INSTALLATION OF COLUMNS

1. General part

The columns manufactured at the Company are divided by the type of their joining to the footing into the following three kinds: being installed on footing anchor bolts, installed on the column footing block, installed on footing anchor bolts and additional reinforcing bars pre-secured in the footing. In the Recommendation, general information is provided including column inspection on the construction site, unloading, storage, raising into planned position, and information on installation of typical assemblies of joining of all abovementioned column kinds to the footing. At present, column installation on anchor bolts or reinforcing bars concreted into the footing is widely used; it is more rational, up-to-date and modern method than the one that has been the only one method – column installation on the column base plate.

Rarely met, non-typical assemblies of column joining to the footing and their installation ways should be indicated in each individual project.

2. Inspection of Production Items on Construction Site

All production items of the Company are marked by a special label meeting requirements of standards. In the label, the following information is provided: name of a production item and identification number, name of the client / object, identification number of the contract, geometric dimensions, the weight, manufacture date, a checking mark of the Quality Service.

It is recommended to verify the quality of all production items being transported prior to unloading and/or during it. When checking geometric dimensions of production items, drawings should be used and Tables for Production Tolerances that are enclosed to the contracts. When visually inspecting production items, it should be necessary to make sure that they do not have damage that may be caused by loading or transportation events. After the discrepancies or damage have been detected, the Construction Manager and Manufacturer‘s Representative (Project Manager) should be informed immediately. The Manufacturer shall assume obligation to take immediately all necessary actions to eliminate discrepancies, still claims concerning damage to production items shall be accepted only then when they are stated prior to unloading the production item from the transportation vehicle.

3. Unloading, Lifting. Interim Storage

The columns shall be unloaded from the transportation vehicle using double-branch strops, the lifting capacity of which corresponds to the weight of the column. It shall be necessary that during production item lifting, the angle between branches of the strop would be <90º. The columns shall be stored on a smooth firm base, putting supporting members in two resting points, under the lifting eyes (Fig. No.1). Extremely long and flexible columns ($L \geq H_{cross\text{-}section} \times 35$) have four lifting eyes. They shall be unloaded using special traverses or two cranes. One should pay attention to the fact that such columns are stored on three supporting members (Fig. No.2).

Unloading and storage of these columns, i.e., the layout of the propping points and raising into the vertical position will be described in the individual project.

Temporarily, the columns are stored near the installation location. Therefore, when unloading them, one should pay attention that the installation hole (to push the lifting facility through the column) is in a horizontal position so that the column will be raised into the vertical position directly from the storage place.

If a column because of the structural peculiarities is manufactured so that the installation hole is in vertical position after unloading, prior to installation it should be turned by 90º. For this purpose, we recommend to use a turning facility. To manufacture such one, the rest bars of large cross-section shall be required (Fig. No.3).

4. Column Raising into Vertical (Planned) Position (Fig. No.4)

Prior to raising a column into the planned position, it is recommended to cut the eyes intended for lifting out from a transportation vehicle and fill up their places. In addition, it shall be necessary using a bright color marker of 1÷2mm thickness to mark vertical axes of the column intended to be raised. Axis marking is required during installation for checking verticality of the column using a theodolite. Therefore, the axes should be marked at least on two perpendicular lateral planes of the column, at both the bottom of the column and the top.

Column raising into a planned position shall be carried out using a special semi-automatic traverse. The traverse shall be selected depending on the weight of the column and its cross-section dimensions. In the Table below, dimensions of inside diameter of installation holes are provided, unified by column weight.

Column weight	Inside of column installation hole	Traverse axis
Up to 5 t	Ø 50 mm	Ø 40 mm
5 – 10 t	Ø 60 mm	Ø 58 mm
10 – 15 t	Ø 80 mm	Ø 68 mm
Over 15 t	Ø 100 ÷ 130 mm	Ø 85 ÷ 110 mm

The traverse shall be unhooked from the ground using a rope of this special purpose. Unhooking is possible only then when the column has been secured on the anchor bolts by nuts, and its verticality adjusted.

The traverses for columns of alternate cross-section with consoles in more than two opposite directions are non-standard ones (large cross-section and long). Therefore, when preparing for ourselves installation facilities for these specific columns, it shall be necessary to consult crane renting companies in advance, and order the item.

5. Installation, Adjustment, Temporary Securing, Concreting

5.1 Column Installation on Footing Anchor Bolts

Prior to the installation of the columns, it shall be necessary to accept from the company that has erected the footing or from the Customer‘s Representatives the test geodetic surveys of the works executed, axis marking on the footing and check whether the anchor bolts are precisely concreted. Then, the nuts shall be screwed on the anchor bolts and washers placed. The planned column bottom altitudes (altitudes of top of the washers) shall be established using a geodetic level instrument. The gap between the top of the footing and the pattern in a typical assembly should have to be left about 50 mm ±10 mm. The columns shall be put on the bolts and erected on the washers, they should be leveled by the lower nuts and adjusted with respect to

the axis of the building then secured putting the upper washers and tightening the nuts (Fig. No.5). Prior to the tightening the nuts, the verticality of the column shall be approximately checked using a 2 m spirit level. The final checking of column verticality and adjustment shall be conducted using a theodolite, placing it in two positions at 90º with respect to each other and to the column. Verticality shall be corrected via height regulation of the supporting nuts. Having adjusted the column into the planned position, the nuts of the anchor bolts shall be tightened by 0.25 kNm force. The exact moment of nut tightening is indicated in the Project and drawings of assembly installation.

