INSTALLATION OF PREFABRICATED REINFORCED CONCRETE WALLS AND LIFT WELLS

1. General Part

At the Company, reinforced concrete wall slabs are manufactured of several types. They are divided by the following different attributes: exterior and interior walls, three-layer ones with a heat-insulating layer inside, two-layer ones and one-layer walls that bear floors, and inclosure walls. Volumetric lift wells also are attributed to the walls. Basic installation technologies and recommendations are valid for all types of walls and lift wells. Only parts of assemblies of joining to the adjacent walls or other structures differ.

Junction assemblies and parts are provided in each individual project of a structure, in a section of working drawings. If the project is of considerable scope, i.e., a great many of various structures are used, the junction assemblies and parts may be provided as a separate catalogue.

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 quality of all transported production items prior to unloading and/or during it. When checking geometric dimensions of production items, drawings should be used and Tables of Production Tolerances enclosed to the contracts. When visually inspecting production items, it shall 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 all necessary actions immediately 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.

3. Unloading, lifting

Wall slabs and lift wells transported to the construction object in a vertical position shall be unloaded using different stropping methods and different lifting facilities. Production items of small overall dimensions are hoisted using strops. One should pay attention that during hoisting, the angle between branches of the strop is $\leq 90^{o}$ (Fig. No.1). When hoisting long (over 8m) wall slabs, it shall be difficult to select strops allowing the angle between the branches not exceeding the allowable value, or extremely long strops shall be required. In this case, it is recommended to use lifting beams with adjustable distance between the hooks.

Prefabricated reinforced concrete slab walls and lift wells are hoisted hooking them on the lifting eyes that are concreted on the top of a production item. Also screwed lifting eyes may be used if on the top of the items there are special sleeves concreted.

For wall slabs that are transported to the construction site in horizontal position or in a vertical one still turned by 90°, special facilities shall be required to hook them and hoist into installation location. The simplest one shall be a special traverse with rope blocks, and a crane with two winches. Using this facility,

the slabs may be turned until they hang hooked by the traverse. Also, special turning devices may be used. In this case, one crane with one lifting winch shall be sufficient.

4. Interim Storage

When storing wall slabs on the construction site, special storage frames are used that are erected on the flat hard surface. Supporting members under wall slabs should not be narrower than 20 cm in order not to damage resting locations of a production item.

One side of the wall slab shall be inserted between the supports of a storage frame and wedged using a wooden wedge so that it will not slip from the frame (Fig. No.2). One-layer wall slabs may be stored in a pyramid, simply propping one to another (Fig. No.4). In this case, spacers (25×100 mm) should be placed between them.

One should pay attention that during some longer time interval, at the propping places caused by wooden wedges and spacers, change in concrete color may occur. This would be a non-desirable phenomena if on the facade wall slabs different tint concrete stains are visible. In this case, instead of wooden wedges, the ones from water non-absorbent material should have to be used (Fig. No.3).

To store volumetric lift wells, no special facilities will be required. They shall be stored on the rest bars (min 100×100 mm) placed on the smooth and firm base.

5. Installation, Adjustment

Prior to the start of installing, one should check whether the building axes are marked clearly and understandably. Using a geodetic leveling instrument, the horizontality of the bearing surface shall be checked, and slab erection locations marked. Also, one should check whether anchor bolts or bars, to which wall slabs are intended to be fastened, are concreted into the bearing structures according to the Project. In accordance with the height provided in the Project, supporting blocks (100×100mm plastic or cement-chip boards of different thickness) shall be leveled using a geodetic leveling instrument. Into the gaps between the blocks, along the entire bearing surface of the wall slab, cement mortar M20 shall be laid. It shall be placed in a manner allowing squeezing the mortar surplus after the production item has been lowered on the blocks. The installation shall start from the most convenient building corner chosen.

