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INSTALLATION INSTRUCTIONS

General guidelines for
Følsgaard Ultima and Modula chambers

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INTRODUCTION

This guideline includes the approved methods and information regarding the installation of Følsgaard cable chambers. The purpose of this document is to serve as a guideline, therefore the information is not directed towards any specific construction project. In connection with this, it should be stated that alternative methods may be required and/or recommended based on the conditions at the site or with respect to the project. Følsgaard reserves the right to change these guidelines and encourages you to contact us to review possible modifications to these comments prior to starting installation. Følsgaard makes no express or implied warranty in relation to techniques, construction methods or materials stated herein.

The Customer shall comply with all laws, regulations, standards and orders of any authority with legal authority over the Customer and in relation to the Customer's installation, maintenance and use of the Products. If the Customer's installation or any part of any Product violates any such laws, regulations, standards or orders of such authorities, then the Customer will be liable for any breach of the same and will be liable for all costs, expenses, and damages resulting from the violation of such laws, regulations, regulations, standards or orders.

COMMENTS REGARDING USE

This installation guide concerns Følsgaard chambers installed in areas classified as Group 1, 2, 3 or 4 in accordance with European Standard EN 124:1994.

Group 1: Class A15
Areas that can only be used by pedestrians and cyclists.

Group 2: Class B125
Pavements, walkways and similar areas, carparks or parking garages.

Group 3: Class C250
Areas which, measured from the outside of the kerb, extend at least 0.5 m into the road and not more than
0.2 m onto the pavement.

Group 4: Class D400
Roadways, carriageways and areas used by high-speed vehicles.

This means that Følsgaard chambers, depending on how they are installed, can be located either in the pavement or in the roadway. Both cases are covered by this document.

EQUIPMENT AND ADDITIONAL MATERIALS

In addition to the supplied cable chamber, the following will be required to carry out an installation:

EQUIPMENT
Tools for digging a hole: mechanical excavator, jackhammer, etc., depending on the condition of the soil and the size of the cable chamber to be installed.

Shovel or spade.
Tools for compacting the base and surrounding materials. (See Appendix 1)
Laying float.
Straight edge.
Handsaw.

In addition to this, the following are required if cuts are to be made for conduits on the site:

Turning saw (with diameter to the outer diameter of the conduit to be installed).
Automatic drill (compressed air, battery or 220 V).
Bracing, if required in accordance with the type and size of chamber (see Table 1)

MATERIALS
Base materials (see Table 1).
Backfill materials (see Table 1).
Jointing mortar/epoxy resin mortar.

FRAME AND COVER
A frame and cover are to be installed, which are dimensioned for the correct load as required by European or other relevant authority standards.

Følsgaard manufactures a range of covers and frames developed for use with the company's cable chambers. Confirmation of the suitability of covers and frames not supplied by Følsgaard should be obtained before they are installed, otherwise this may adversely affect the quality of the installation.

HEALTH AND SAFETY !!

In areas with public access, the site should be properly signposted and guarded in accordance with national standards.

In addition, all other security measures required by law, the customer and specified in the contract by local authorities, other landowners and the police must be observed at all times.

Before conducting excavation of any kind, all necessary precautions must be taken regarding the identification/protection of buried supply lines near the chamber.

INSTALLATION METHOD

Excavation area

1. Mark the outer boundaries of the excavation area on the ground. Place the lower section of the cable chamber on the ground and mark around it with room for either the minimum thickness of backfill as indicated in Table 1 or the width of the compaction equipment, whichever is the largest.

Hole

2. Excavate the hole to the correct depth. The depth of the hole should be measured from final ground level minus the thickness of the frame and jointing according to the level specified for the frame and cover installation, cable chamber depth and required base height (see Table 1 for base depths)

Base

3. Compact the bottom of the excavated pit with compaction equipment and make sure that the surface is even. If 'soft areas' do occur, then they should be excavated and filled with limestone (MOT1) or other approved materials compacted in accordance with national standards.

4. Build the base using the necessary materials.

4.1. According to the client's specifications, if a drain will be used in the cable chamber, then it must be installed now. In the case of compacted stone, the stones must be levelled with the shovel and compacted according to Appendix 1.

4.2. In the case of base concrete, the concrete - class C40 - is to be levelled and compacted according to Appendix 1. For bases that require reinforcing mesh, the base should be executed on 2 levels with the mesh located in the centre.

