INSTALLATION OF HOLLOW CORE FLOOR SLABS

1. General Part

Hollow core floor slabs are designed and manufactured using a continuous formation method in accordance with the floor plan with indicated holes submitted by the Client. The end edge of slabs may be of geometric shape (oblique or stepped sawing) provided in the Project.

The concrete grade for slab production – C35/45. Slab standard heights – 180, 200, 25, 300, 400 mm (types HCS180, HCS200, HCS250, HCS300 and HCS400). Slab standard width – 1200 mm. It is possible to produce narrower slabs, sawn longitudinally every 100 mm, still not narrower than 300 mm (types HCS180, HCS200, HCS250) or the ones of 360 mm, 600 mm, 720 mm, 960 mm width (types HCS300, HCS400).

To calculate load carrying capacity and select slabs, a special software HC-Unit is used. All production items are certified at the Center for Certification of Construction Production and meet EU requirements. Pre-stressed reinforced hollow core floor slabs are widely used for prefabricated floors. Their popularity is caused by economical cross-section and effective production method, variety of production item heights and load carrying capacity, smooth lower surface and effective use in a structure of a building. Various holes and openings may be formed in the slabs.

The allowable tolerances of a production item may cause slight increase in the weight of item. One should not forget the fact that when selecting a crane, it should be necessary to take into account not only its lifting capacity, weight of the item but the own weight of the lifting device as well.

A LIFTING DEVICE (A TRAVERSE WITH GRIPPERS) IS RECOMMENDED AND RENTED UNDER A CONTRACT BY THE MANUFACTURER OF FLOOR SLABS.

2. Inspection of Production Items on the Construction Site

All production items of the Company are marked by a special label meeting standard requirements. On this label, the following information is provided: name of the 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 Control Service.

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

3. Unloading, Hoisting

Unloading and hoisting of HCS slabs shall be conducted using a special lifting device - a hoisting traverse, which consists of a lifting beam with two hoisting grippers (Fig. No.2). The position of the hoisting grippers on the lifting beam shall be adapted to the length of the slab. The free ends of the slab should not be protruded from the gripper by more than 0.5 m (Fig. No.3). When hooking the hoisting gripper to the slab, one should be extremely careful. Check whether the zone of slab hooking is not damaged and take care of

gripping the slab in all width (Fig. No.4). To hoist short slabs (up to 3 m length), only one gripper shall be sufficient. During unloading and hoisting, it shall be necessary to use safety chains that are at the grippers to ensure safe hoisting of the item and its holding in the case of sudden release of the grippers. The chains shall be put on after the slab has been lifted at the height not greater than 10 cm from the supporting members. They cannot be unhooked until the slab occurs directly above the planned bearing surface, at 10 cm from it (Fig. No.5). The narrowed slabs, slabs with grooves or slabs that cannot be hoisted using the grippers because of any other reasons should be hoisted using special lifting eyes that are concreted in the slabs (Fig. No.6), lifting belts or any other method recommended by the Manufacturer.

If the end of a slab is narrowed, still the throat does not exceed 0.5 m of length, it is recommended to hoist the slab in a usual way. If the throat is 0.5÷ 3.0 m, the slab shall be hoisted using lifting eyes concreted in the slab (Fig. No.7).

When a slab with the hole is being hoisted and grippers used, it shall be necessary to follow restrictions indicated in Fig. No.8. When a slab is being hoisted with a lateral groove and grippers are used, the following condition should be met- the lateral groove should be further then 1.4 m from the end of the slab. If a lateral groove is nearer than 1.4 m from the end of the slab, the item shall be hoisted using lifting eyes (Fig. No.8)

4. Interim Storage

Interim storage on the construction site usually is not required, as production items are installed directly from a lorry. If interim storage is conducted, for this purpose a horizontally leveled site should be prepared. The items shall be piled atop one another with no more than 6-9 pieces in a pile (pile height ≤2.5 m), and supporting members shall be put atop one another in a vertical. The ends of the slab should be protruded from the supporting members by not more than 40 cm (Fig. No.9).

5. Installation

HCS slabs are installed on a leveling neoprene strip, fastened to the bearing structure (a transverse-member or beam in Fig. 10). Prior to installation the slabs on wall slabs, the smoothness of the bearing surface should be checked. If the bearing surface is not smooth, the roughness should be removed or leveled. To level a resting surface, plastic or metal (50mm x 75 mm) leveling plates-spacers of thickness from 1 to 20 mm should be used. The overall height of the leveling plates should be not less than 15 mm so that the concrete may run under the resting part of the slab. One should pay attention to the fact that the leveling plates should be placed under vertical walls of the floor slab (it is prohibited to place the leveling plates at the holes in the floor in order not to break off the concrete in the resting part of the floor, Fig. No.11). The installers direct the hoisted floor slab into the proper position – directly above the bearing surface and unhook the safety chains.

After the banksman has commanded, the item shall be lowered into the planned position. Prior to unhooking the slab from the crane, its lateral position is verified and also the length of the bearing surface. The minimum length of the bearing surface of a floor slab shall be as follows: on masonry – 10 cm. on concrete or metal -8 cm.

When installing a narrower than 120 cm slab, one should make efforts to flatten its sawn edge to the wall or other structures, but not to the other slab. If this is not possible, a gap of about 2 cm should be left between the edge of the sound slab and the edge of the longitudinally sawn slab that is next to the first one, so that after a formwork has been propped (Fig. No.12) a lower joint would be formed not differing from other joints.

If in the floor a large hole should be formed, the manufacturer shall design and submit a special supporting member and indicate its location for support (Fig. No.13). When installing this node, it is recommended to leave a clearance indicated in the Project between two floor slabs of full length, then put in a supporting member in the proper location and let in a short floor slab into the niche formed (Fig. No.14).

6. Adjustment, Curvature Equalization

Different curvatures of adjacent slabs may occur because of many influences as follows: improper storage of slabs and transportation, different length adjacent slabs etc. If these mismatches in the lower side of the floor exceed the allowable size – 8 mm, the curvature of slabs should be necessarily equalized. In many cases it may be conducted via a help of adjustable struts lifting the lowest part of the slab into optimal level by the edge of the adjacent production item (Fig. No.15). In such propped position, the slab shall be maintained until filled joints set. When lifting the slab, one should take care that the ends of the slab do not elevate themselves from the bearing surface. When lifting is not a sufficient action, the slab with the most considerable curvature may be pressed by putting on it a proper weight. To equalize the curvature of slabs, a clamping device may also be used (Fig. No.16). The device shall be inserted from above into the joint between the adjacent slabs in the location where difference in curvatures is the most significant and clamped after plugging with wooden plugs. The clamping device shall remain in that place until concrete mix in the joint reaches the planned strength.

7. Positioning, Installation of Ties (Fig. Nos. 17, 18)

The quantity of slab ties and their installation methods are indicated in each project. As this influence is determined by great many of different factors, in the Project, tie installation nodes, their locations on the floor and concreting peculiarities shall be indicated. More frequently, the ties are installed at the ends of slabs by the supporting members. If a floor functions as a diaphragm, the ties (anchors) shall be also installed with the longitudinal walls. For this purpose, at the sides of a floor slab, the grooves are designed.

8. Concreting of Junctions and Joints

The installation joints that are between the slabs and also the ends of slabs should be filled with fine aggregate concrete, the strength class of which when compressing shall be C20 (Mpa), still C25, C30 (Mpa) are recommended. The maximum diameter of fillers being used shall be 8 mm. The concrete shall be compacted using an internal vibrator (head diameter 20 mm).

Prior to concreting of joints and anchor ties, one should make sure that there is no rubbish or extraneous matter in the joints. If a clearance between the slabs is more than 5 mm, it is recommended to seal the lower part of the joint with “Makroflex“ foam. When carrying out finish works, the joint at the lower part shall be sealed with silicone or acrylic sealer (Fig. No.19).

One should pay particular attention when concreting the ends of the slabs by the supporting members. The concrete, with which the holes of floor slabs are to be filled, should not run deeper than the length of the supporting member of the slab (Fig. No.20). This means, that the holes of slabs that are at their ends prior to concreting should be sealed not deeper than at the end of the propping. For this purpose, together with the

slabs, plastic caps for holes are delivered. To seal the holes, not only special caps may be used but also it is recommended to use foam polystyrene or stone wool.

