



**"M" SERIES ACTIVE ANCHORAGES**



The "M" system is designed to comply with the guidelines **ETAG 013** and it is awarded with the European Technical Approval **ETA-09-0012** and the marking **CE 0969-CPD-001/09-PT**.

The anchorage is made of: an anchor plate, wedges, connection and anchor casting.

Simulations made with finite element codes and laboratory tests allowed to design a compact anchorage to comply with the guidelines **ETAG 013**.



The "M" series active anchorage is made of the following parts: casting, anchor plate, wedges and connection in H.D.P.E. to connect the casting to the metallic or polyethylene sheath. Castings have a turned plane for the plate, holes for connection to cap and formwork and a threaded grouting hole. Castings are in spheroidal cast iron EN-GJS 500-7 EN-JS-1050, which offers a high resistance to stress. Being weldable, it guarantees the maximum safety during installation.

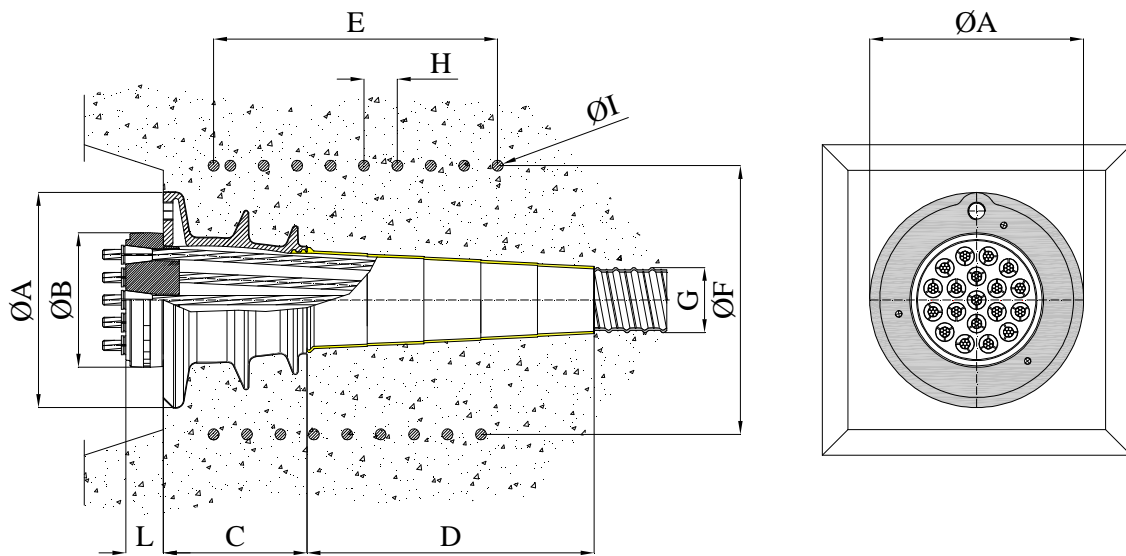
Strands are blocked on a distribution plate with truncated cone holes in steel C40-45 UNI EN 10083/1 and by means of wedges in steel 16NiCr4Pb UNI EN 10277-4.

The anchorage and the sheaths are connected by means of a truncated cone connection that guarantees a correct deviation of strands, minimizing the values of losses. The connection is made of H.D.P.E. and suitable for the connection to several-diameter sheaths.

All castings have threaded holes on the plane to allow an easy fixing to the formwork by means of bolts.