5. Carefully place the lower ring section on the base. If the cable chamber system does not have a preformed base, then the ring should be knocked about 10 mm into the base using light blows. The correct placement of the cable chamber ring is with the horizontal protrusion at the bottom. Check that the ring is level and placed at the correct depth. If a concrete base is used, then float can be used to provide a smoother finish.

Walls of the cable chamber

6. Then install the remaining wall sections. Check that each section is correctly embedded to avoid spaces between them.

Conduit entrances

7. The cable chambers can either have the conduit entrances pre-drilled from the factory, or they can be drilled on site.

7.1. In the case of factory pre-drilled cable chambers, remove the conduit caps as required.

7.2. Pipeline openings made on site are best created using a turning saw and a drill. If these tools are not available, then a square opening can be made with a hand saw or angle grinder. When installing the conduit, the space between the cut and the conduit should be filled with mortar.

7.3. If trumpet-shaped openings or cable chamber connections are used, then these can be installed now.

7.4. Insert the conduit into the holes.

7.5. The conduit openings should not be located in the lower section or the top two sections without prior permission from Følsgaard

7.6. Conduit openings should not be cut out within 50 mm of the corners.

7.7. The distance between the conduit openings should be at least half the diameter of the conduit from edge to edge.

7.8. The total diameter of all conduit should not exceed 20% of the total perimeter of the supply cable chamber section.

7.8.1. If conduit openings account for more than 20% of the total perimeter of a section, a C40 encirclement should be installed up to the upper section ring with conduit openings.

Building over existing supply lines

8. Where cable chambers must be build over existing supply lines, the Følsgaard cable chambers can easily accommodate this by either:

8.1. Cutting a conduit opening in the appropriate ring section, as previously described, and then using a hand saw to cut out an open arc from the bottom of the ring.

8.2. Alternatively, after creating the conduit opening, you can cut the ring to length and assemble it around the existing conduit opening.

8.3. In both cases, it is important that a complete ring is fitted on each side of the cut out ring section.



Wall installations and safety systems

9. Wall installations can be installed at this stage if they are not already installed at the factory.

9.1. Mark the location of the installations on the cable chamber walls, in accordance with the client's specifications, then drill 11 mm holes and fix the installations with the supplied bolts.

9.2. Wall installations and safety systems can be retrofitted later on most cable chambers. For specific details, please contact Følsgaard directly.


INSTALLATION METHOD

Bracing

10. On certain cable chambers, cross-bracing is Required. See Table 1 for further Information.

10.1. Ensure the bracing is vertical, flush and placed correctly.

10.1.1. On larger cable chambers telescopic 'Acrow' stiffeners are used. These are not supplied by Følsgaard. Timber parapets should be used to equally distribute the loads across the chamber. See Table 1 for information on distances.

Topping up

11. Once the cable chamber is installed at final depth, the conduit openings are shaped, the equipment is installed and, where required, appropriate bracing is installed, the area around the cable chamber can be refilled. Topping up is carried out in layers and must be guided to the top of the cable chamber or, in the case of roadway constructions, to the underside of the asphalt structure. Please refer to Table 1 for information on recommended backfill materials and the required material width.

Please refer to Appendix 1 for depth and number of layers for the selected material and the chosen compaction method.

11.1. If timber bracing is used, then this should be lifted together with the backfill to ensure that there is sufficient support for the cable chamber wall section that is being compacted against.

11.2. If Acrow bracing is to be used, then these can remain in position until the backfilling and compaction are completed and the material has sufficiently hardened.

Final adjustment

12. If the cable chamber height has been miscalculated and the levels cannot be changed by adjusting the base of the cable chamber, then it is possible to cut the upper section of the cable chamber horizontally to straighten the level.

12.1. Simply mark the chamber section to be adjusted and cut with either a hand saw or an angle grinder.

12.2. The required section can then be embedded alongside the next section using the regular method.

12.3. Now fill the holes in the upper section with lean concrete to form a solid base on which the frame can be embedded.



Frame and cover

13. Once the cable chamber has been filled, the frame and cover can be fitte

13.1. Place the frame on top of the cable chamber to ensure that there is enough space for a mortar layer. The acceptable layer thickness may be different depending on the client, so the relevant requirements should be checked. Usually, the thickness of mortar layers can vary between 10 and 40mm. Pack the frame to required height with suitable, approved materials and check that the frame is level.

13.2. Remove the frame and place the mortar layer. This should be approximately 10 mm higher than required and 25 mm wider than the extent of the underside of the frame.