Estimated consumption of concreting materials for one linear meter of joint of floor slabs shall be as follows:

Ser. No.	Slab height H, mm	Concrete capacity, m^3
1	180	0,007
2	200	0,008
3	250	0,010
4	300	0,013
5	400	0,017

One should not forget that in the joint, where a sound slab and longitudinally sawn one meet, prior to filling, a formwork should be put that allows forming of the lower joint not differing from other sound slabs joints (Fig. No.12).

To concrete the joints, it is recommended to use a special wheelbarrow. Its use reduces work costs markedly and quickens the work (Fig. Nos. 21, 22).

9. Measures in winter

When installing the slabs in the winter time, it shall be necessary to clean off the snow and the ice from the slabs and their bearing surfaces. Select the concrete for filling of such quality and such admixtures that would allow proper and qualitative work.

If extremely cold weather sets in (below – 10^0C), the place to be concreted should be covered and heated. After concreting has been finished, make sure that drainage holes at the bottom of the slabs are not blinded.

10. Safety at Work

All unloading, storage and installation works should be organized on the basis of the following documents regulating safety at work:

DT8-00 "Safe Use of Elevating Machines Regulations"

DT5-00 "Safety and Health in Construction Regulations"

Installation of hollow core floor slabs does not require special or particular means of safety at work. The workers that are intended to carry out installation should be having heard safety instructions for erectors and high-rise erection workers, should possess appropriate certificates, know all items of the abovementioned recommendations and wear safety belts. The slabs being hoisted should be necessarily surrounded with safety chains of the grippers. During work, it shall be necessary to wear the assigned personal protection means. After a part of the floor has been installed, onto which other workers from the construction site may get, the protective enclosure should be placed. The protective enclosure or handrails are of various structures (standard handrails manufactured by different companies), still they should ensure safe movement of the workers on the installed floor.

All holes on the installed floor should be immediately shielded or fenced with a protective enclosure (Fig. Nos. 23, 24).

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

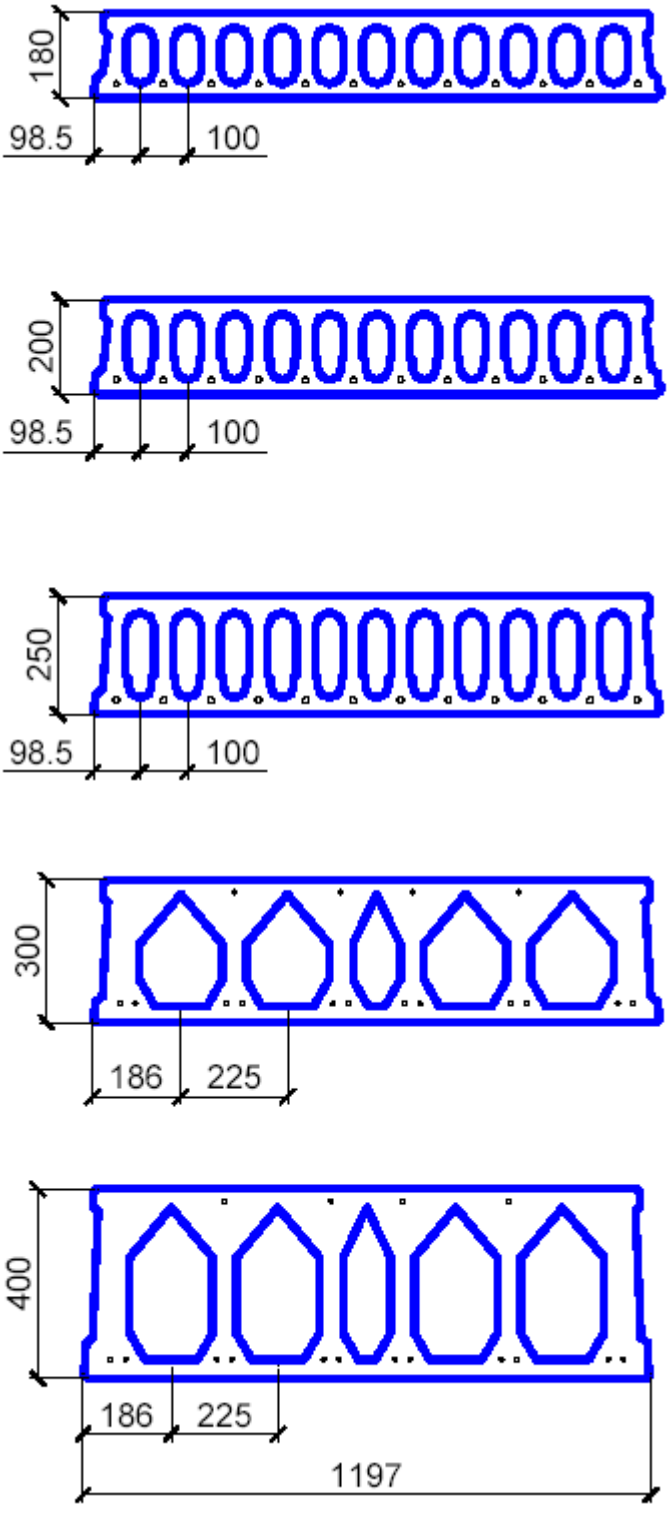
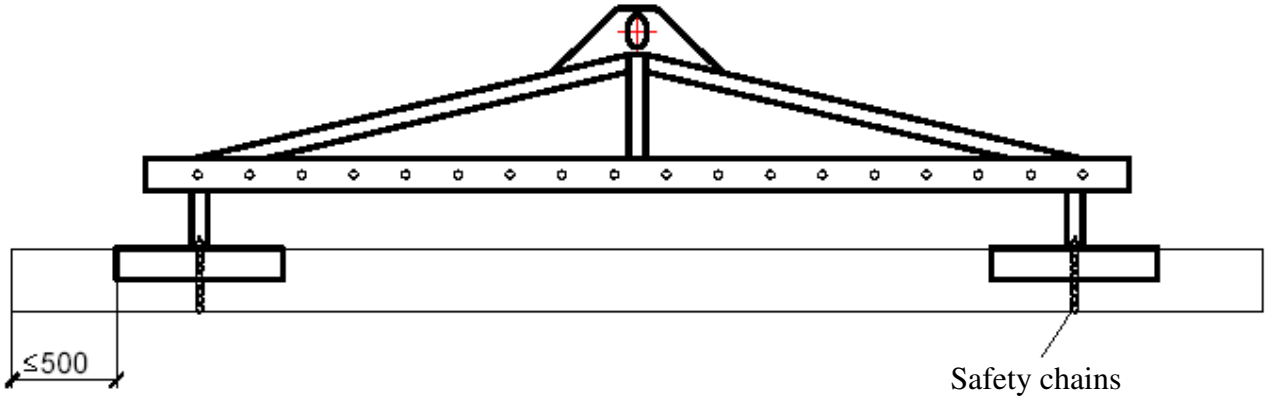


Figure No.1

INSTALLATION OF HOLLOW CORE FLOOR SLABS

Figure No.2



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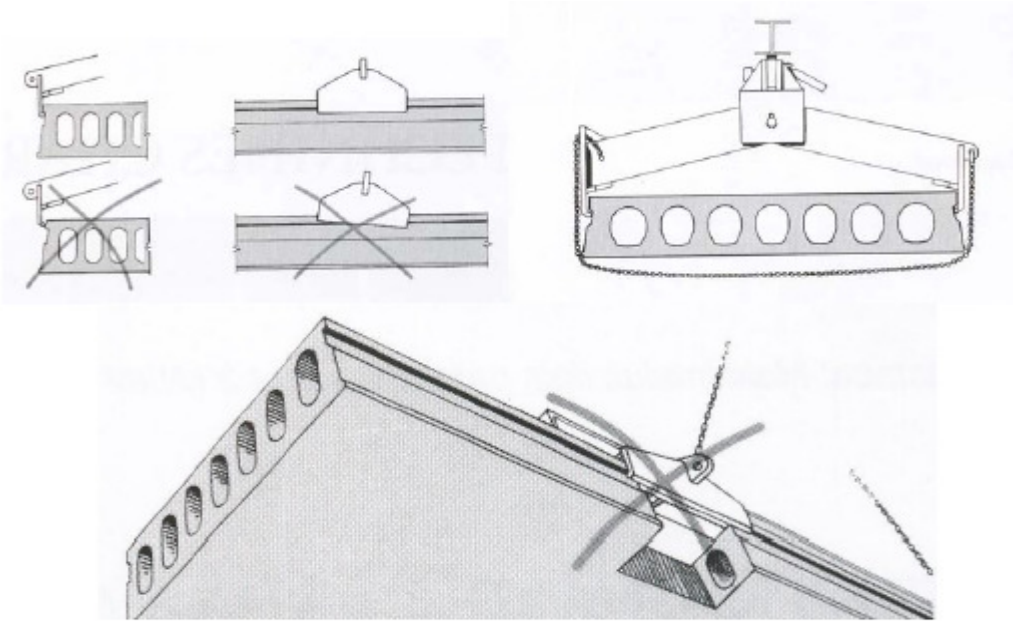

