TARTU MAJA
BETOONTOOTED

02/2010

LINEAR STRUCTURAL ELEMENT

# COLUMN

AS Tartu Maja Betoontooted produces linear structural elements with the product name column in conformity with the standard EVS-EN 13225 “Precast concrete products. Linear structural elements” and EVS-EN 13369 “Common rules for precast concrete products“.
A column is a vertical linear structural element in a construction that mostly endures pressure and which has a length that exceeds the biggest dimension of cross-section more than three times and the dimensions of the cross-section do not differ more than four times.

## M A T E R I A L S

The following materials are used at the production of columns:

- normal-weight concrete with the strength class of at least C25/30 with the production and characteristics conforming to standard EVS-EN 206-1 ”Concrete. Specification, performance, production and conformity”;
- reinforcing steel as reinforcement with qualities conforming to the European standard EVS-EN 10080 “Steel for the reinforcement of concrete. Weldable reinforcing steel”.

**AS Tartu Maja Betoontooted** Betooni 7, 51014 Tartu, Estonia
**Phone** +372 731 5400 **Fax** +372 731 5401 **e-mail:** info@tartumaja.ee www.tartumaja.ee

## PRODUCTION

The columns are manufactured in a horizontal position, except for round columns with length up to 6 m, which are manufactured in a vertical position. The length of the columns is optional. The columns are reinforced in the longitudinal and transverse direction. The diameter of the longitudinal reinforcement bar is at least 12 mm. There is at least one bar in every corner in columns with polygonal cross-section. The minimum number of bars in columns with round cross-section is 6. The diameter of transverse reinforcement (stirrups, eyes or spiral reinforcement) is at least ¼ of the biggest diameter of the longitudinal reinforcement bar and at least 6 mm. The spacing of transverse reinforcement along the column is not greater than:

- 12 times of the minimum diameter of the longitudinal bar;
- the smallest dimension of the cross-section of the column is 300 mm

Concrete strength at output of the column is at least 50% of the strength class of the concrete.
Columns are produced on the basis of a designer's working drawings.

## QUALITY

The quality of the columns is secured by designing methods and factory production control. The production control of the factory includes regular control of all the used devices, materials, elements and the production process itself.

## FIRE RESISTANCE

The required fire resistance of the column is secured by the selection of appropriate cross-section dimensions and the protective layer of reinforcing steel. The fire resistance class of the product is in the range R60 - R120.

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## PRODUCTION TOLERANCES

The production tolerances of the columns conform to the standard EVS-EN 13225 “Precast concrete products. Linear structural elements” and EVS-EN 13369 “Common rules for precast concrete products“, unless working drawings state otherwise.

**Table 1.**

Production tolerances

| Dimension | Tolerance (mm) |
|---|---|
| Length L | +/- (10 + L/1000) +/- 15 |
| Nominal measurement of cross-section [1)] | |
| h 150 | + 10; - 5 |
| h = 400 | +/- 15 |
| Positioning and nominal dimension of openings and cavities, positioning of fastening plates [1)] | |
| h 150 | + 15; - 8 |
| h = 400 | +/- 23 |
| h 2500 | +/- 45 |
| Angle deviation of end or cross-section, | +/- h/100 5 |
| Curvature in any principal plane, | +/- L/700 |

[1)] The intermediate values of nominal dimensions h are interpolated linearly
The installation tolerances of column shoes, anchor bolts and beam shoes conform to producer’s requirements.
Symbols in the table of manufacturing tolerances are explained in Figure 1.