13.3. Carefully place the frame on the mortar layer and make sure that the inner sides of the frame are flush with the edges of the chamber. If an ascending frame is used, this should be done automatically.

13.4. Gently push the frame into the mortar layer until the correct level is reached and continuously check that the frame is level.

13.5. Remove any excess mortar that has been wedged into the chamber and use a trowel to apply mortar to external flanges/cement rods at a 45° angle away from the frame.

13.6. Once the mortar is sufficiently hardened, the covers can be installed. (Resin epoxy mortar can be used, which can have a significant impact on reducing curing time. Obtain client permission before using.)


Restoring

14. The finished surface can now be restored around the cable chamber.

Other comments

15. The Følsgaard cable chamber can be supplies as a fixed depth unit, which will require appropriate lifting equipment if lifting is planned as a single unit. Lifting eyelets, frames and other measures can be installed at the factory to facilitate mechanical lifting.

APPENDIX 1

Specification for the restoration of lane openings - Appendix 8

Table A8.1 Compaction requirements for granulate, non-cohesive soil and cement-bonded

Compaction equipment and weight category	cohesive material (less than 20 % granulate content)			Granulate material Non- (20% granulate content or more, including cement-bonded material)		
	Minimum layer/Lift for compacted layers/Lift for thickness up to			Minimum number of compacted thickness up to		
	100 mm 1	50 mm	200 mm 1	00 mm 1	50 mm	200 mm
Vibration tamper						
50 kg minimum	48 #N	P4		8N		P
Vibration drum						
Single roller						
1000-2000 kg/m 8	NP	NP		6N	PN	P
2000-3500 kg/m	36N	P3			57	
Above 3500 kg/m	346	#		346		
Double roller						
600-1000 kg/m	NP NP	NP		6N	PN	P
1000-2000 kg/m	48N	P		36N		P
Above 2000 kg/m	235			234		
Vibratory plate						
1400-1800 kg/m^2 N	PN PN	P5			NP	NP
Over 1800 kg/m^2	36N	P3			57	

Alternative compaction equipment for restricted access areas (including small excavations with ditches less than 200 mm wide)	
Vibration tamper 25 kg minimum **Pneumatic pile driver** 10 kg minimum	**Minimum 6 compression layers** **Not more than 100 mm compacted expansion thickness**

Comments:

1 NP = Not permitted

2. # = Not permitted on fully cohesive material, i.e. clay and/or silt soils without particles > 75 microns (μm)