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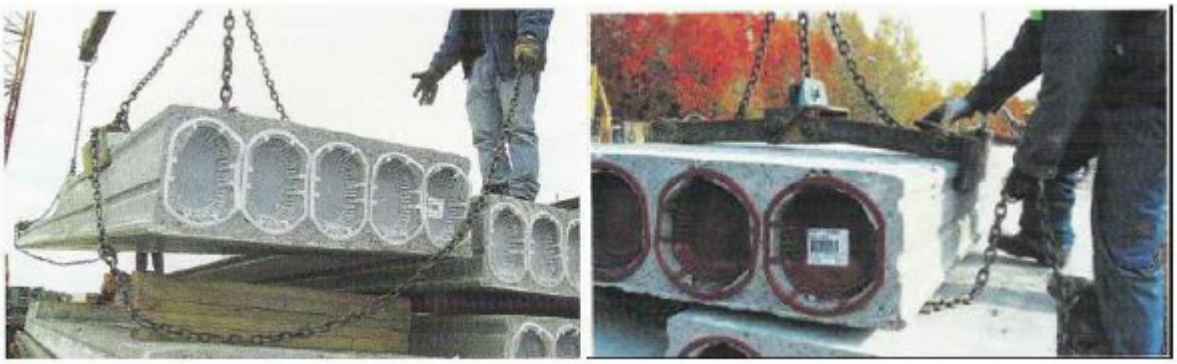
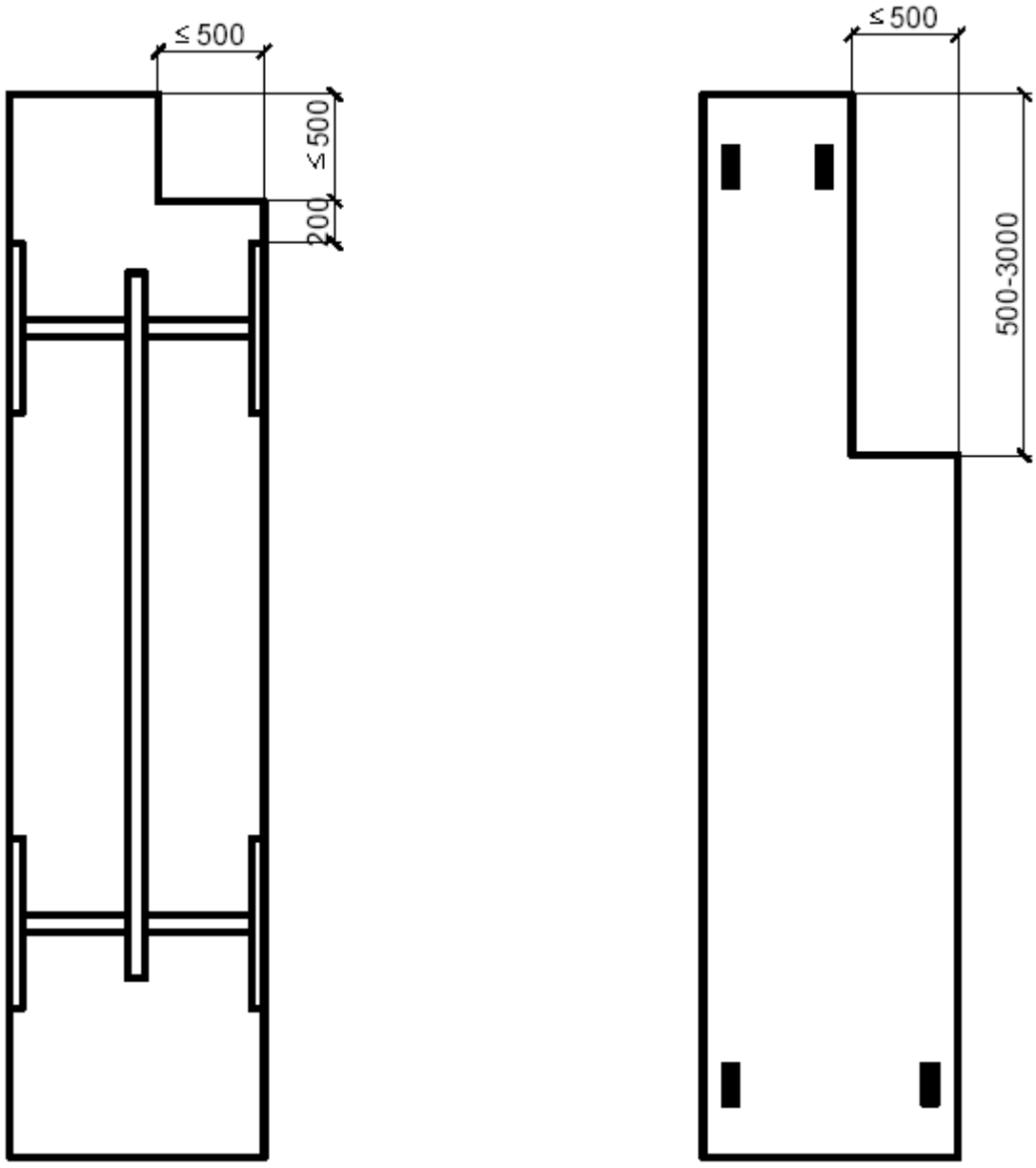


Figure No.5 Putting on and removal of safety chains

Figure No.6 A narrowed slab with lifting eyes

INSTALLATION OF HOLLOW CORE FLOOR SLABS



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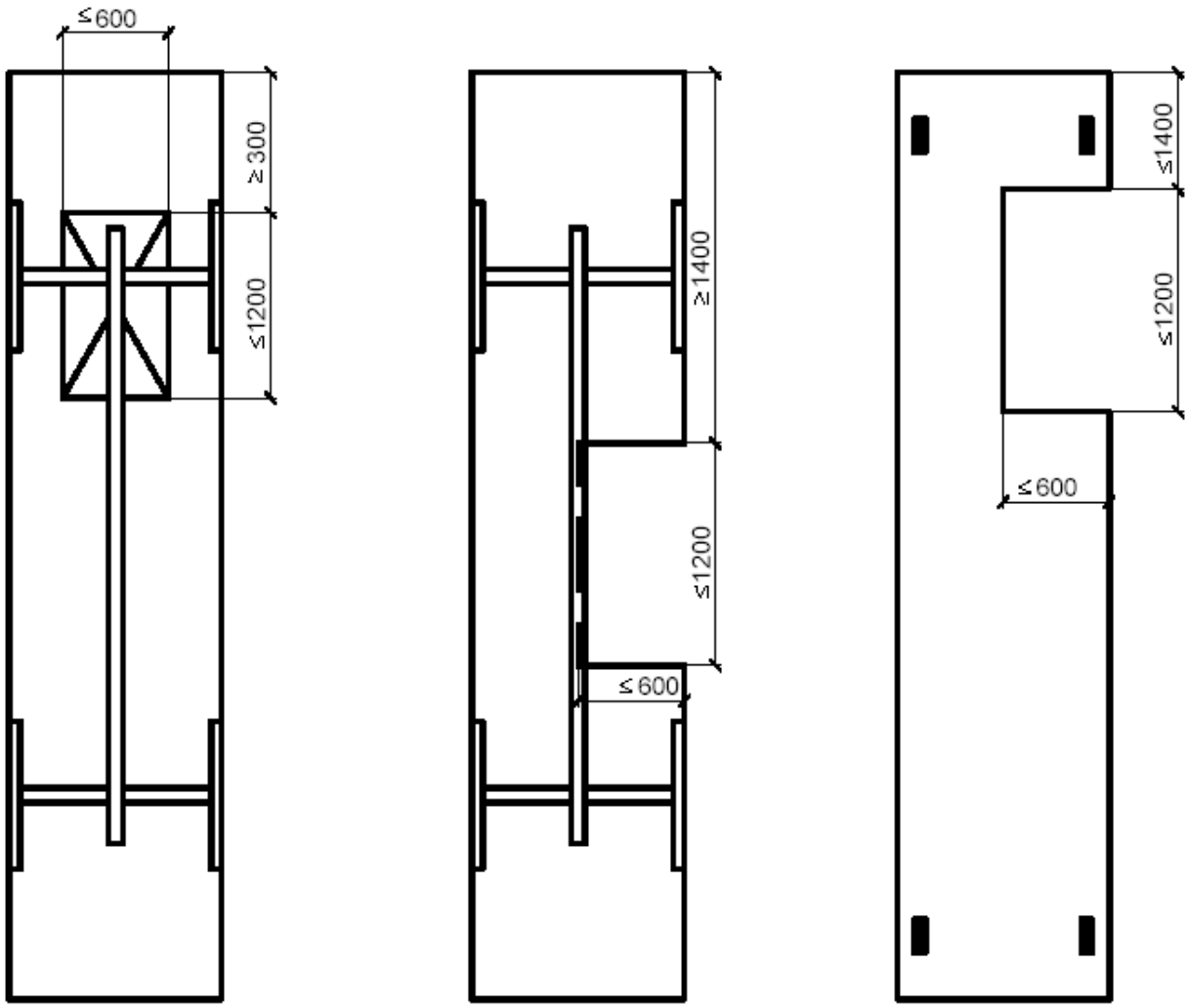

