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INSTRUCTIONS FOR ANCHORING COLUMN/MAST TO THE FOUNDATION PLINTH

GENERAL INFORMATION

The following instructions describe the procedures for erecting the column (whether circular, octagonal, or polygonal in cross-section) in the case of direct embedding into the foundation plinth and in the case of columns with a base plate and anchor bolts. **IN ADDITION TO THE FOLLOWING INSTRUCTIONS, YOU SHOULD ALWAYS REFER TO THE CONSTRUCTION DRAWINGS PROVIDED AT THE TIME OF ORDERING, WHICH MAY CONTAIN ADDITIONAL INFORMATION RELATING TO SPECIFIC CASES**

Before erecting the column, it is essential to wait until the foundation block has fully set.

DIRECT BURYING OF COLUMNS INTO THE FOUNDATION BLOCK

To insert the column into the foundation block, carry out the following steps:

- Insert the base of the column into the socket of the foundation block
- Spread crushed gravel (pressing it down firmly) and sand around the column in the proportions shown in the drawing below.
- Place 4 wooden wedges (preferably knotty) around the column, arranged at 90° angles; adjust the wedges to level the column
- Compact the sand thoroughly (adding more if necessary to maintain the proportions shown in the drawing)
- Seal with concrete, which must be of the same strength class as that used to construct the plinth (class C25/30)
- Subsequently, remove the wedges and fill the hole left by the wedges with concrete of the same type as that used to construct the plinth