3. Single roller vibratory drums are vibratory rollers that only vibrate on a single roller.

4. Double roller vibratory drums are vibratory drums that vibrate on two separate drums.

TABLE 1

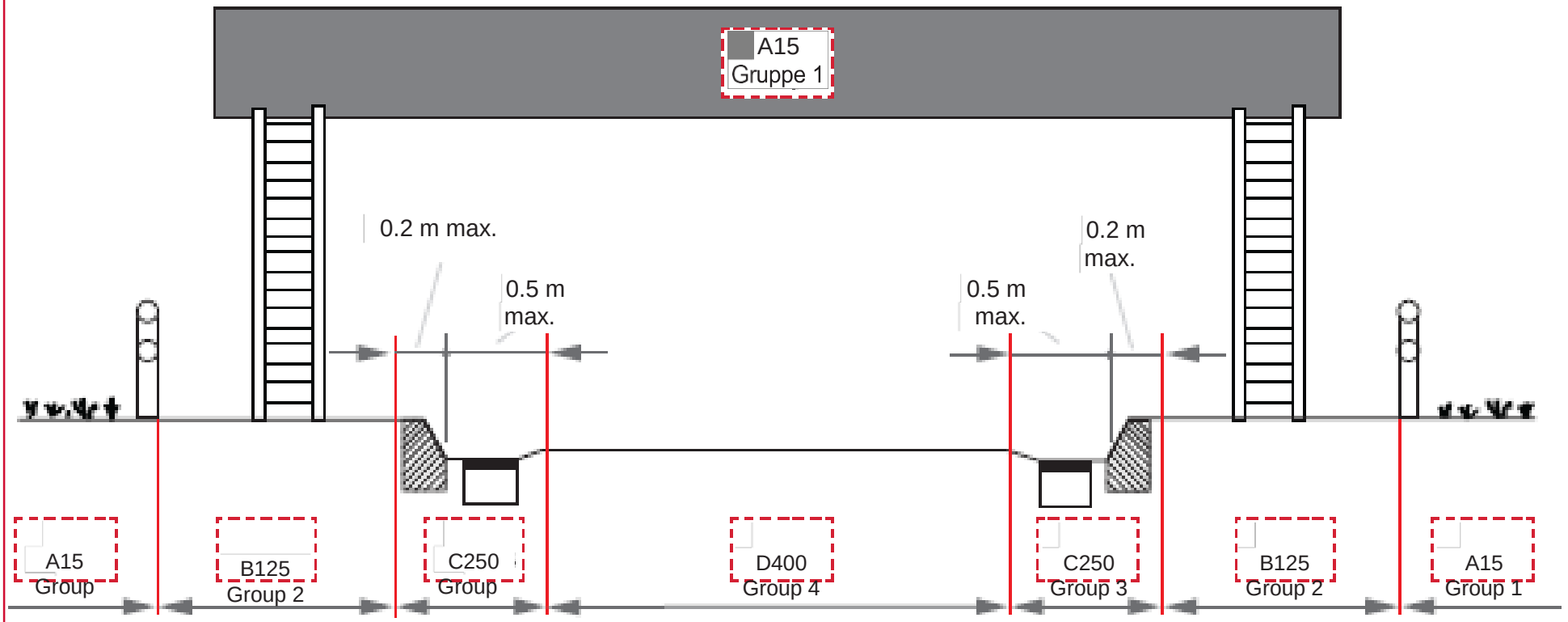
Product	EN 124 Group	Recommended minimum coverage class*	Maximum chamber depth (mm)	Excavation footprint	Base material	Bracing	Backfill	Additional Information.
Modula (Sidewall up to 1200 mm)	1	A15	1200	100 mm or the width of the compaction equipment	50 mm compacted stone (MOT1)	Bracing is required for chambers with sidewall lengths greater than 600 mm.	Compressed MOT1 stone or as excavated material if of granulated type.	**Fire plug sections** only require granulate backfill. Final adjustment is not required, 25 mm sections are available. Shared base/dog kennel arrangement around infrastructure. **TSSL** base section does not require casting, minimum depth 450 mm up to 900 mm
	2	B125	1200	100 mm or the width of the compaction equipment	100 mm compacted stone (MOT1)		Compacted MOT1 stone or lean concrete.	
	3	C250	1200	150 mm or the width of the compaction equipment	150 mm lean concrete (C40)		Minimum 150 mm C40 concrete	
	4	D400	2000	200 mm or the width of the compaction equipment	150 mm lean concrete (C40), reinforced with A393 mesh.		Minimum 200 mm C40 concrete	
Modula (Sidewall over 1200 mm)	1	A15	1200	100 mm or the width of the compaction equipment	50 mm compacted stone (MOT1)	Double bracing uniformly spaced	Minimum 100 mm C40 concrete	
	2	B125	1200	100 mm or the width of the compaction equipment	100 mm compacted stone (MOT1)			
	3	C250	1200	150 mm or the width of the compaction equipment	150 mm lean concrete (C40)		Minimum 150 mm C40 concrete	
	4	D400	2000	200 mm or the width of the compaction equipment	150 mm lean concrete (C40), reinforced with A393 mesh.		Minimum 200 mm C40 concrete	
Ultima	1	A15	2400	150 mm or the width of the compaction equipment	50 mm compacted stone (MOT1)	≥1200mm single, central bracing, required in both directions. ≥1800mm double bracing with uniform gap. ≥2500 mm bracing at intervals of 600 m with Acrow braces, both horizontally and vertically .	Sidewall length < 1500mm As excavated if granules are acceptable, otherwise compacted MOT1 stone. Sidewall length between 1500 and 2500mm compacted MOT1 stone. Sidewall length > 2500mm minimum 150mm C40 concrete	**French Telecom SNCF Motorway communications** approved, complete system available with bottom half base, bracket and cover.
	2	B125	2400	150 mm or the width of the compaction equipment	100 mm compacted stone (MOT1)		Sidewall length < 2500mm compacted MOT1 stone Sidewall length > 2500mm minimum 150mm C40 concrete	
	3	C250	2400	150 mm or the width of the compaction equipment	150 mm lean concrete (C40)		Sidewall length < 2500mm compacted MOT1 stone Sidewall length > 2500mm minimum 150mm C40 concrete	
	4	D400	2400	200 mm or the width of the compaction equipment	150 mm lean concrete (C40), reinforced with A393 mesh.		Minimum 200 mm C40 concrete	
	5	E600	2400	200 mm or the width of the compaction equipment	250 mm lean concrete (C40), reinforced with 2 layers of A393 mesh at uniform intervals.		Minimum 250 mm C40 concrete	

***Coverage class, refers to recommended minimum frame and cover for EN124 group, backfill requirements are according to EN124 group, see diagram xxx**

It is important to note that the backfill requirements for the chamber relate to the installation site of the cable chamber (EN124 group).