The wall slab is hoisted into a place. The installers direct the slab into a proper position. After the senior installer has given a signal, the slab is lowered on the anchor bolts or bars. Structural solutions of joining are provided in Fig. Nos. 5,6,7,8. When the wall slab is propped on the leveled supporting blocks, its horizontality shall be checked using a spirit level not shorter than 2 m. Then, openings (min. Ø16mm) shall be drilled in the production item at 2/3 from the bottom and 50÷70 cm from the edges, and into the openings, temporary securing adjustable rods shall be screwed using anchor bolts. The rods shall be erected at ~ 45º angle, while the other their end shall be anchored into the floors. When fastening the rods into the floors (most frequently this floors is the floor of a lower storey), it shall be necessary that when drilling the anchor, one should hit directly into the hollow core floor slab edge, because if one has drilled into the location of floor hole, the anchor may fasten itself insufficiently firmly (Fig. No.9). Only after one has made sure that the installed production item is reliably secured, one may unhook the hooks of the lifting facility.

The wall slab shall be precisely adjusted into the vertical position using temporary securing adjustable rods. Verticality checking shall be conducted using a long 2 m spirit level, whereas in the case of the tall

walls – using a theodolit. One should check whether all edges of the installed production item are in the planned position. If the wall is installed on the anchor bolts, then washers shall be placed and nuts tightened. After that, in an analogous way, the next wall slab shall be installed. After its installation, the horizontality, verticality shall be checked of the slab, and also its position with respect to the previously installed item, whether the planned width of outside and inside joints is retained. When installing three-layer or two-layer slabs, it shall be necessary to make sure whether the junction between heat-insulating layers is sufficiently compressed and tight.

So, in the succession chosen, in accordance with the junction assemblies indicated in the Project, all exterior and interior bearing wall slabs shall be installed. Reinforcement of indicated in the Project diameter and length shall be put through the eyes at the sides of production items. Then, non-bearing interior walls and partitions shall be installed.

Lift wells shall be installed in the same way as walls. As they are volumetric members, lift wells do not require propping with rods.

6. Securing, Fastening

Prefabricated reinforced concrete wall slabs shall be secured and fastened using two adjustable rods. To install walls, standard rods of 2.5 m ÷ 4.3 m length shall be used. The rods shall be fastened to both the member being installed and to the floor, using expanding anchors (min. Ø16 mm). In particular cases, the rods may be screwed using bolts into the sleeve concreted in the wall slab. Such sleeves may be pre-concreted into the wall during its manufacturing if this is the Client‘s wish. The angle between the adjustable rod and installed wall should be ~ 45º, whereas the expanding anchor should be drilled into one of the vertical edges of the hollow core floor.

When installing walls on the ground floor, until cellar floors has been made, one shall confront a problem of rod fastening. For this purpose, foundation blocks put on the future floors or special blocks intended for this purpose may be used, and the bolts securing the expanding rods shall be threaded into those blocks.

7. Filling up the Inside Joints

First of all the grooves-boxes of installed wall slabs should be filled up, in which the wall anchoring bolts or reinforcement bars shall be fastened (Fig.Nos.5;6;7;8). For this purpose, fine aggregate concrete of indicated in the Project grade shall be used or special dry mixes (described below) prepared on the construction site.

Prior to filling up the vertical joints, one should check whether in all junctions of wall slabs the proper reinforcement has been pushed through the eyes (Fig. Nos.10÷14).These joints may be filled up from the top with the indicated in the Project concrete after the formwork boards have been propped against wall junction. Still, at present, vertical joint filling up using a special dry mix and an agitator-pump is more widely used and recommended. Using this pump, a plastic mix of appropriate consistency is prepared, which is sprinkled into the joint without use of any formwork. After that, the mix surplus shall be evenly trowelled. One of the most frequently used mixes for filling up with concrete the vertical inside joints of walls is “Jointing Mortar JM 832“. In winter conditions, at temperatures down to -10ºC, we recommend “Jointing Mortar JM 842“.