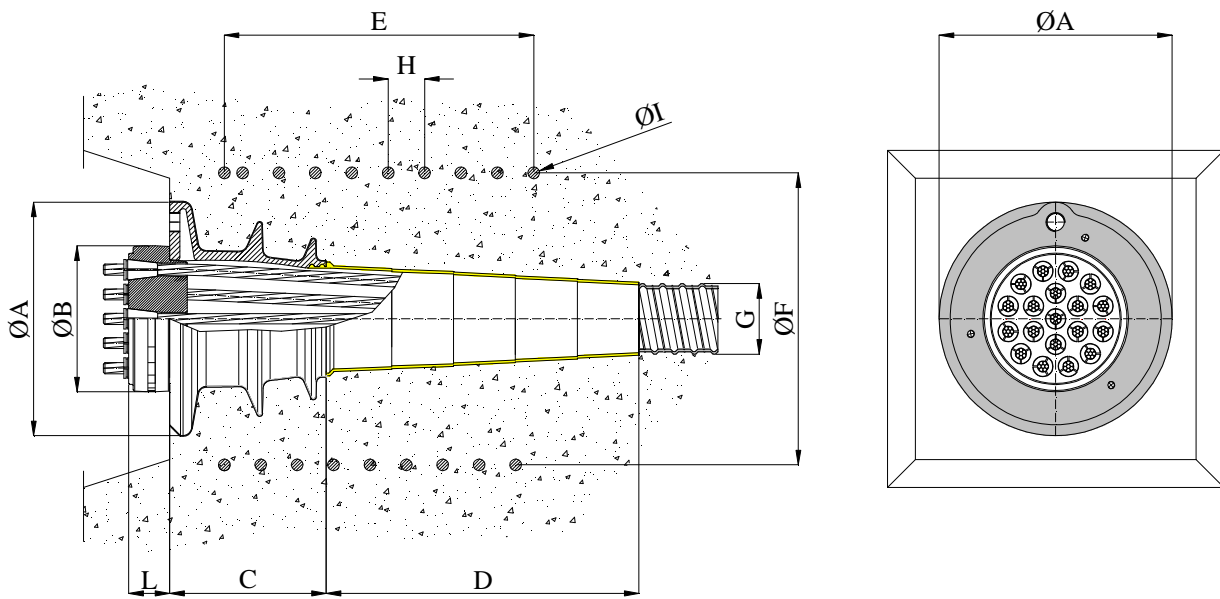
All castings have a gas threaded hole for grouting to allow the connection to the several solutions available for grouting. Castings may be supplied with an epoxy coating protection on request.

**45 MPa CONCRETE CLASS**



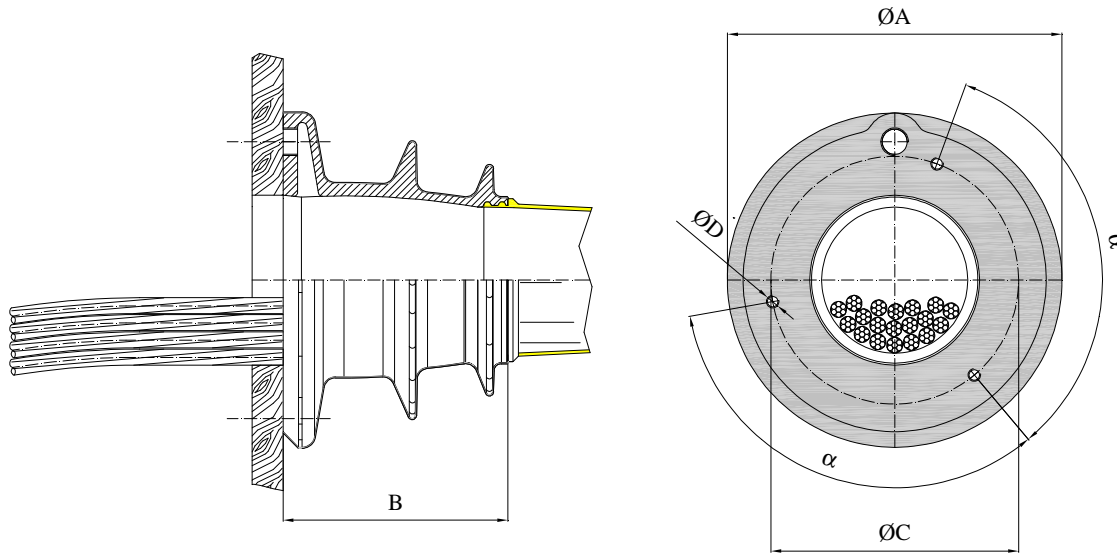
Type	Ultimate load for cable			A	B	C	D	E	F	G	H	I	L
	T15	T15S	T15C										
	259 kN	279 kN	307 kN	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
<b>4M15</b>	1036	1116	1228	160	105	103	300	180	170	45/50	45	12	45
<b>7M15</b>	1813	1953	2149	200	125	133	340	250	220	62/67	45	12	45
<b>9M15</b>	2331	2511	2763	235	146	163	380	250	250	72/77	45	14	45
<b>12M15</b>	3108	3348	3684	265	160	180	385	300	300	80/85	50	16	45
<b>15M15</b>	3885	4185	4605	290	176	197	405	350	355	85/90	50	16	45
<b>19M15</b>	4921	5301	5833	320	200	215	430	425	400	95/100	50	16	56
<b>22M15</b>	5698	6138	6754	355	230	260	430	425	420	100/105	50	18	61
<b>27M15</b>	6993	7533	8289	380	250	277	470	400	460	110/115	50	18	70