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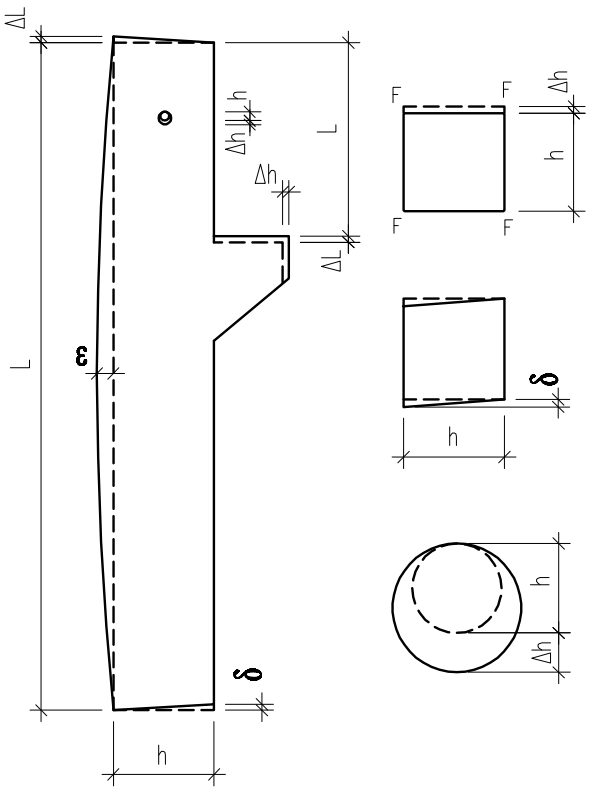
**Figure 1.**

Symbols in the table of tolerances

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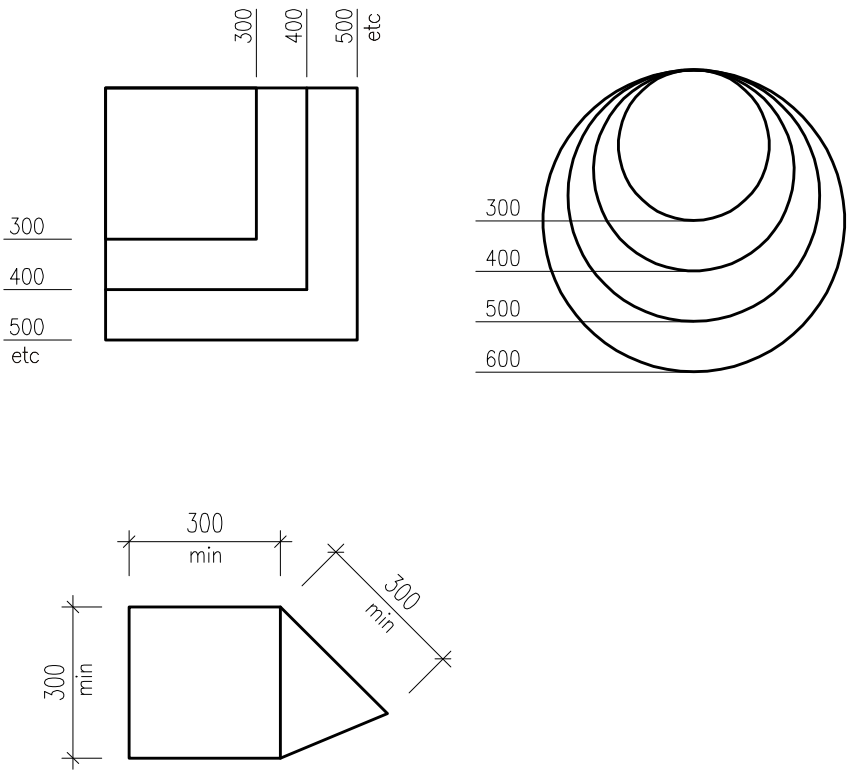
## A SELECTION OF COLUMN CROSS-SECTIONS

Columns can have rectangular, round or polygonal cross-sections. A selection of the possible column cross-sections has been presented in figure 2.
Usually the spacing of cross-section dimensions is 100 mm. At the connection of a reinforced concrete beam with a column by standard steel fasteners the minimum, dimension of the cross-section is 300 mm. The size of the angle phase of the column is 10 x 10 mm.