Example – If an 1310 x 850 x 1050 ULTIMA cable chamber is to be installed in a footpath (Group 2) but with a D400 SG iron frame and cover. This should be installed as a Group 2 cable chamber, i.e. base of 100 mm compressed MOT Type 1 backfill - 150 mm compressed MOT Type 1.

FIGURE 1


A15
Gruppe 1
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A15
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Group 2
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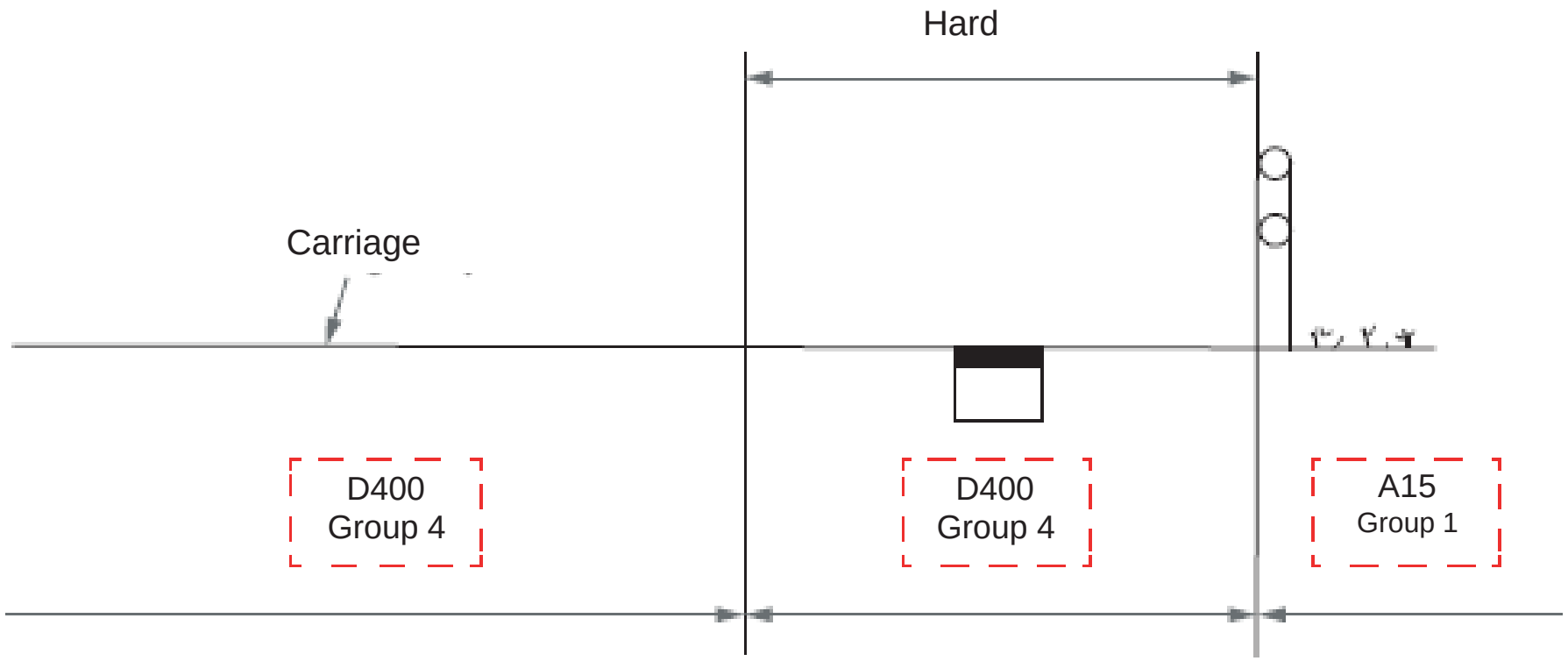
Group
D400
Group 4
C250
Group 3
B125
Group 2
A15
Group 1

DIAGRAM 2



Typical section of hard shoulder showing the location of some