**35 MPa CONCRETE CLASS**



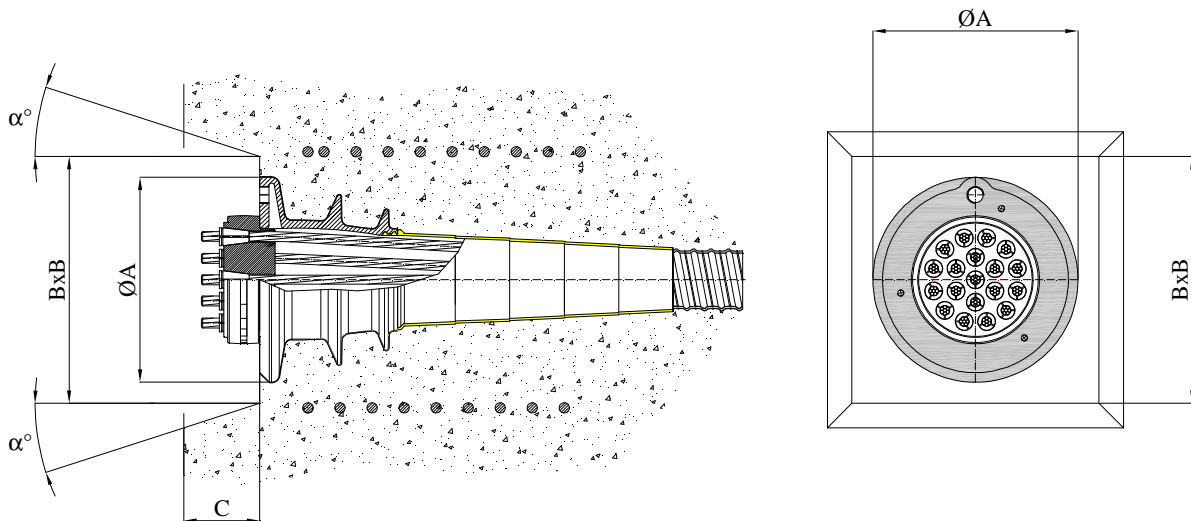
Type	Ultimate load for cable			A	B	C	D	E	F	G	H	I	L
	T15	T15S	T15C										
	259 kN	279 kN	307 kN	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
<b>4M15</b>	1036	1116	1228	160	105	103	300	205	180	45/50	45	12	45
<b>7M15</b>	1813	1953	2149	200	125	133	340	270	240	62/67	45	12	45
<b>9M15</b>	2331	2511	2763	235	146	163	380	270	300	72/77	45	14	45
<b>12M15</b>	3108	3348	3684	265	160	180	385	350	350	80/85	50	16	45
<b>15M15</b>	3885	4185	4605	290	176	197	405	450	410	85/90	50	16	45
<b>19M15</b>	4921	5301	5833	320	200	215	430	450	440	95/100	50	16	56
<b>22M15</b>	5698	6138	6754	355	230	260	430	425	480	100/105	50	18	61
<b>27M15</b>	6993	7533	8289	380	250	277	470	480	530	110/115	50	18	70