8. Filling up the Outside Joints

The outside joints of prefabricated reinforced concrete walls shall be filled up after the greatest part of the building has been assembled or after the exterior walls have been fully installed. Assemblies of joint filling up and ventilation duct locations are indicated in each project separately. Most frequently, to fill up the joints, BOSTIK porous polyethylene foam profile, special primer and special sealing mass are used (Fig. Nos.10,11).

Works of joint filling up are carried out from a construction cradle, tower or scaffolds. Particular attention should be paid to this work, as only after a thorough and correct filling up of the outside joints of walls, protection of heat-insulating layer and other structures of the building will be ensured against water and condensation moisture.

9. Measures in Winter

When installing prefabricated reinforced concrete walls in the winter time, one should necessarily clean off the snow and ice from slabs. One should select for junctions and joints, the concrete of the quality and admixtures allowing proper work of filling up and not weakening the strength of joints. If anti-freezing admixture is not sufficient, the places to be concreted should be covered and heated. Outside joint sealing shall be allowed to be carried out only at ambient air temperatures exceeding +5ºC.

10. Safety at Work

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 carry out installation should be having heard a course on instructions of safety at work for installers, hitchers, high-rise erections workers that work on scaffolds and in cradles, and they should possess appropriate certificates and know all abovementioned items of the Recommendation. One should pay attention that all temporary securing adjustable rods have rough regulation fixation plugs that should be plugged and fixed. In a multi-storey house, to remove temporary securing rods (except for two upper storey) shall be allowed only after concrete utilized for all junctions and assemblies has fully set, and after all proper welding or other fastening works have been conducted on not fewer than two upper floors. Fastening rods may be removed from the upper two floors only then when all fastening works have been completed. A fence installed on the floor may be dismantled immediately prior to start of installation work of the next floor walls, and only to the extent depending on how much place shall be required to install a wall slab. The workers that carry out outside joint filling up works require particular personal protection means. As materials being used there are volatile and hazardous to breathing and eyes, it shall be necessary to wear protective glasses, gloves and respirators. If other chemical materials are used, the personal protection means should be selected and used in accordance with Safety Data Sheet requirements.

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

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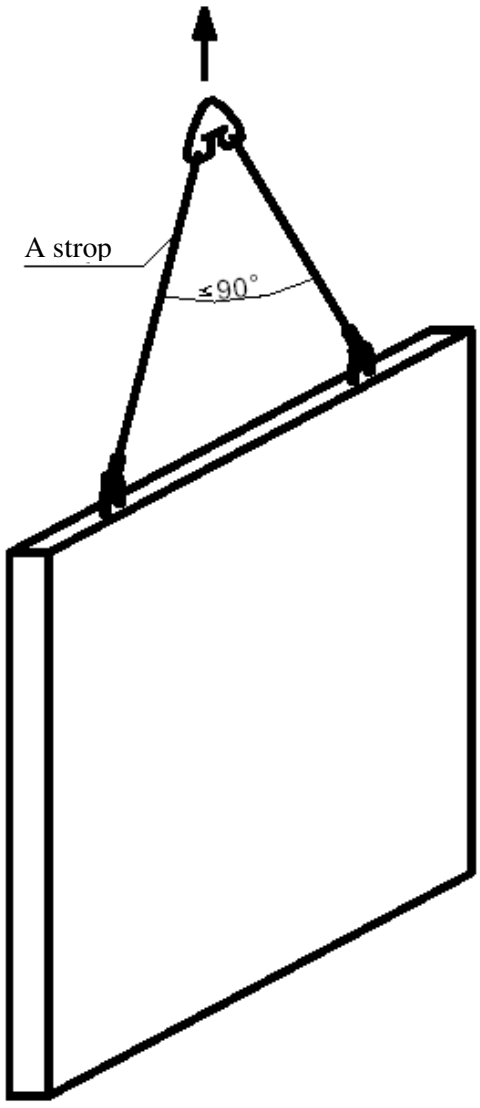


Figure No.1

Figure No.2. *Storage of walls. Attention should be paid to the size of the wooden rest bars!*

Figure No.3 *Wall securing during storage. Attention should be paid that the wedges are coated with non-soiling, water non-absorbent material*

