	988	175	Bottom concentric ring inside anchors (pos 5)
Ø25	1008	1412	175	Top concentric ring inside anchors (pos 6)
Ø16	572	801	64	Concentric ring in pedestal (pos 10)
Ø16	400	560	64	Rings at foundation edge (pos 7.2)

Blinding layer 33 m3, concrete 477 m3, grout 1.3 m3, reinforcement 50 t, reinforcement ratio 105 kg/m3

Item no.	Mass (kg)	Certificate	Format	Status	Revised by	Created date	Created by
0056-1177	0	-	A1	Approved	-	2015-12-16	SAGRA
Material / Specification			Scale	Change no.	PDM ver.	Reviewed date	Reviewed by
-			1:30	40314.2	0.5	06.01.2016	NIMUL
-			Proj.	Item description			
			Pro/E	V117 3.45/3.60MW HH80 Mk3 IEC1b/IECS GWL at foundation level			
			Metric	Replaces / Copy of	Drawing no.	Ver.	Sheet
			Dimensions shown in mm unless otherwise specified	-	0056-1177	0	1 of 1

Vestas
vestas.com

WARNING: PROPRIETARY AND CONFIDENTIAL INFORMATION.
This document and the information set forth herein are confidential and proprietary to Vestas Wind Systems A/S. It contains trade secrets, and independent economic value, actual or potential, may be derived from the document/information not being generally known. In consideration of you receiving this document you agree (1) to keep the information secret (11) only to use the information for the purpose specifically agreed with Vestas (111) not to disclose directly or indirectly any part of the information to any third party and (112) not to make copies or reproductions thereof by whatsoever means or undertake any qualitative or quantitative analysis, reverse engineering or replication.

VESTAS PROPRIETARY NOTICE: This document contains valuable confidential information of Vestas Wind Systems A/S. It is protected by copyright law as an unpublished work. Vestas reserves all patent, copyright, trade secret, and other proprietary rights to it. The information in this document may not be used, reproduced, or disclosed except if and to the extent rights are expressly granted by Vestas in writing and subject to applicable conditions. Vestas disclaims all warranties except as expressly granted by written agreement and is not responsible for unauthorized uses, for which it may pursue legal remedies against responsible parties.

T07 0056-1177 Ver 00 - Approved - Exported from DMS: 2017-04-13 by RADVC