## CONNECTION TO THE FORMWORK FOR M ANCHORAGES



Type	4M15	7M15	9M15	12M15	15M15	19M15	22M15	27M15
A	160	200	235	265	290	320	355	380
B	103	133	163	180	197	215	260	277
C	124	145	190	203	235	237	290	325
D	M10	M10	M10	M12	M12	M12	M16	M16
$\alpha$	180°	120°	120°	120°	120°	120°	120°	120°
Quantity	2	3	3	3	3	3	3	3

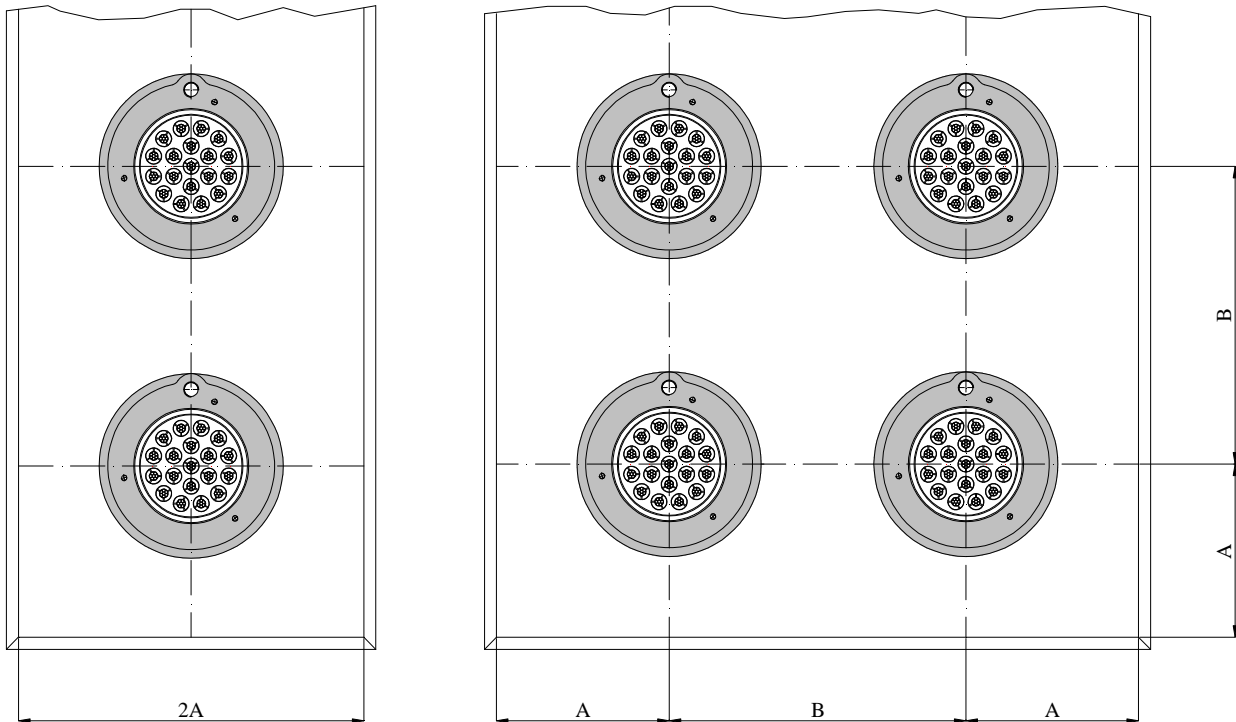
## RECESSES FOR M ANCHORAGES



Type	4M15	7M15	9M15	12M15	15M15	19M15	22M15	27M15
A	160	200	235	265	290	320	355	380
B x B	200x200	240x240	275x275	305x305	330x330	360x360	395x395	420x420
C	110	110	110	110	110	125	130	140
$\alpha$	15	15	15	15	15	15	15	15