One should pay attention to the adjustment of round cross-section columns with respect to building axes. It shall be necessary to mark column axis on the column extremely thoroughly and precisely. After the column has been put on the anchor bolts, the axes of the column should be matched to the building axes marked on the footing.

The advantage of column installation on anchor bolts is that columns of up to 8m height do not need propping by supports. Taller columns (of three-storey building height) shall necessarily be propped using standard supports until girders and floors of the ground floor are installed. The height of their fastening should be allowing avoiding disturbance of the further procedures of production item installation (Fig. No.6).

Before the beginning of installation of girders and beams, the column-footing junction assembly should be concreted. Assembly concreting shall be conducted using not shrinking fine aggregate concrete, the compressive strength of which shall be not less than that of the column concrete. For this purpose, installation mix of “Ceresit CX15”, “Vetonit 600/3”, “Vetonit 1000/3” kinds or analogous mixes of other manufacturers shall be used. Installation of girders or beams shall be allowed only then when concrete of the column and footing reaches 70% of the compressive strength.

To carry out this work quickly and qualitatively, an appropriate formwork should be assembled around the pattern of the column. The formwork dimensions depend on column cross-section and other planned requirements. The column-footing junction assembly shall be concreted by 40÷50 mm wider than the column in two opposite directions or in all four ones, while its height shall be by 20 mm greater than a niche of column fastening (Fig. No.5).

5.2 Column Installation into Column Footing Block

This is the oldest traditional method for column installation. All recommendations described in items 1÷4 are suitable for installation of these columns. Essential difference is in installation of column-footing junction assembly. (Fig. No.7).

Prior to the installation of columns, one shall check the building axis marking on the footing, shall mark column axes at three sides at both column top part and bottom one at the footing block upper part. Then, in the center of the bottom of the footing block the supporting blocks shall be placed (100×100). Alternating the thickness of supporting blocks (in a typical assembly 50±10mm), a planned altitude of the column bottom is leveled using a geodetic level instrument. At the bottom of the footing block, the guiding dowels-2 shall be put that secure the resting part of the column. After the column has been placed into the block, the dashes of axes marked on the footing shall be matched with the column axis marks. Then the dowels-1 are inserted which shall be gradually hammered, and the column will be secured in the block with its verticality adjusted. Columns taller than 6 m should be propped using supports as indicated in Fig. No.6. The installed assembly shall be filled with fine aggregate concrete of the grade indicated in the Project.

5.3 Column Installation on Footing Anchor Bolts and Reinforcement Bars

The columns of structures of under-crane roads or other ones permanently affected by dynamic loads are installed on six or more footing anchor bolts and at the same time on the reinforcement bars let out from the footing (see Fig. No.8). These columns on their resting parts have securing parts inserted and also channels that are put on footing reinforcement bars. Installation of these columns is analogous to the column assembly actions described in item 5.1. Still, concreting of the supporting assembly is quite more complicated.

The column-footing junction assembly shall be hermetically sealed using formworks. Concreting shall be carried out via pumping the concrete mix using an agitator-pump through the openings at the column sides that are left for this purpose and connected to the channels that are put on the footing reinforcement. Self-compacting mix shall be pumped through one of the openings until the air is pushed out through the other openings and they are filled with this mix to the top. Mix make (Sikagrout-314, Vetonit1000/3 or other) is indicated in the drawings of assembly installation.

NOTE: When carrying out installation of a reinforced concrete multi-storage frame, in particular when installation is conducted in a stepping back way and throughout more than one storage, propping the columns shall be necessary not only as propping of a single member, but also as assurance of stability of the entire frame of the structure being erected. Then to prop the columns, single rods, temporary ties or structural ties may be used. The installation technology for this frame should be approved by the Structure Project Manager.

6. Measures in Winter

When installing columns in the winter time, one should ensure that prior to installation, the snow and the ice is thoroughly cleaned off not only from the columns but also from footing and anchor bolts. When concreting assemblies of junctions, the concrete should be with anti-freezing admixtures selected by the existing ambient air temperature. Prior to filling with mix, the place to be concreted occasionally may be required to be slightly heated using a gas burner or steam. The concreted junction should be immediately covered with heat-insulating material (stone wool or special mats)**.** In the case of extremely cold weather, during the initial setting of the concrete, the concreted place should be heated. For this purpose around the concreted place, a case shall be made and hot air blown into it.

7. Safety at Work (Fig. No. 2, 3, 4)

All Works of unloading, storage, installation should be organized on the basis of the following documents that regulate safety at work:

DT8-00 “Safe Use of Elevating Machines Regulations“.

DT5-00 “Safety and Health in Construction Regulations“.

The workers that conduct installation of columns should be having heard a course on instructions of safety at work for installers, they should have certificates of installers and hitchers and know all abovementioned items of the instruction. One should observe and ensure that strangers would not get on the

territory of installation or some machinery that may brush against temporary facilities of column propping. To unload and raise into the planned position, standard facilities should be used that correspond to the weight and overall dimensions of a column.

The Recommendation has been prepared by UAB "Betonika" according to recommendations of the concern "CONSOLIS".