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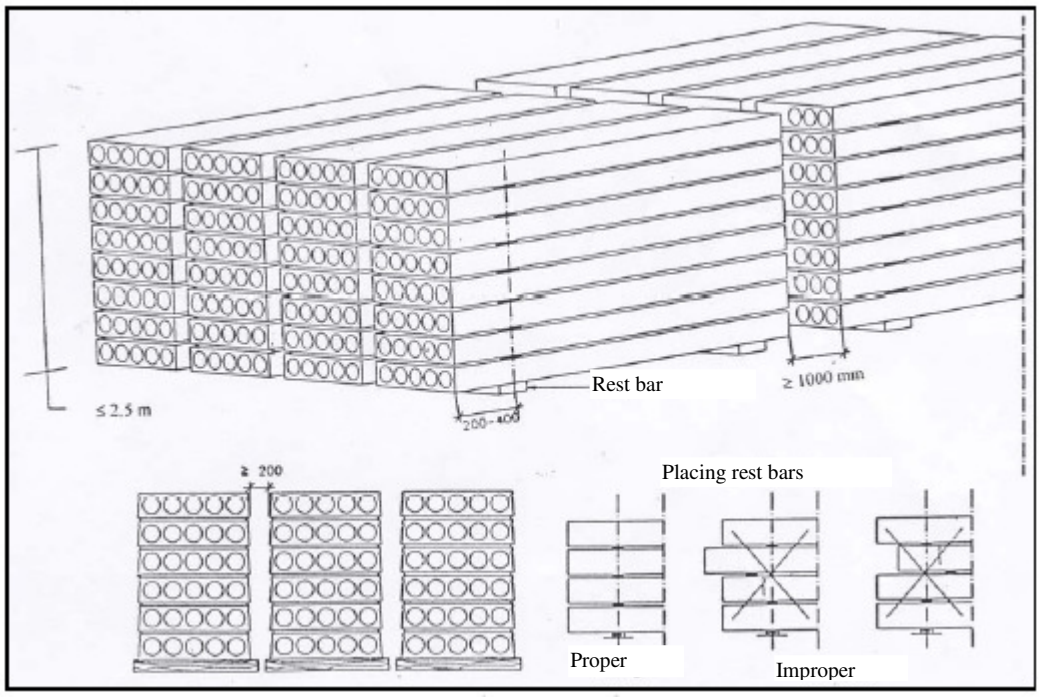

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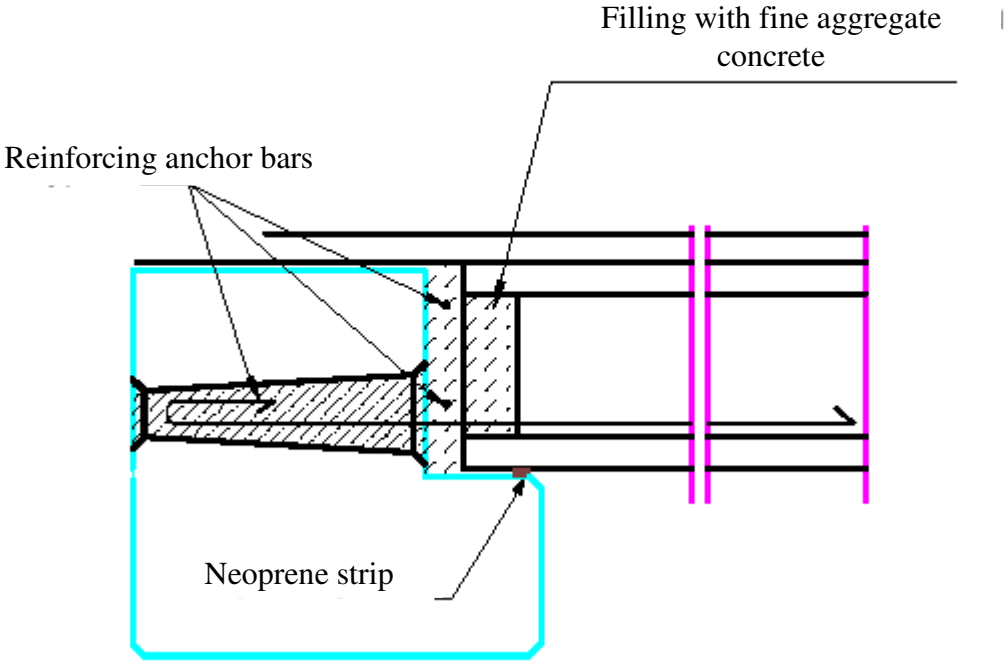