## DISTANCES FROM EDGES FOR M ANCHORAGES

The distances from edges and between anchorages are the same for the three types of anchorage **M<sub>EP</sub>**<sup>®</sup>, **M<sub>X</sub>**<sup>®</sup> and **M**



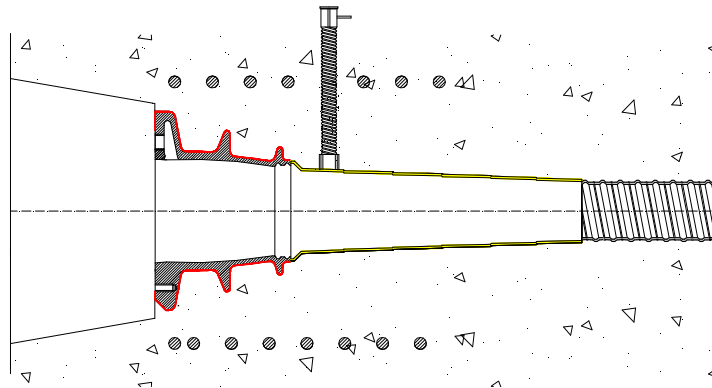
Minimum centres spacing B (mm)			Minimum edges distance A (mm)		
Type	$f_{cmj, cube}$		Type	$f_{cmj, cube}$	
	35 MPa	45 MPa		35 MPa	45 MPa
<b>4M15</b>	250	230	<b>4M15</b>	130	120
<b>7M15</b>	335	295	<b>7M15</b>	175	155
<b>9M15</b>	370	320	<b>9M15</b>	190	165
<b>12M15</b>	430	380	<b>12M15</b>	220	195
<b>15M15</b>	480	430	<b>15M15</b>	245	220
<b>19M15</b>	545	485	<b>19M15</b>	280	250
<b>22M15</b>	585	520	<b>22M15</b>	300	265
<b>27M15</b>	650	580	<b>27M15</b>	330	295

## UNBONDED POST-TENSIONING ON "M" ANCHORAGES

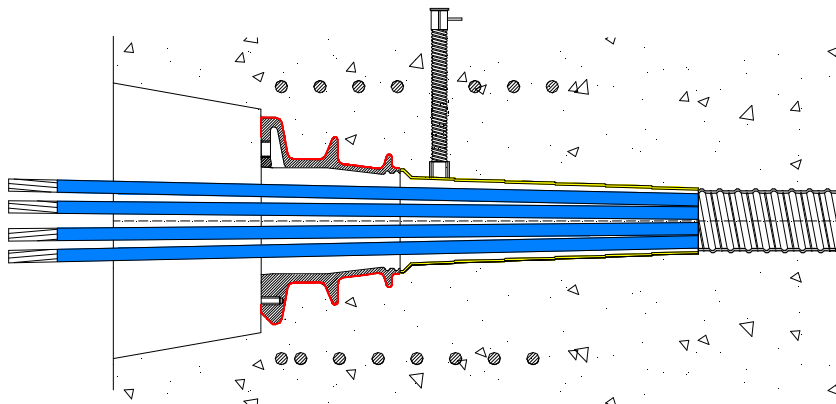
The **unbonded** post-tensioning with **M**, **MEP**<sup>®</sup> and **MX**<sup>®</sup> anchorages is carried out by using unbonded, greased and plastic-coated strands, which are restrained in a mortar grouting with a rubber buffer and allow their following tensioning and the covering with grease of all the parts of the anchorage that are subject to corrosion, such as: anchorage block, wedges and strand are restrained in grease.