INSTALLATION OF COLUMNS

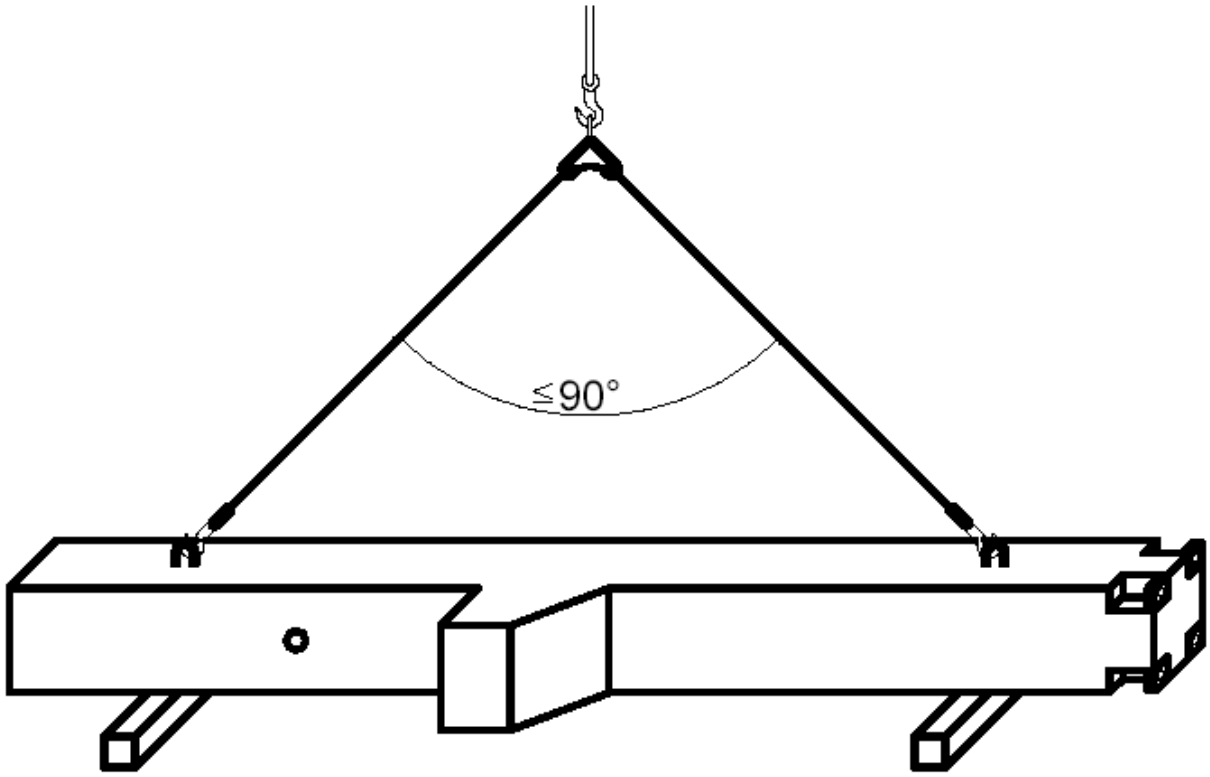


Figure No.1

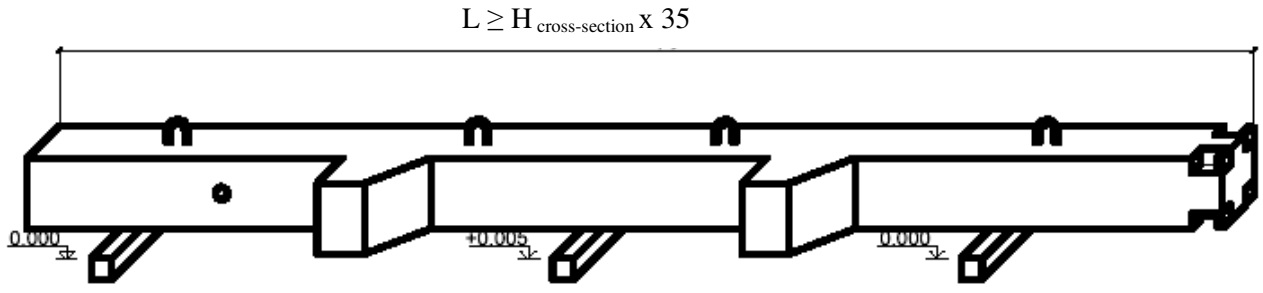