**Figure 2.**

A selection of column cross-sections:
a) rectangular
b) round
c) polygonal

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## USAGE

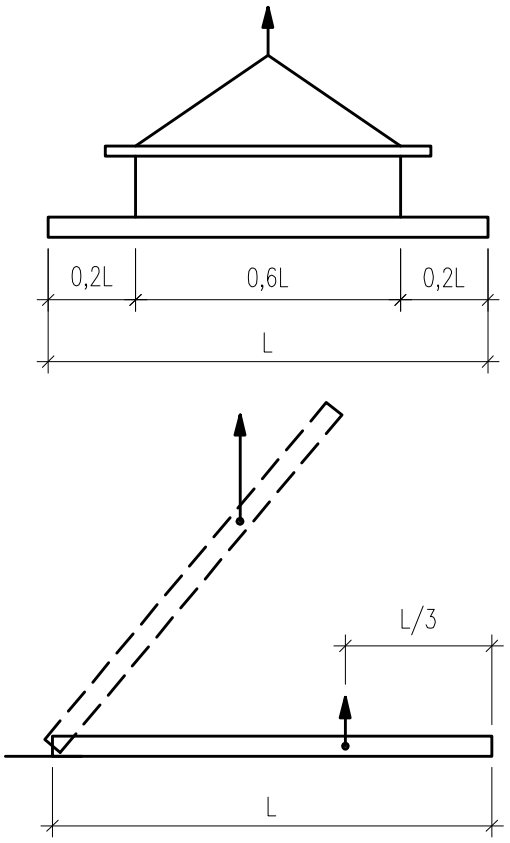
Columns are used for the construction of single-storey buildings with portal frames (warehouses, industrial buildings), multi-storey skeleton buildings (non-residential buildings, parking lots) and other buildings.
The length of the column is specified separately in case of every building proceeding from architectural and structural considerations. The column length of a single-storey building is usually up to 12 m. In case of the production of very long columns or columns loaded with big eccentric weights they can be pre-stressed.
The columns of multi-storey buildings usually reach through three or four floors.

## STORAGE AND TRANSPORTATION

Columns are stored and transported in horizontal position in up to 4 layer piles.
Columns are stored on at least 100 mm x 100 mm squared timbers placed on compact horizontal ground. Intermediate battens, which are thicker than the hoisting eyes, are placed between the column lines next to hoisting eyes. The intermediate battens will remain above each other.
In the transportation vehicle the columns have to be fixed to prevent their movement.
Columns are hoisted from two hoisting eyes with or without a traverse. Whereas the optimal distance of a hoisting eye from column end is 0.2 times the length of the column (Figure 3).
Columns are hoisted into vertical position by a gripper with a hoisting bar (Figure 3).
Openings for the hoisting bar are left at the production of the column.

**Figure 3.**

Hoisting of a column

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## ASSEMBLY

The fastening of a column to a foundation and to a beam can be either articulated or rigid.
A column is fastened to a foundation with anchor bolts by using the concreted steel “column shoes” (Figure 4). The column joint is made similarly to the fastening of the column to the foundation.
The beam is supported by the column end, beam shoe or cantilever (Figures 5 and 6).