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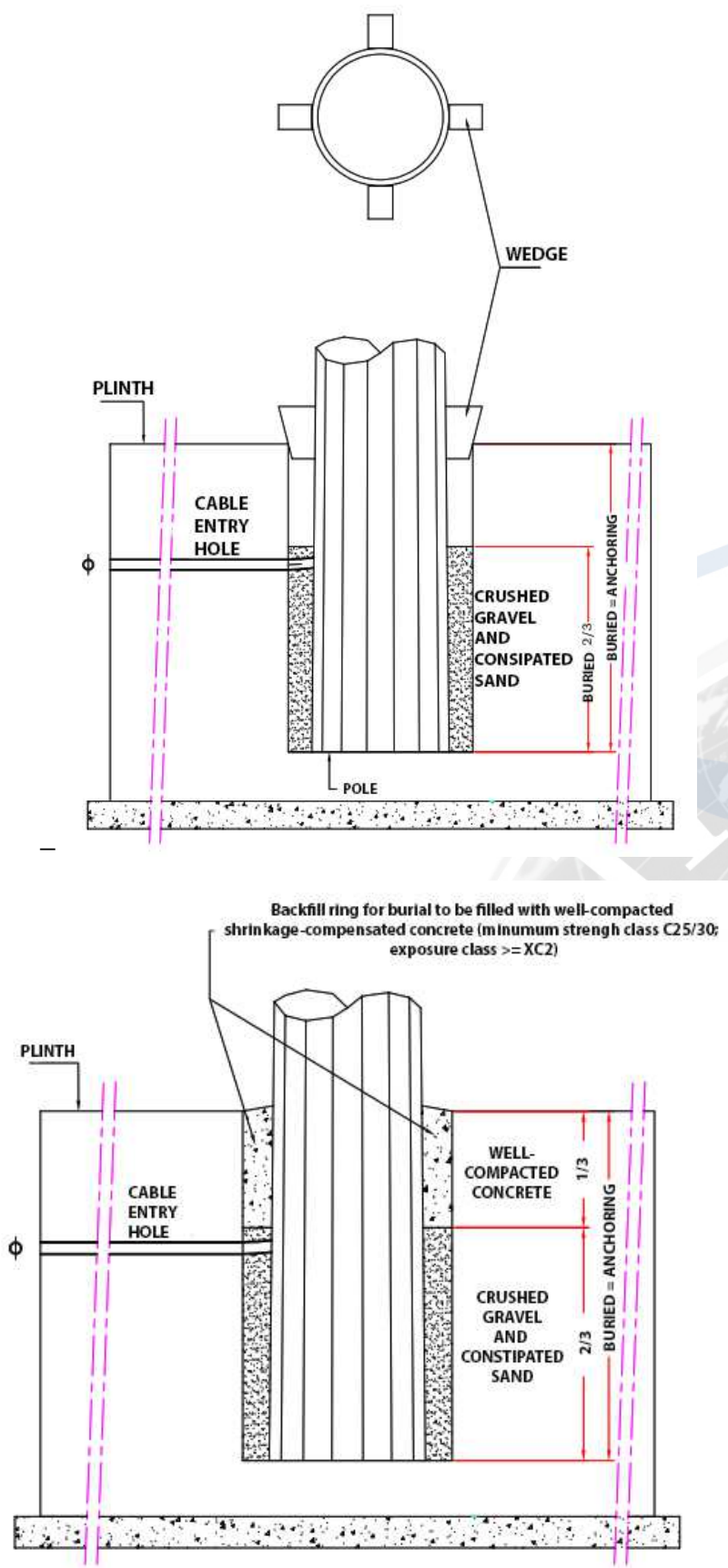
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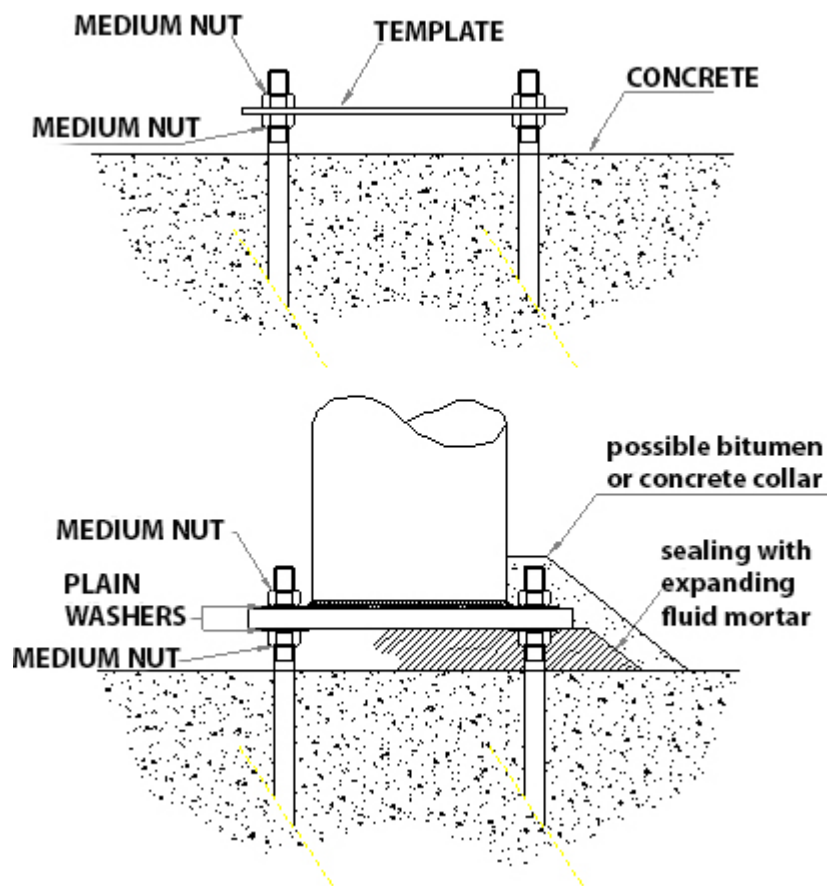
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COLUMNS WITH BASE PLATE AND ANCHOR BOLTS



For columns with base plates, the erection process must be preceded by the embedding of anchor bolts into the base plinth. To ensure the correct positioning of the anchor bolts, use a blank steel template, that is, a plate pre-drilled with holes spaced at precise intervals.

The assembled anchor bolts-template assembly must be perfectly level and secured (with straps) to the plinth reinforcement to prevent any unwanted movement during concrete pouring.

Carry out the following steps:

- Insert the column onto the protruding anchor bolts and rest it against the nuts below
- Screw, without tightening, the nuts above
- Adjust the plumb line by turning the nuts below
- Tighten the nuts above
- Seal with expanding fluid mortar

NOTE: When embedding anchor bolts in the foundation plinth, care must be taken to ensure that the entire threaded part remains outside the concrete. In addition, to prevent the threads from getting dirty or damaged, it is good practice to protect them by covering them with adhesive tape.