Figure No.2

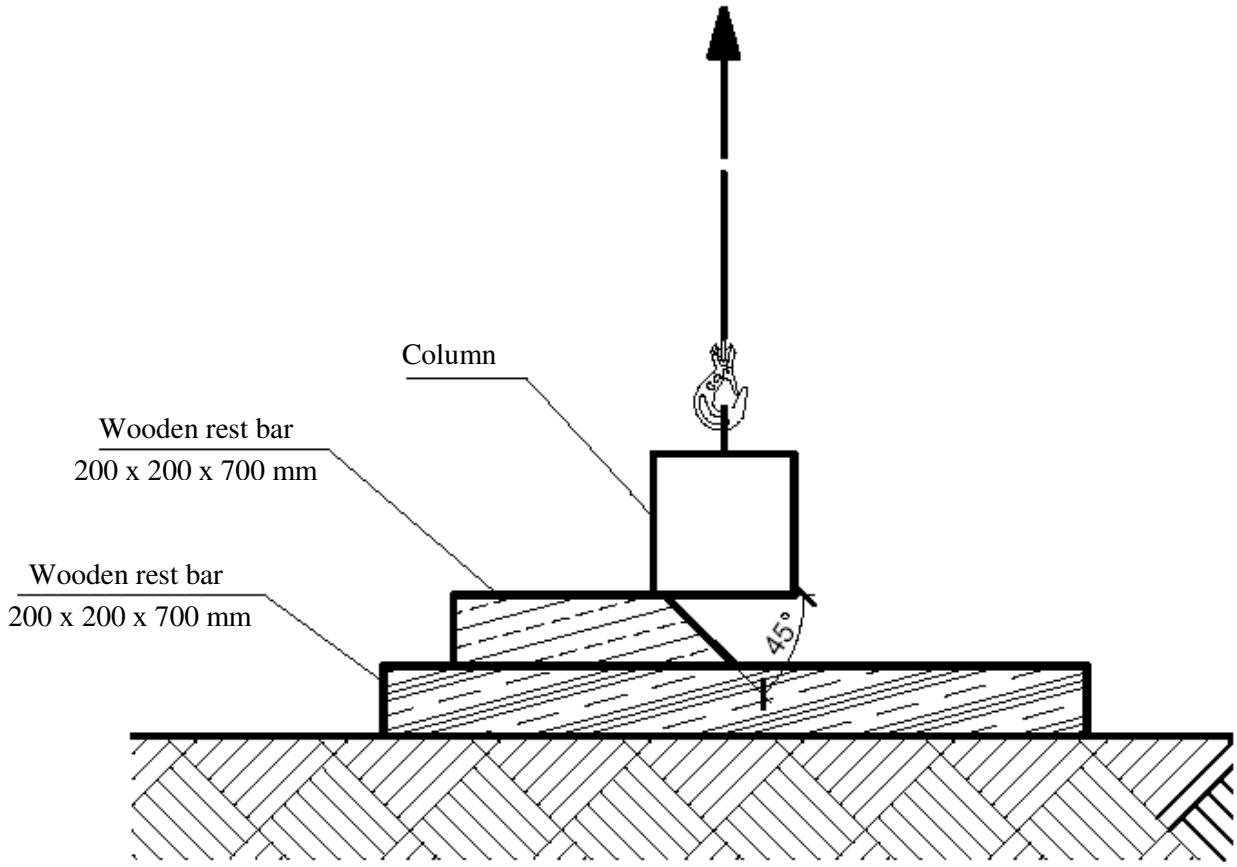
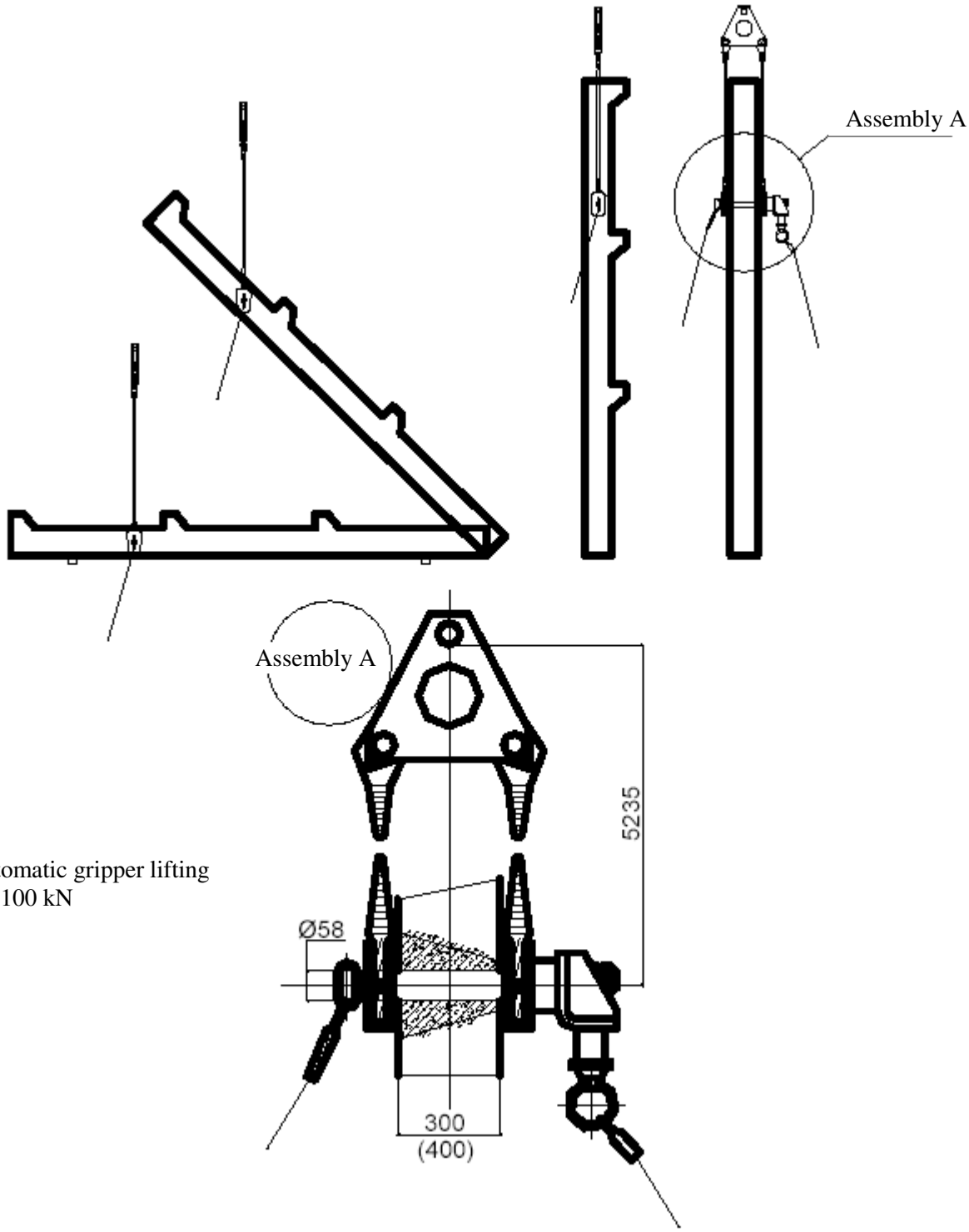