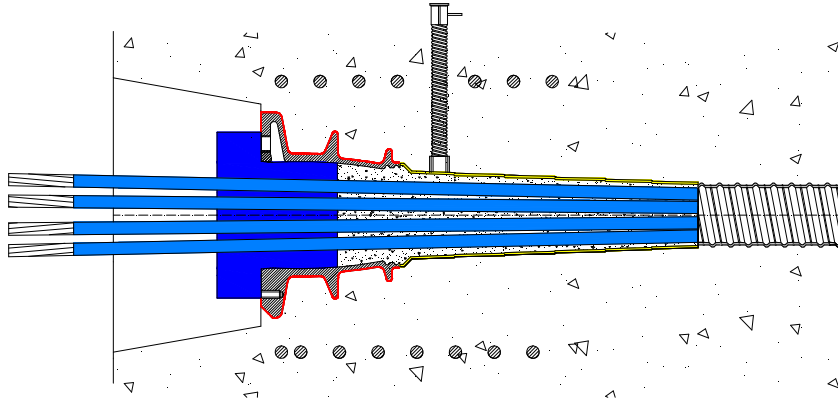
The rubber buffer allows to restrain grouting at half anchorage as well as the strand tightness on the polyethylene coating. Once the cable grouting is over, the buffer can be removed. The void obtained inside the anchorage allows to protect the under plate strands and shall be filled with grease. The strand by strand coating of the free whips must be removed following the procedures, the anchor plate must be removed, tensioning must be carried out and the protection cap, which is filled with grease, must be installed.



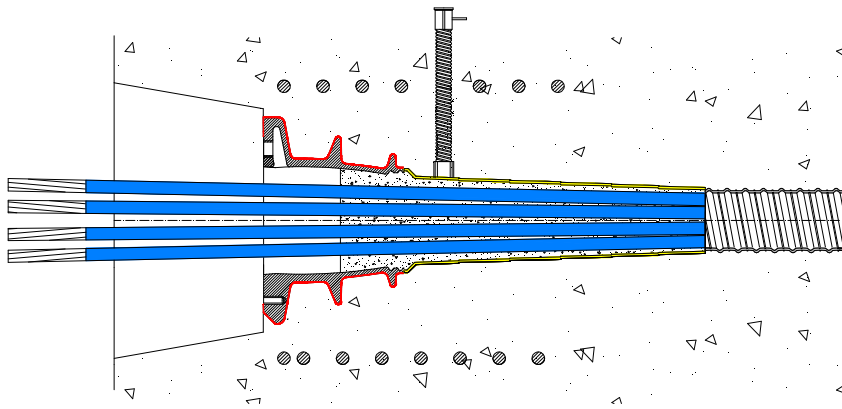
Grouting with vent placed on the truncated cone reduction in polyethylene.



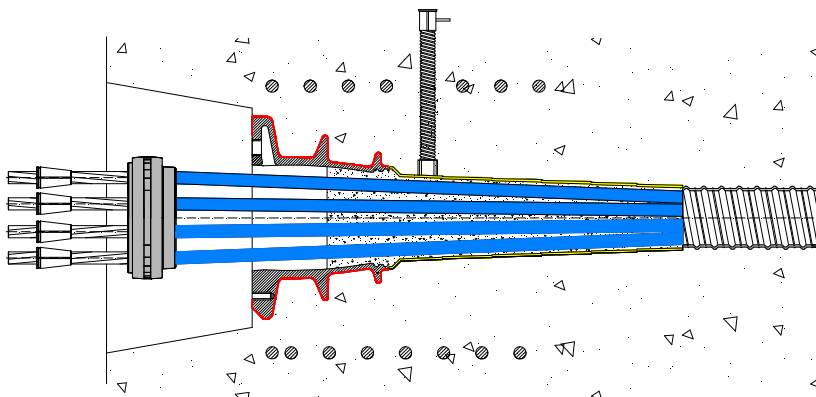
Insertion of greased and polyethylene-covered strands into the anchorage. The restraining buffer allows to carry out the cable grouting before installing the anchor plate to block the strands.