Once the concrete has set, it is possible to unscrew the nuts and remove the template, which can then be used for installing other anchor bolts.



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WARNING NOTE

TIGHTENING OF BOLTS FOR JOINTS NOT SUBJECT TO PRE-LOAD

The provisions of Ministerial Decree of 14 January 2008, “Technical Standards for Construction”, specify a pre-load force for bolted joints such as to prevent slippage between the parts to be joined, thereby creating a friction-based joint. In this case, a force equal to 70% of the bolt’s ultimate tensile strength is assumed, in accordance with the following formula:

$$F_{p,Cd} = 0.7 \cdot \frac{f_{th} \cdot A_{res}}{\gamma_{M7}}$$

To which it is associate a tightening torque equal: $M = k \cdot d \cdot F_{p,Cd}$

where:

f_{th} = tensile strength of the bolt

A_{res} = the load-bearing area of the bolt (excluding the thread)

γ_{M7} = safety factor (equal to 1.1 for pre-loaded high-strength bolts)

k = safety factor specified by the manufacturer

d = nominal diameter of the bolt

The purpose of a friction joint is to bring the parts to be joined into contact in such a way that they do not slide relative to one another, thereby inducing a tensile stress in the bolt shank up to values close to the yield strength. In fact, considering an 8.8-grade bolt [yield strength 640 MPa, tensile strength 800 MPa], the pre-load force is equal to:

$$F_{p,Cd} = 0.7 \cdot \frac{f_{th} \cdot A_{res}}{\gamma_{M7}} = 0.7 \cdot \frac{f_{yh}}{0.8} \cdot \frac{A_{res}}{1.1} \cong 0.8 \cdot f_{yh} \cdot A_{res}$$

where f_{yh} = yield strength

Therefore, values close to 80% of the yield strength are reached.

In the case of structures on a base plate, the connection between the plate and the plinth is not a friction-fit bolted joint that operates under pre-load. In fact, the purpose of anchor bolts is to transfer the stresses from the superstructure to the foundation plinth, that is, to keep the structure in place and prevent it from toppling over.

Furthermore, we would like to point out that applying the pre-load torque to the anchor bolts can be counterproductive, as this would pre-stress the anchor bolts themselves with a force already amounting to approximately 80% of the yield strength (leaving only 20% as a reserve for external loads)..

For the reasons set out above, in general, THE PRE-TENSIONING TORQUE MUST NOT BE APPLIED to the nuts on the anchor bolts or fasteners generally used in our products (unless otherwise explicitly stated in the workshop drawings for any special cases).

THE BOLTS MUST BE TIGHTENED USING STANDARD SPANNERS AVAILABLE IN STORES, WITHOUT EXTENSIONS OR SIMILAR DEVICES, USING A FORCE THAT CAN BE APPLIED BY AN AVERAGE PERSON

The applied torque values can be estimated on the basis of the following assumptions:



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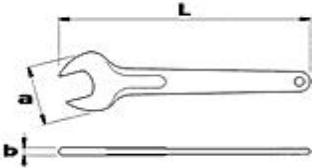


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- Considering that these are bolted joints that must not be preloaded.
- Considering that tightening the bolts using normal human strength is sufficient.
- Considering that the maximum force a normal person can safely exert is defined as 25 kg (Legislative Decree 81/08 – ISO 11228)
- Considering the length of standard open-ended spanners available on the market

The following formula can be used to calculate the tightening torque: $M = F \cdot L$, where F = applied force (max 25 kg ~ 245 N) e L = length of the spanner

The table below provides, for guidance, the lengths of standard single-ended open-end spanners.

Open-ended spanner		
	Spanner dimens.	L [mm]
	10	120
	13	145
	17	160
	19	175
	21	175
	22	196
	24	196
	26	216
	27	216
	30	240
	32	270
	35	300
	36	300
	38	300
	41	340
	42	340
	45	376
	46	376
	50	420
	55	450