Column
Wooden rest bar
200 x 200 x 700 mm
Wooden rest bar
200 x 200 x 700 mm
45°

Figure No.3

INSTALLATION OF COLUMNS



Semi-automatic gripper lifting capacity 100 kN

Figure No.4

INSTALLATION OF COLUMNS

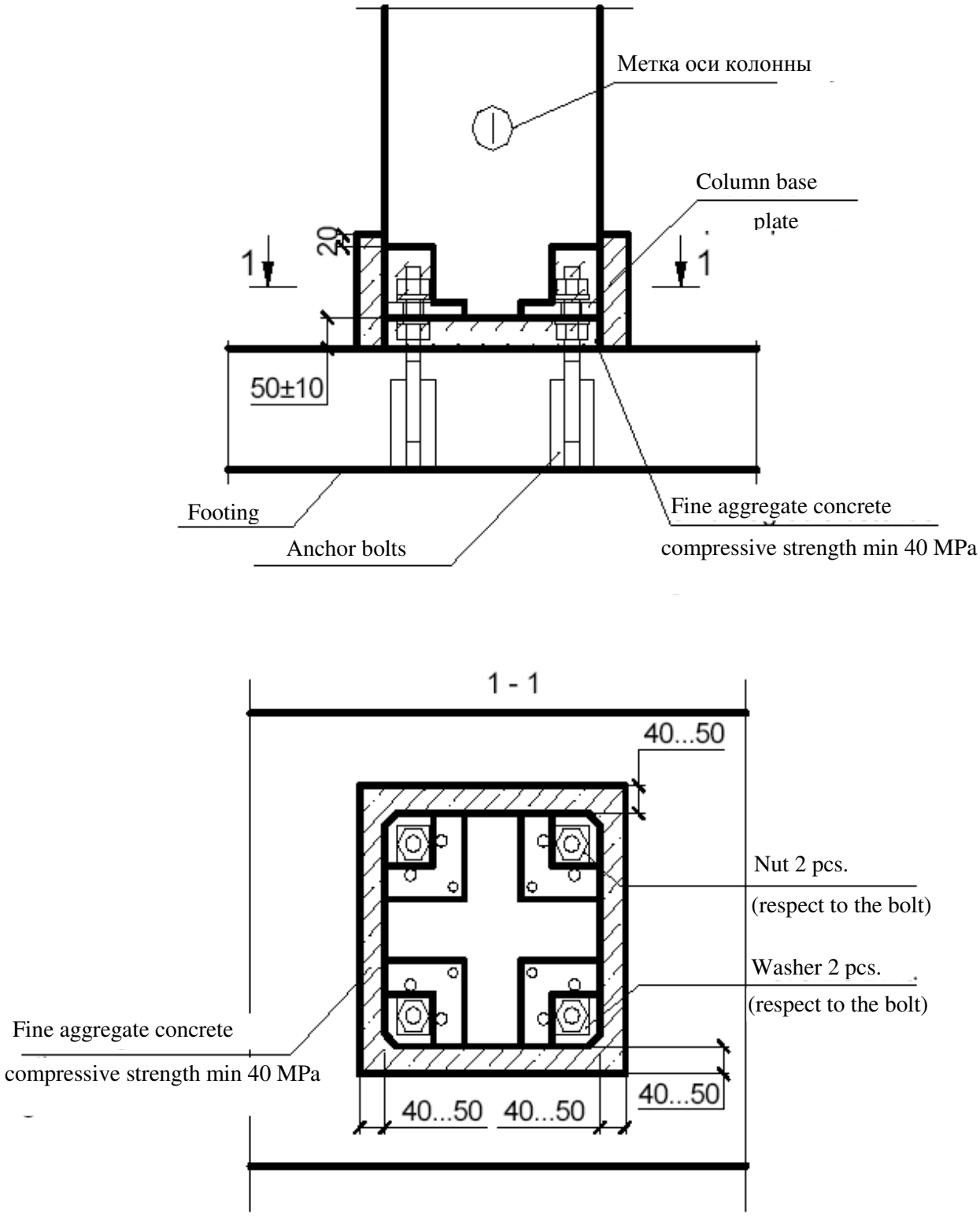


Figure No.5

INSTALLATION OF COLUMNS

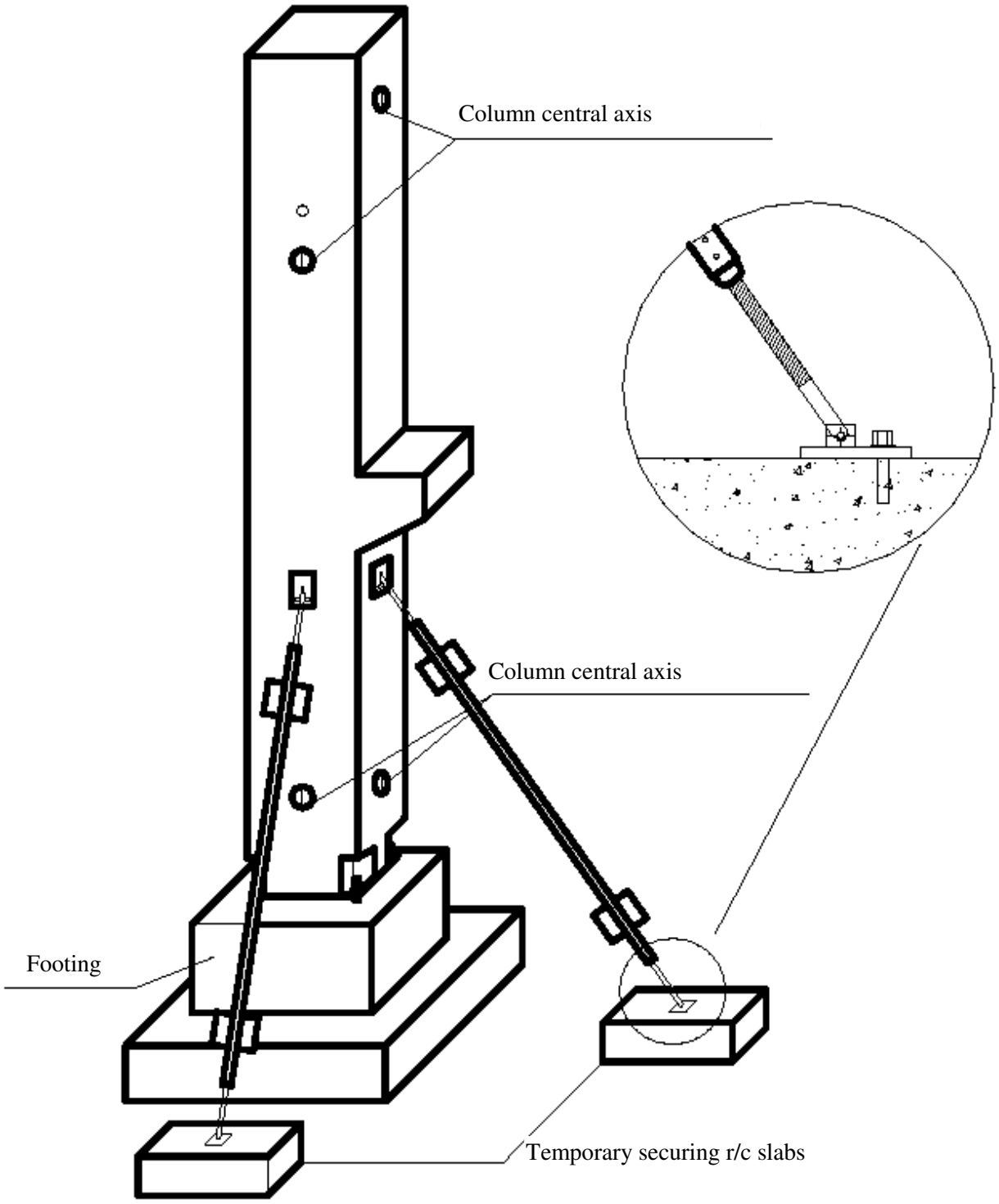
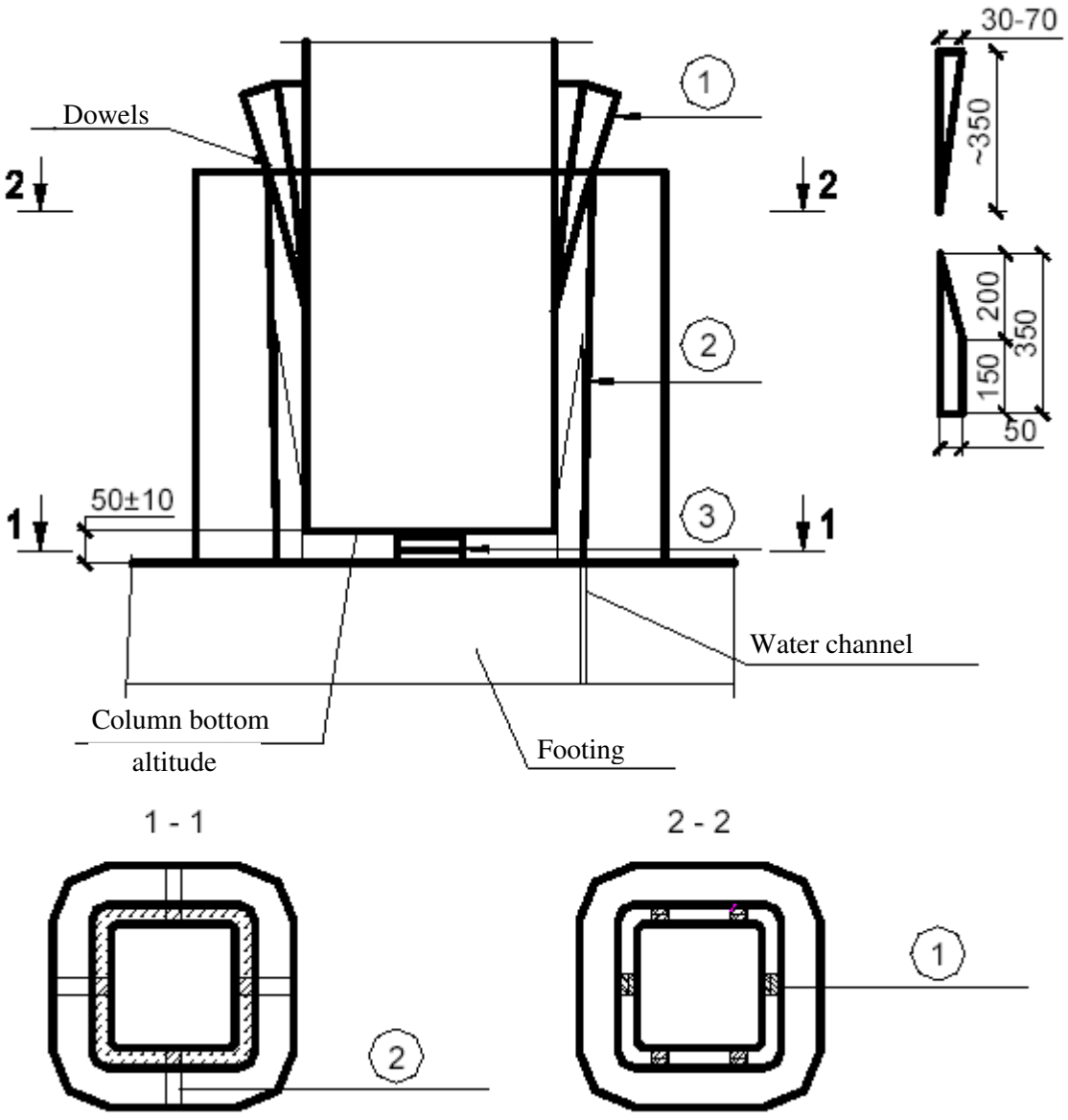