Figure No.4 *One-layer wall slabs stored in pyramid and secured.*

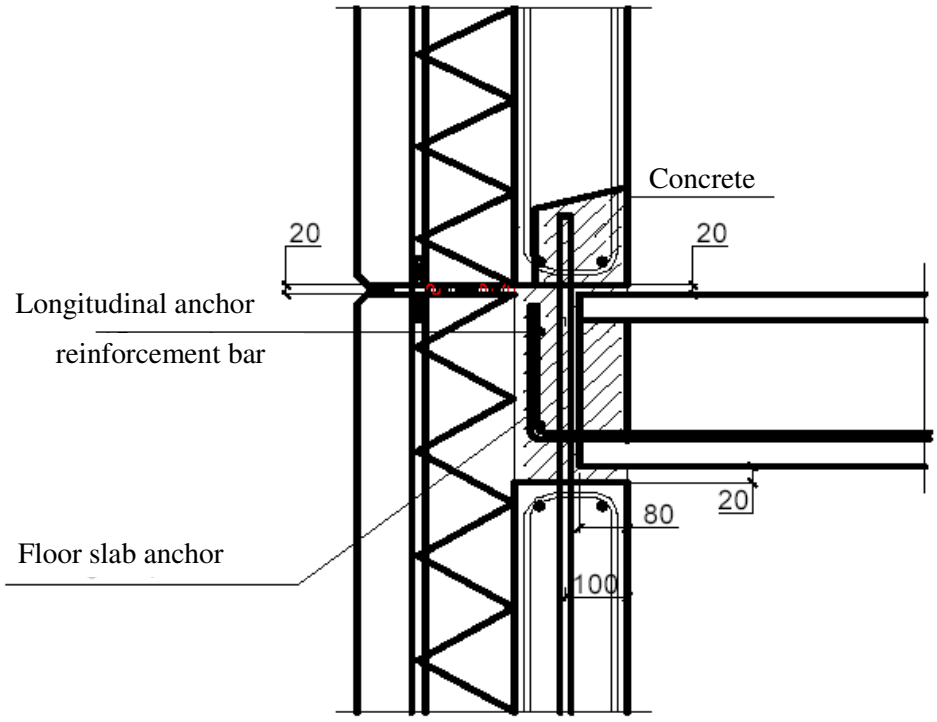


Figure No.5

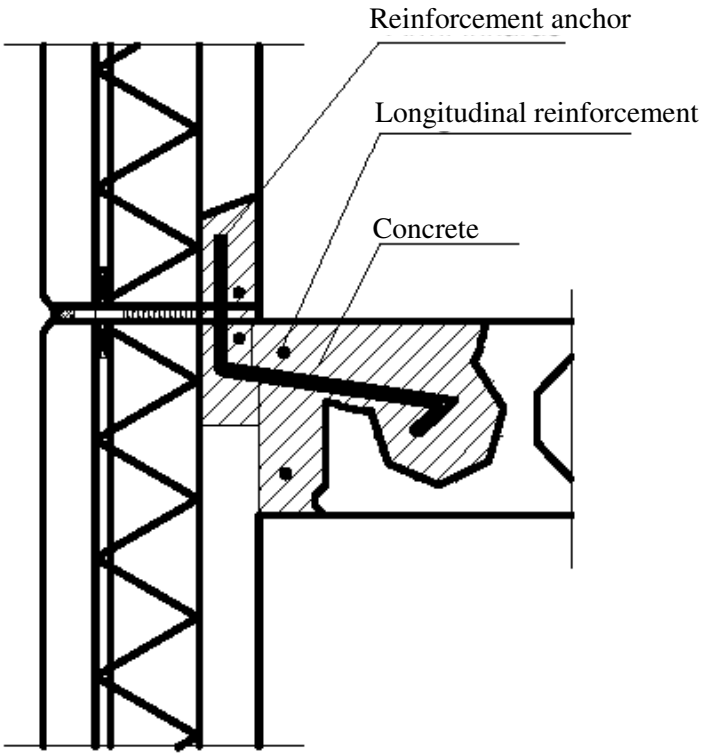