**Figure 4.**

Fastening of a column to the foundation

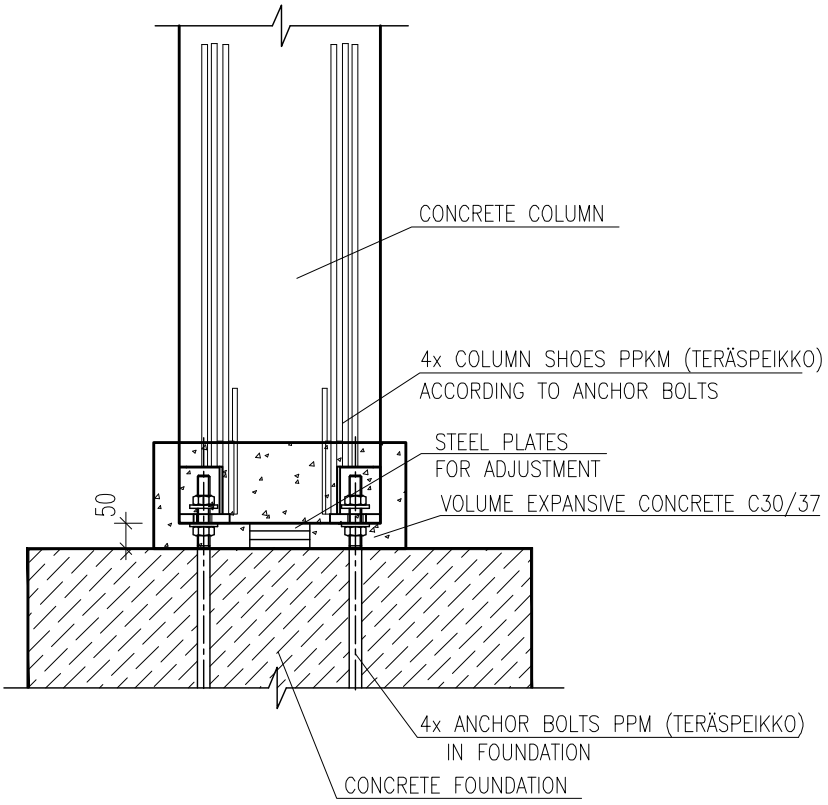


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**Figure 5.**

Connection between the column and the beam (concealed cantilever joint)

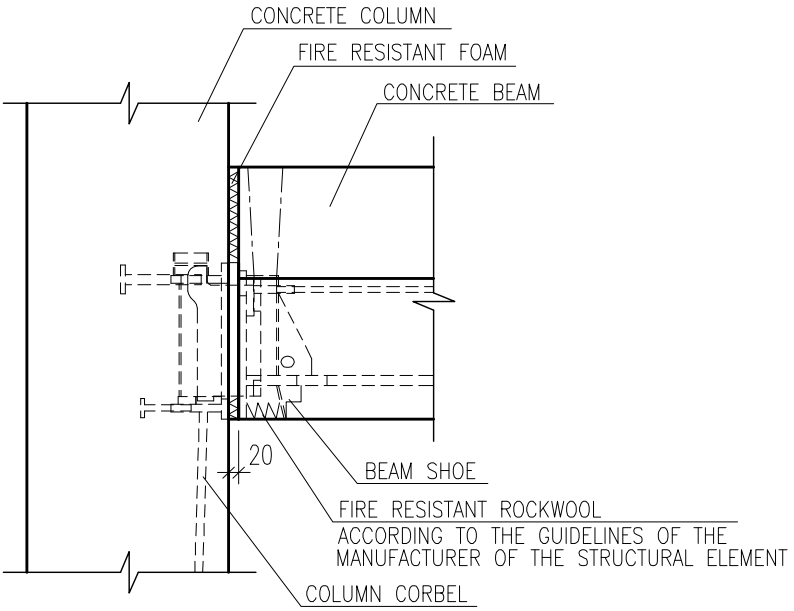
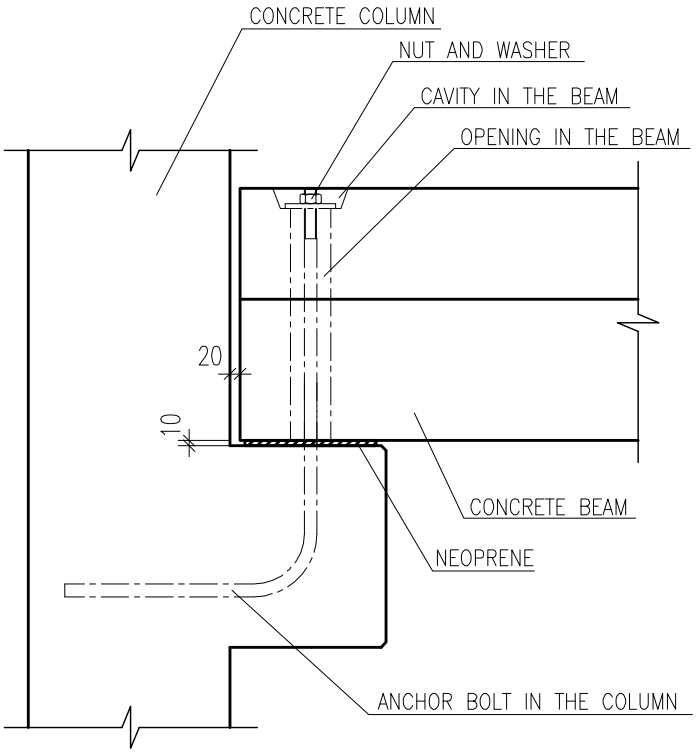



**Figure 6.**

Connection between the column and the beam (column cantilever and anchor bar joint)

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