Figure No.10

INSTALLATION OF HOLLOW CORE FLOOR SLABS

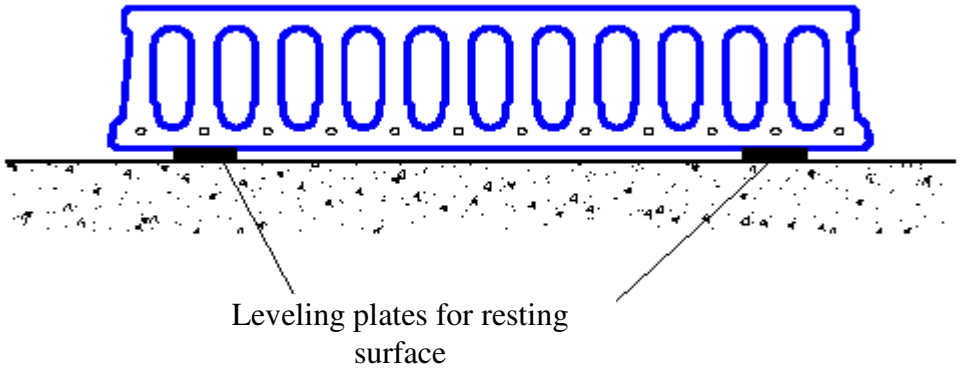


Figure No.11

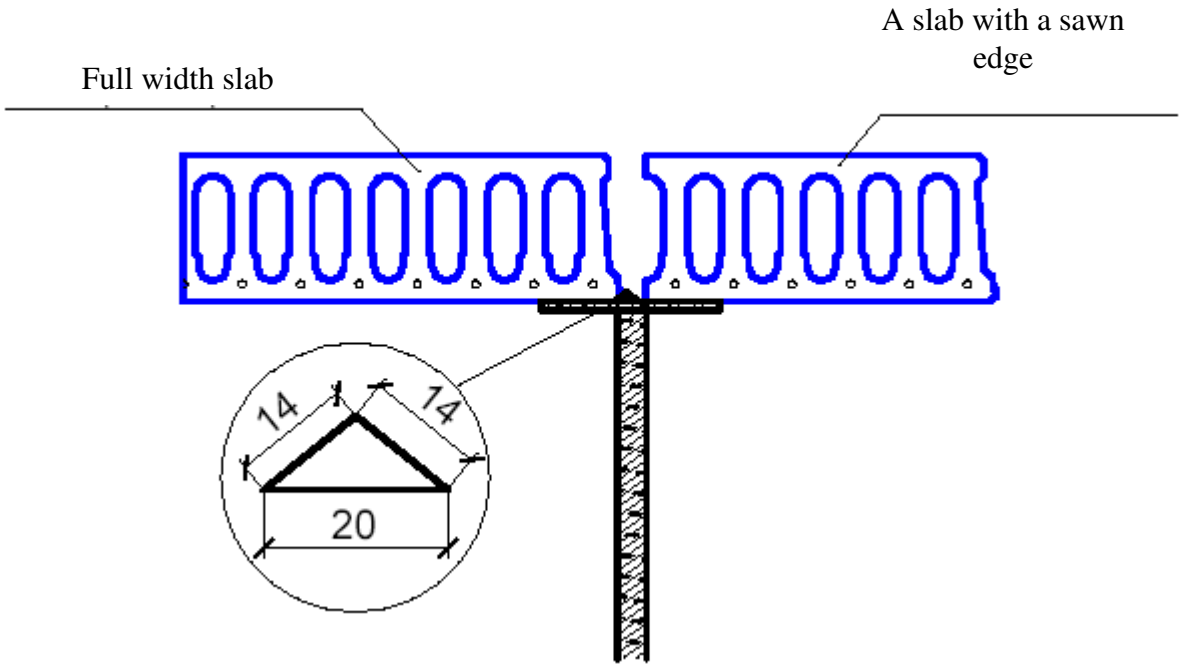


Figure No.12

Figure No.13

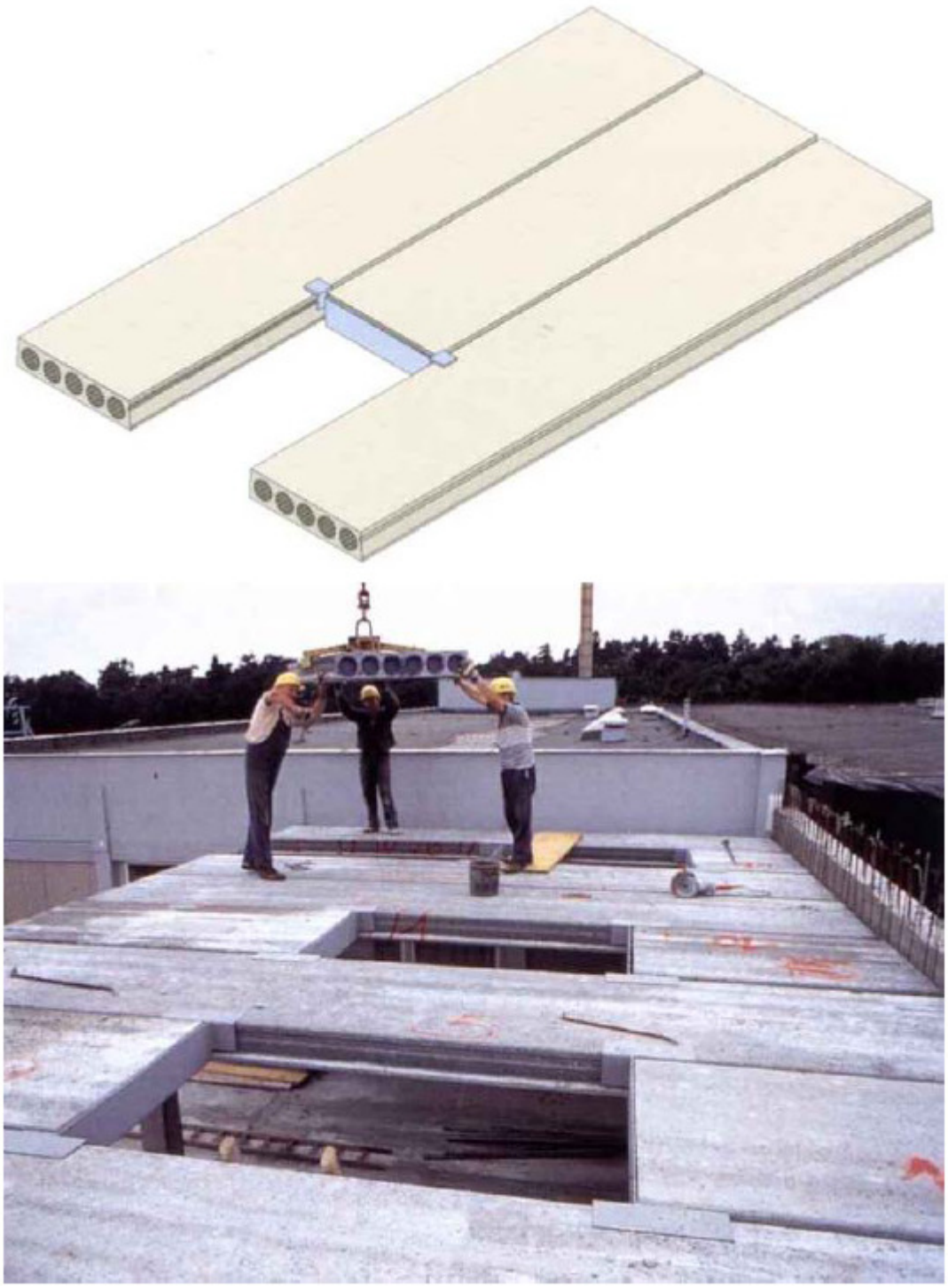


Figure No.14

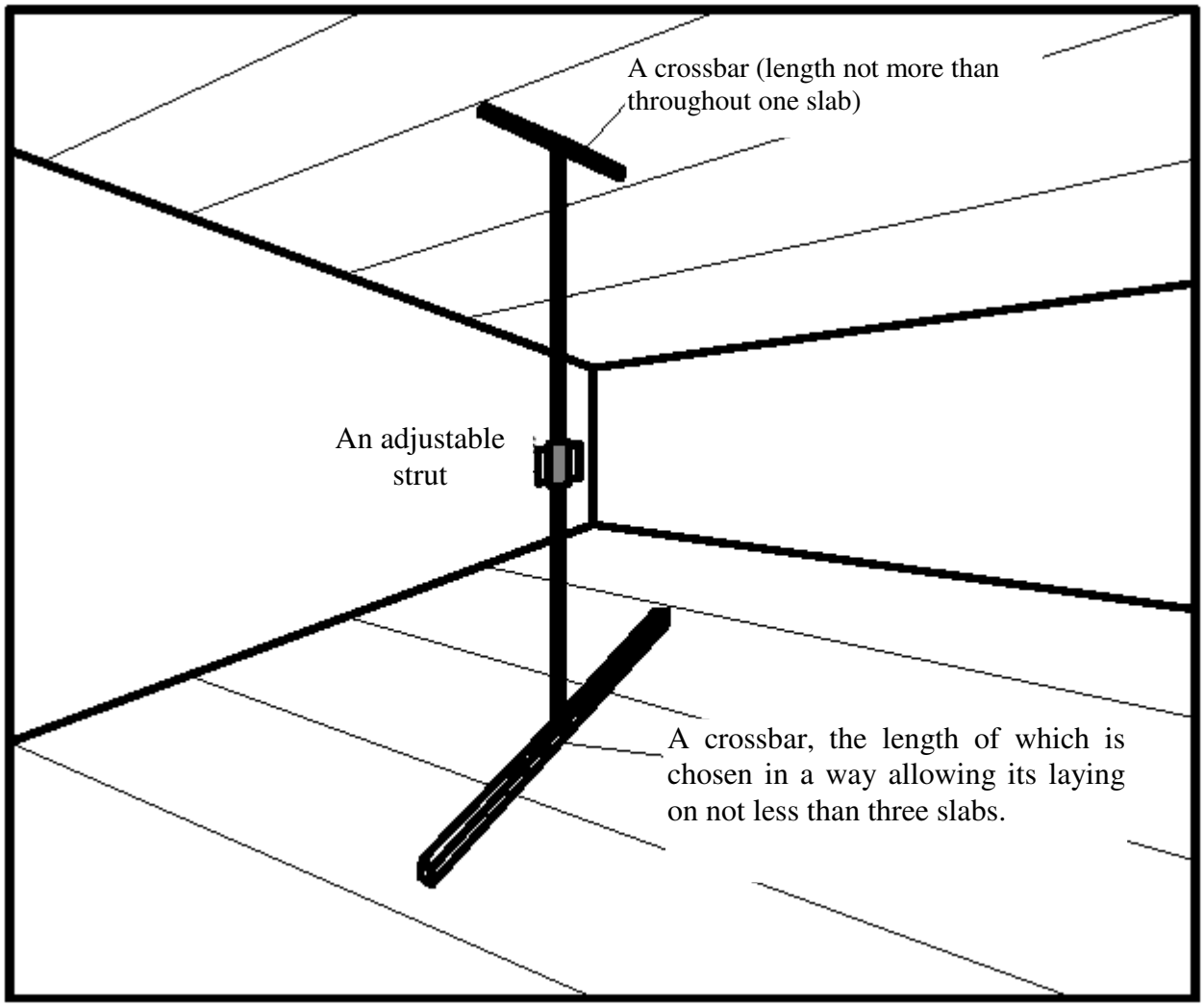

A crossbar (length not more than throughout one slab)
An adjustable strut
A crossbar, the length of which is chosen in a way allowing its laying on not less than three slabs.