Reinforcement anchor
Longitudinal reinforcement
Concrete

Figure No.6

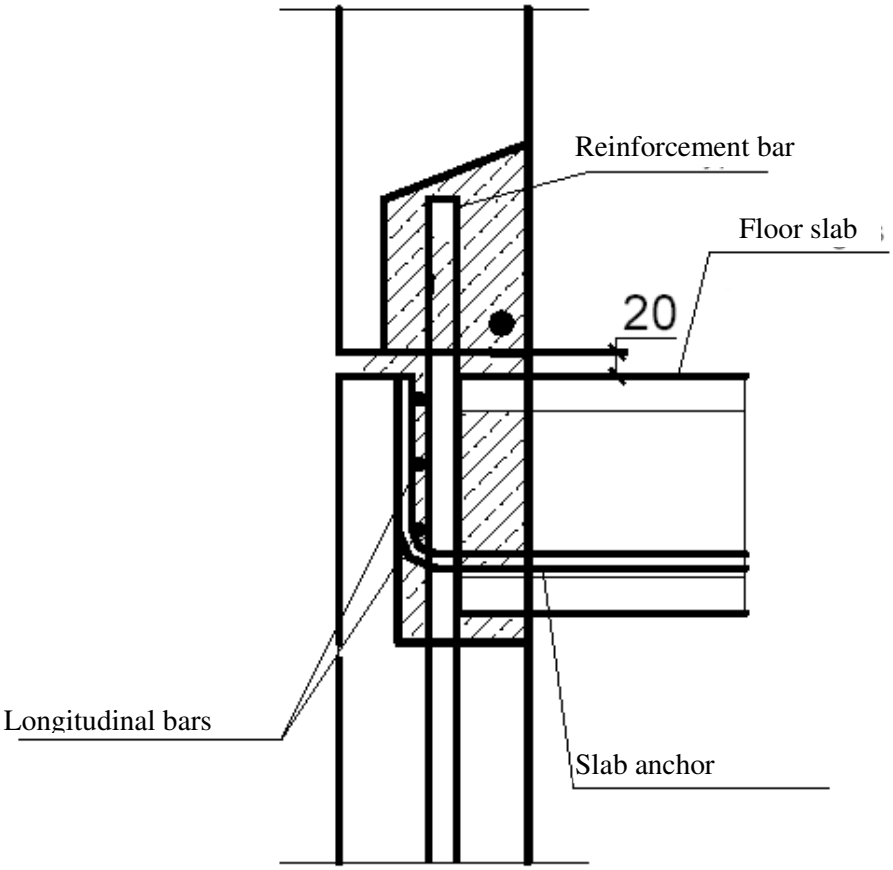

Reinforcement bar