Figure No.6

INSTALLATION OF COLUMNS



SPECIFICATION OF MATERIALS				
Mark	**Part**	**Material**	**Quantity**	**Comments**
1	Dowel	Wood	12 pcs.	
2	Dowel	Wood	4 pcs.	
3	Supporting block	Wood	4 pcs.	

Figure No.7

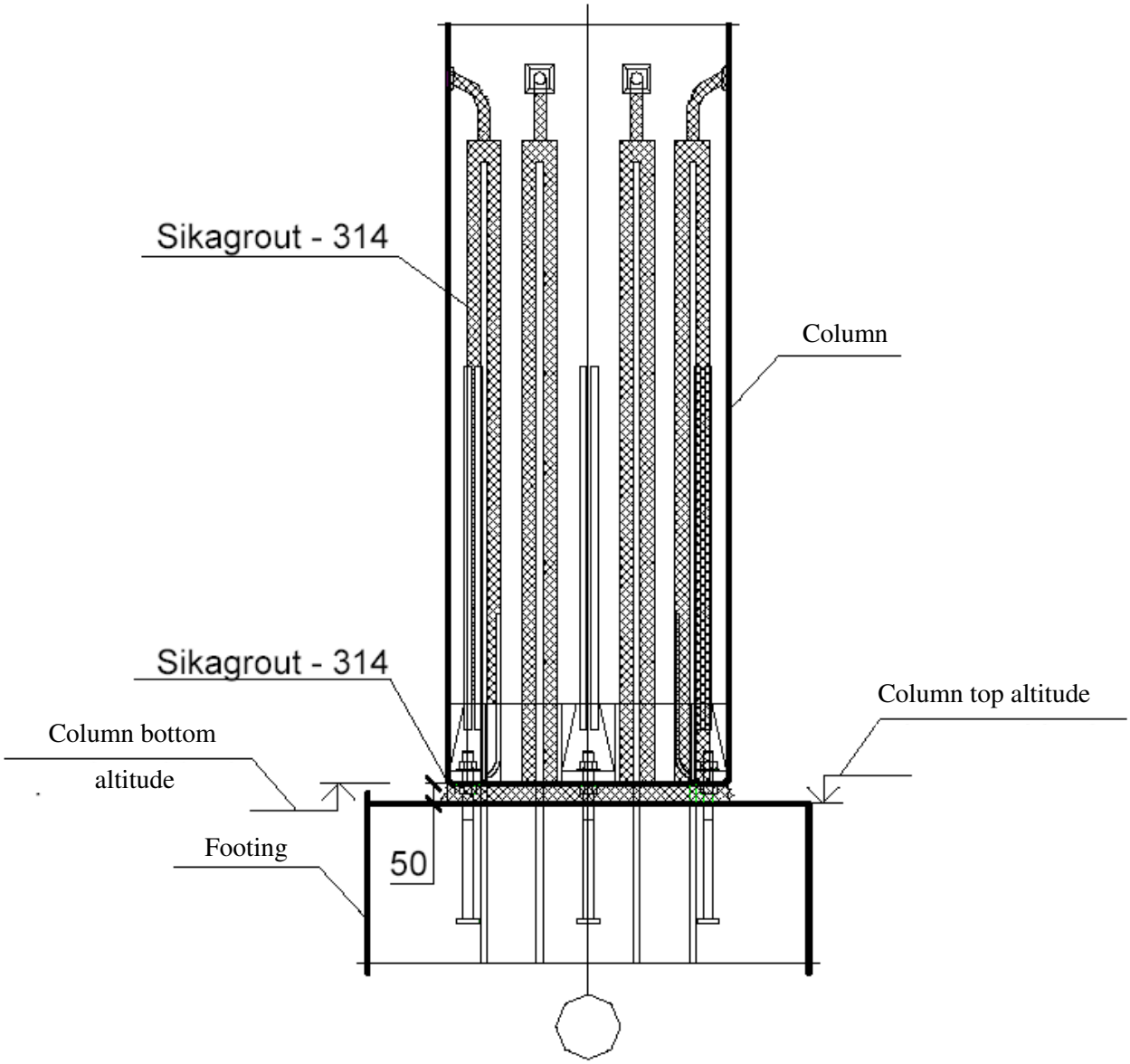

Sikagrout - 314
Column
Sikagrout - 314
Column top altitude
Column bottom
altitude
Footing
50