Figure No.15

Figure No.16

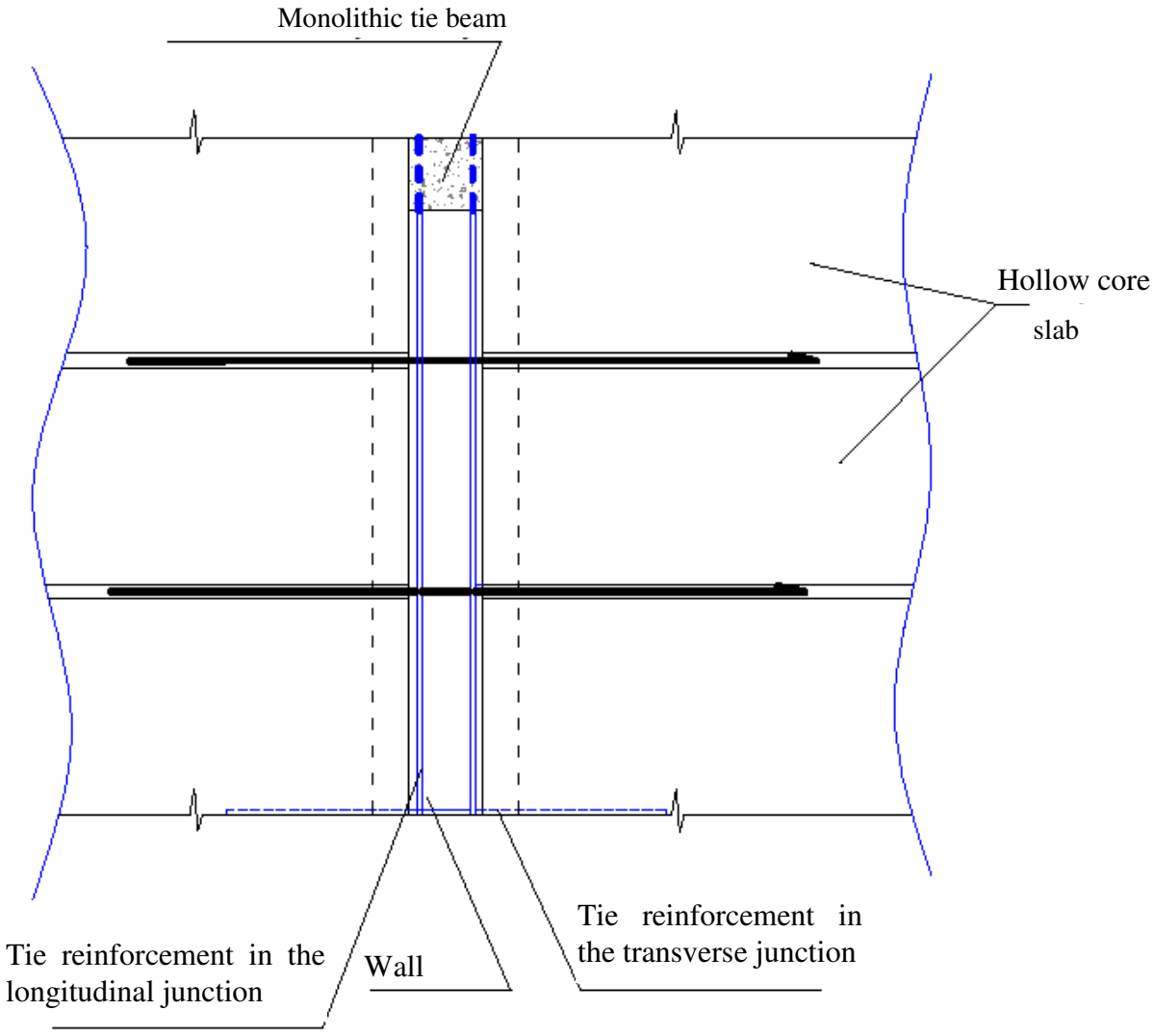

Monolithic tie beam
Hollow core slab
Tie reinforcement in the longitudinal junction
Wall
Tie reinforcement in the transverse junction