Floor slab
20
Longitudinal bars
Slab anchor

Figure No.7

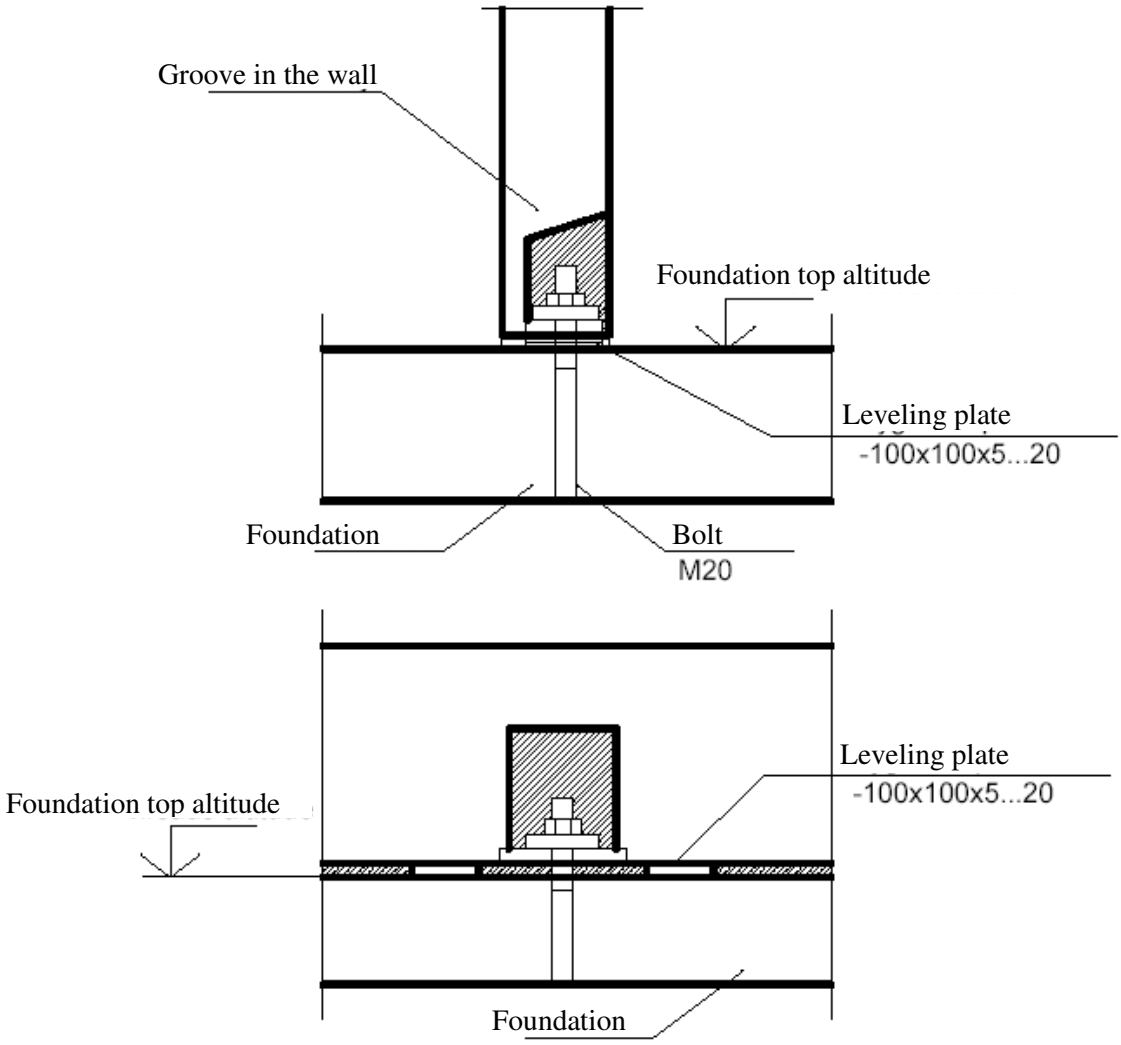
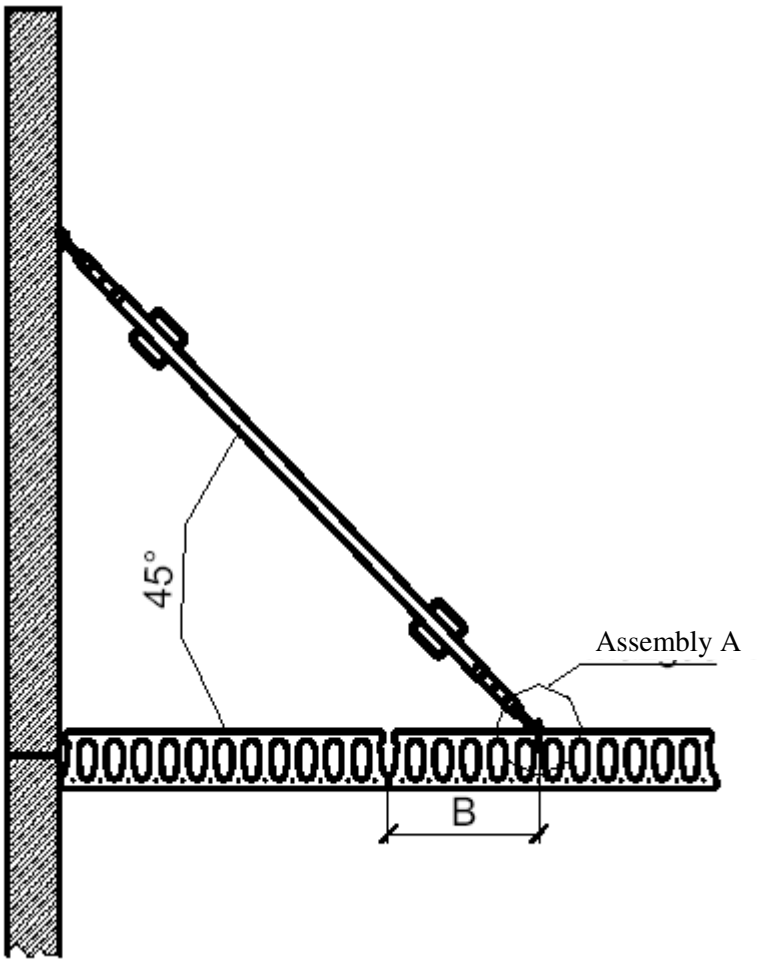