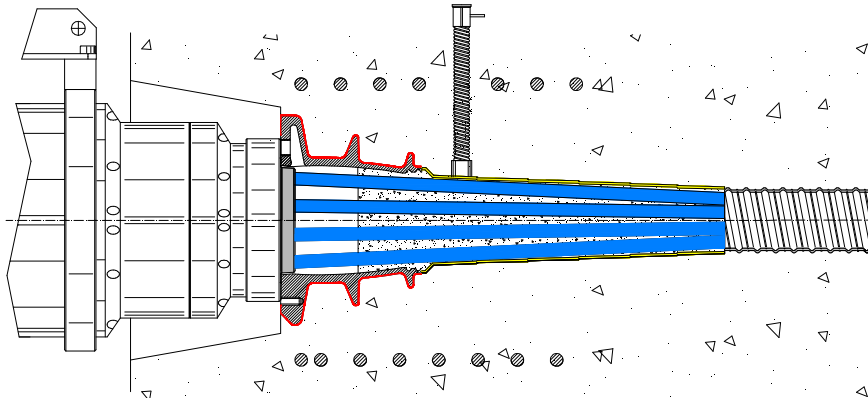
The buffer allows to restrain the grouting at half anchorage, allowing the insertion into the thus obtained recess of the greased anchorage to protect the uncovered strands.



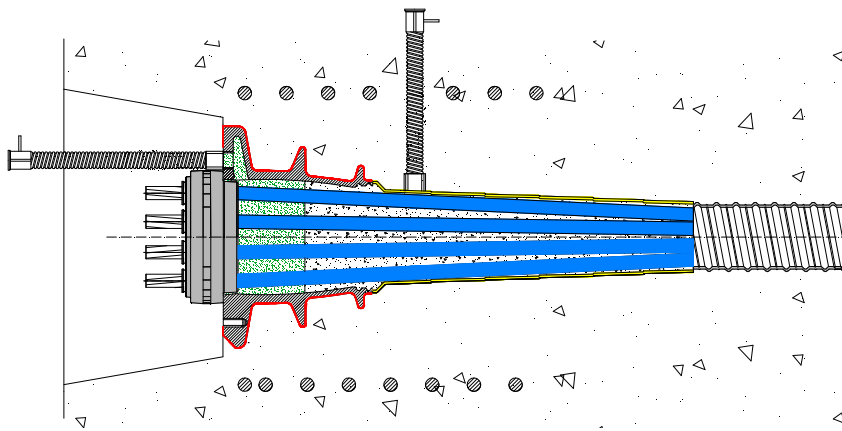
After grouting the buffer must be removed, thus obtaining a recess for the grease to protect the under plate strands.



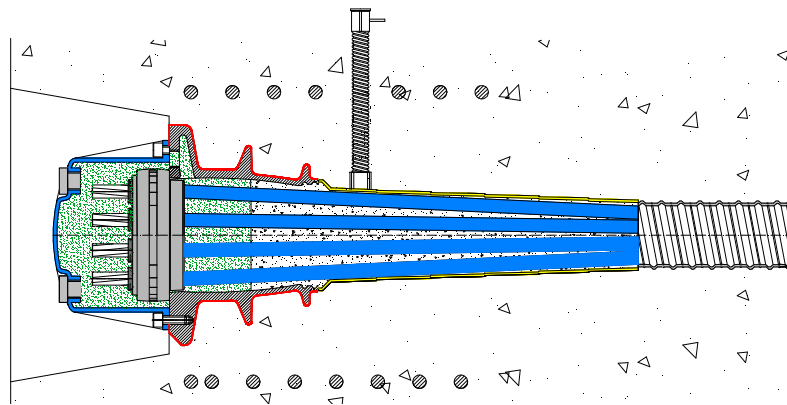
Approaching of the anchor plate and insertion of locking wedges.



Prearrangement for tensioning with M jack



Grease grouting into the void behind the anchor plate.



Insertion of the protection cap to guarantee the complete coverage of the anchorage area and its protection against corrosion.