Figure No.17

INSTALLATION OF HOLLOW CORE FLOOR SLABS

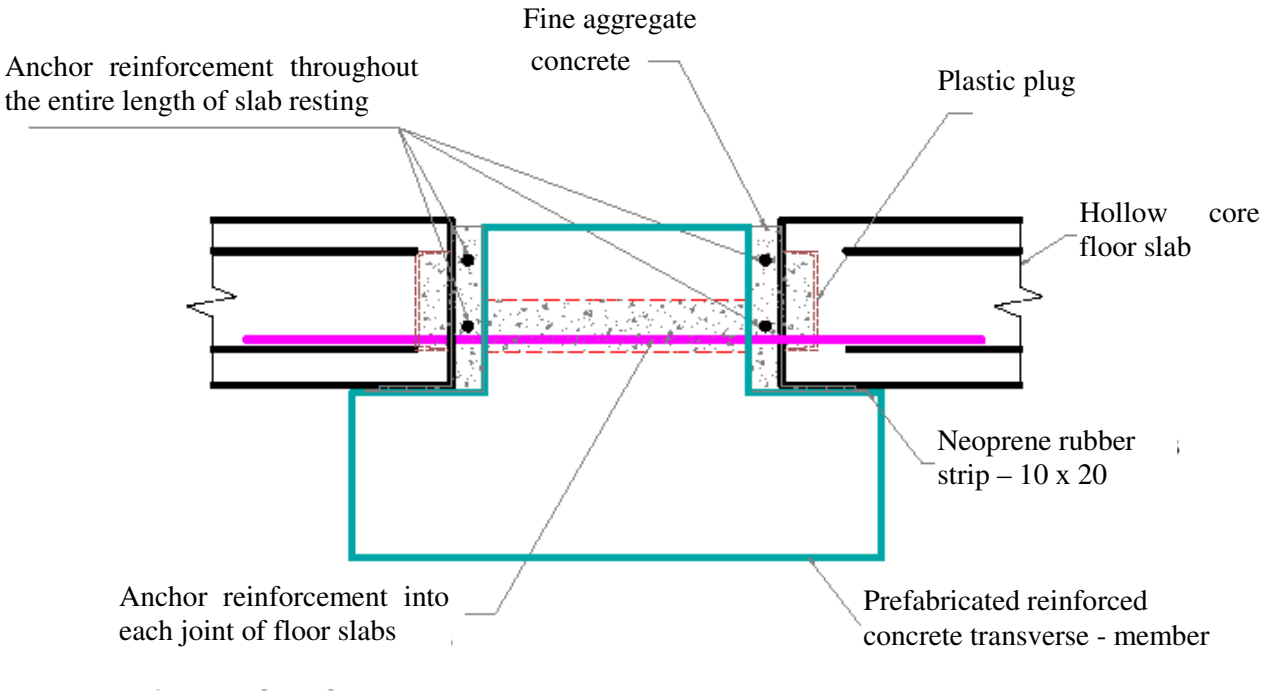


Figure No.18

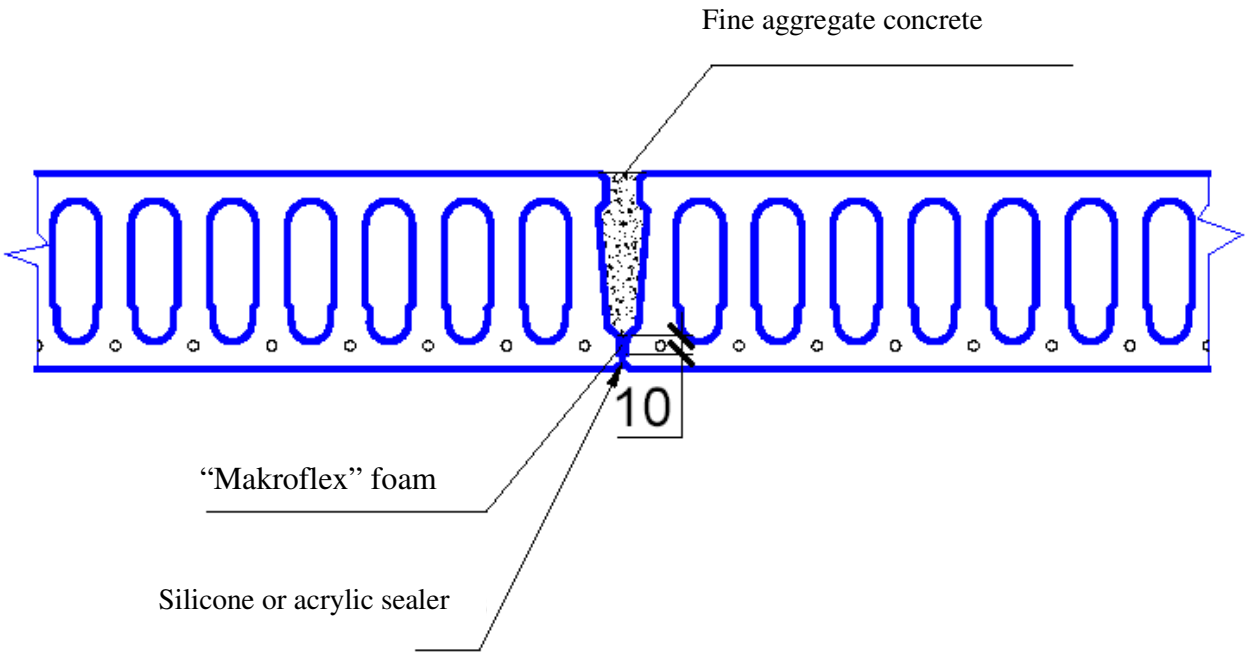
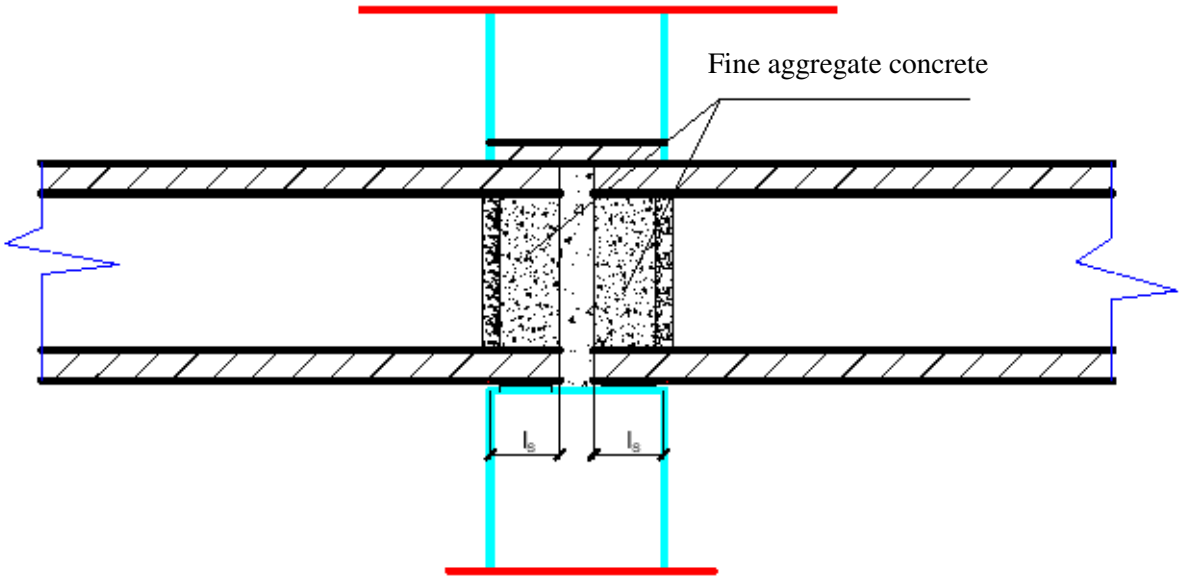
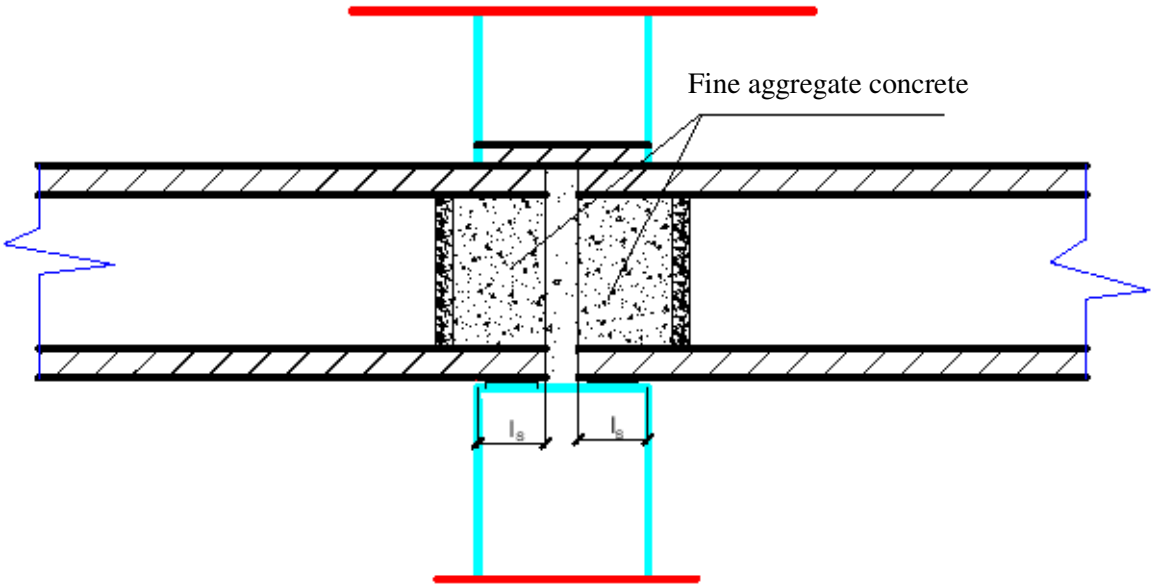