Figure No.8

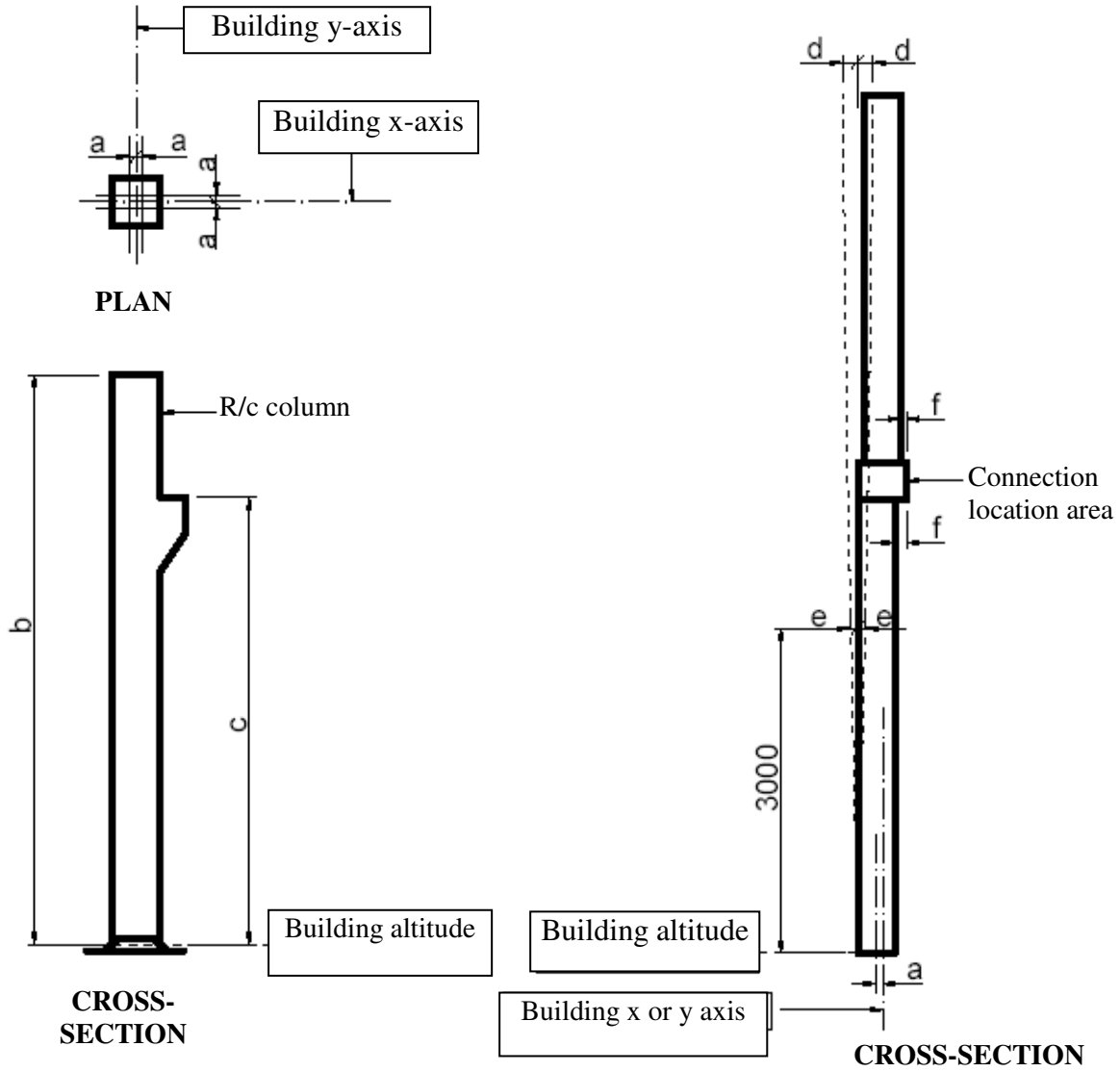

Building y-axis
Building x-axis
a
a
a
a
PLAN
R/c column
b
c
Building altitude
CROSS-SECTION
d
d
f
Connection location area
f
e
e
3000
Building altitude
a
Building x or y axis
CROSS-SECTION

Figure No.9

Column installation tolerances

Pre-cast r/c members on pre-cast r/c or monolithic r/c structures

a = distance from building axis	
in places visible with difficulty	± 15 mm
in places of architectural importance	± 10 mm
b = top altitude deviation from the planned	
maximum down	15 mm
maximum up	10 mm
c = support altitude deviation from the planned	
maximum down	15 mm
maximum up	10 mm
d = maximum deviation from perpendicular	
(member height in structure ≤ 30m)	25 mm
e = deviation from perpendicular in any segment of 3m height	10 mm
f = maximum shift from the planned edge	
in places of architectural importance	10 mm
in places visible with difficulty	15 mm