Figure No.19



Proper concreting



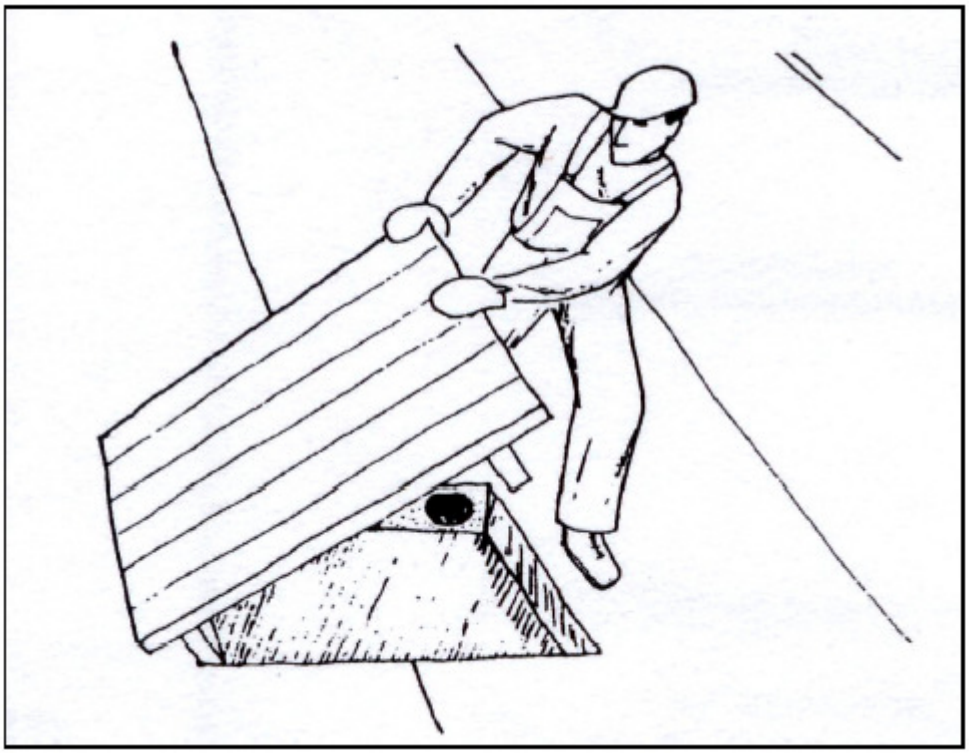
Improper concreting

Figure No.20

Figure No.21

Figure No.22

INSTALLATION OF HOLLOW CORE FLOOR SLABS



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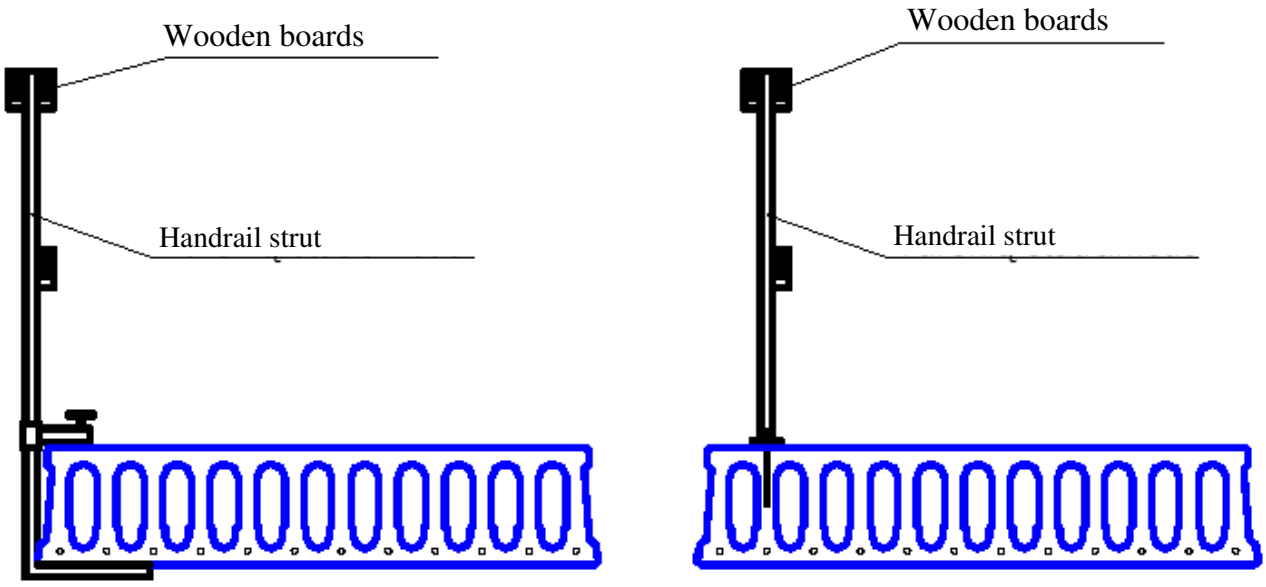

Figure No.24

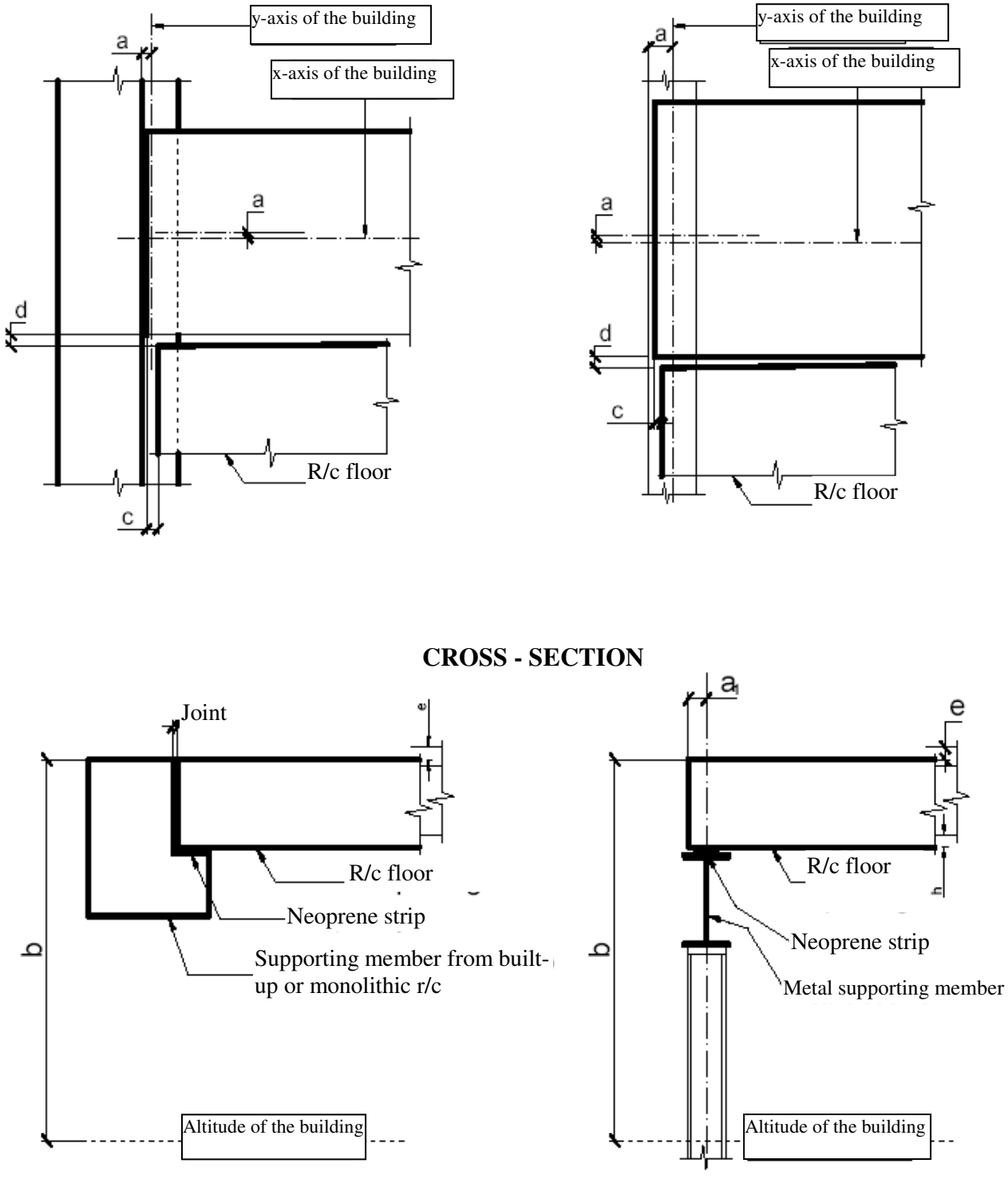
y-axis of the building
x-axis of the building
a
a
d
c
R/c floor
y-axis of the building
x-axis of the building
a
a
d
c
R/c floor
CROSS - SECTION
Joint
e
R/c floor
Neoprene strip
Supporting member from built-up or monolithic r/c
b
Altitude of the building
a1
e
R/c floor
Neoprene strip
Metal supporting member
b
Altitude of the building

Figure No.25

Installation tolerances – hollow core slabs and roof members

Built-up r/c members on built-up r/c, monolithic r/c, masonry and on metal structures

a = distance from the building axis	± 25 mm
a_1 = distance from the metal axis line	± 25 mm
b = altitude of the top part at the end of the member	
with the leveling layer of the floors	± 20 mm
without the leveling layer for floor slab	± 10 mm
without the leveling layer for roof	± 20 mm
c = maximum shift from the planned edge (with or without leveling layer)	25 mm
d = joint width, when member length	
≤ 12.0 m	± 10 mm
12.0 < ... ≤ 18.0 m	± 15 mm
e = difference in altitudes of the top of members existing next to each other	
with floor leveling layer	20 mm
without the leveling layer for floor slab	10 mm
without the leveling layer for roof	20 mm
h = difference in bottom altitudes of hollow core slabs that are in a visible place	8 mm