Groove in the wall
Foundation top altitude
Leveling plate
-100x100x5...20
Foundation
Bolt
M20
Leveling plate
-100x100x5...20
Foundation top altitude
Foundation

Figure No.8



ASSEMBLY A

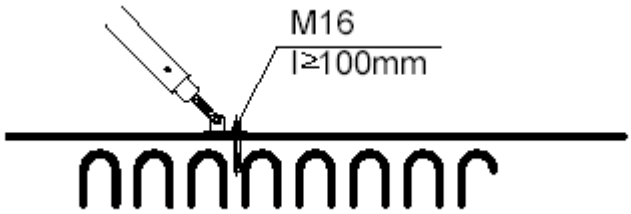


Figure No.9

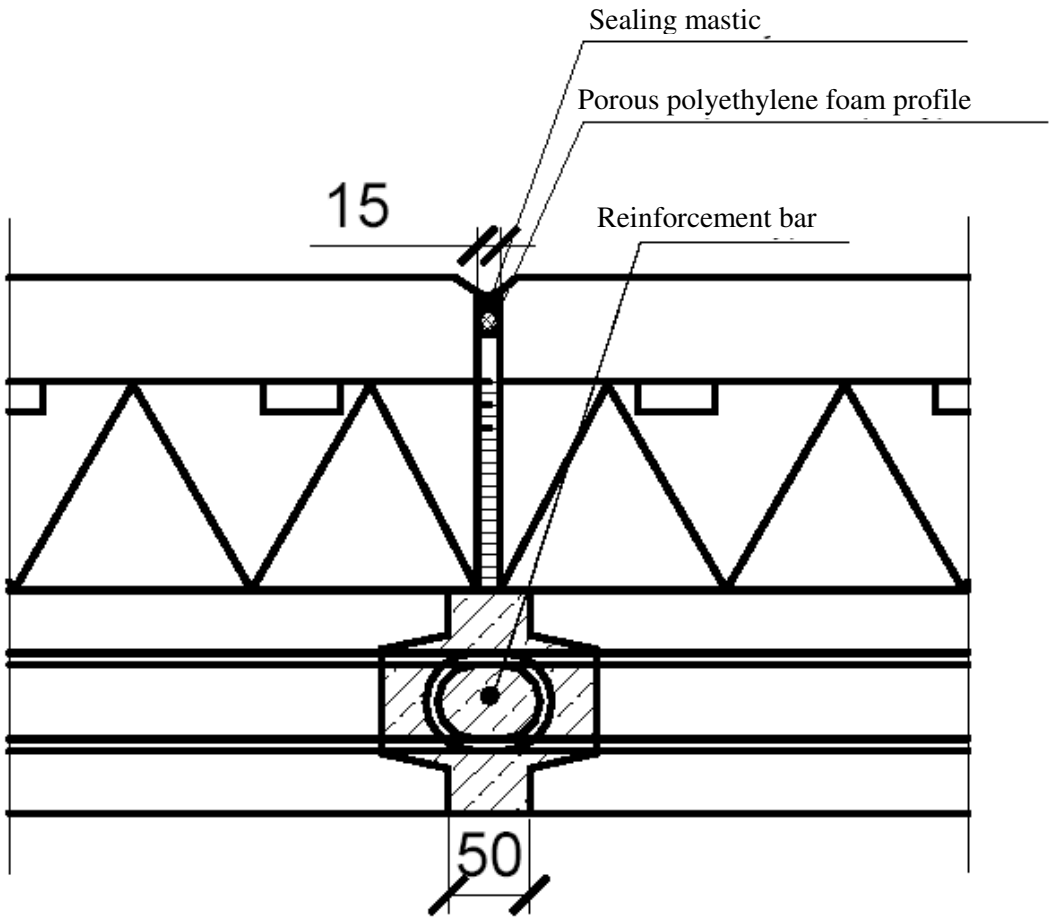

Sealing mastic
Porous polyethylene foam profile
15
Reinforcement bar
50

Figure No.10

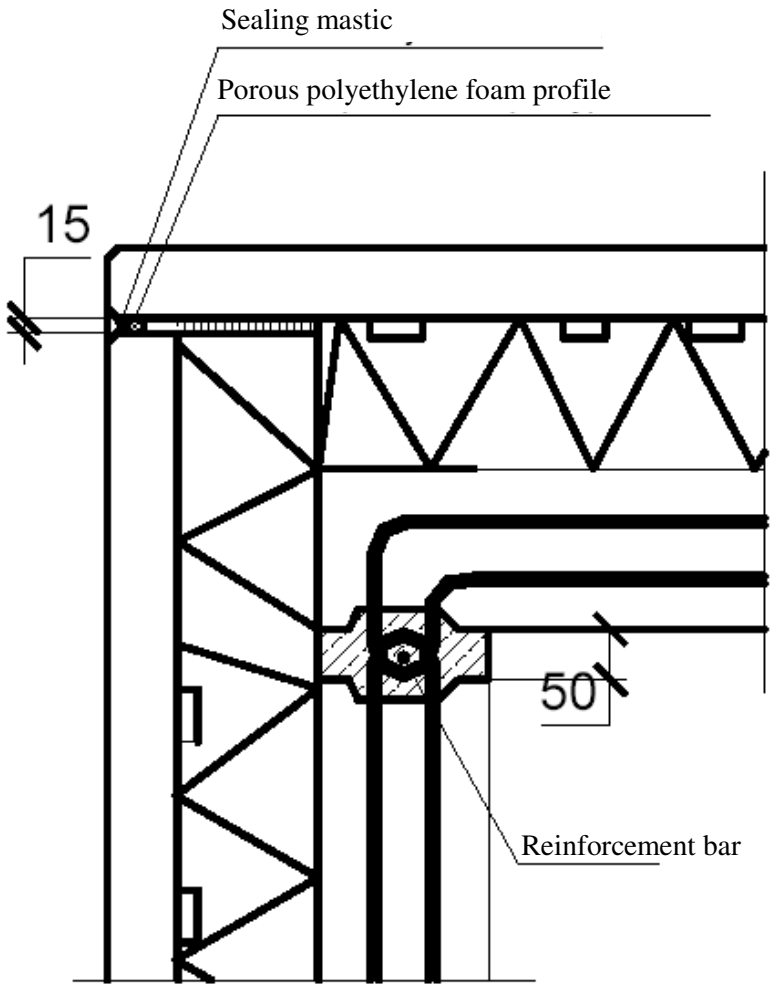

Sealing mastic
Porous polyethylene foam profile
15
50
Reinforcement bar

Figure No.11

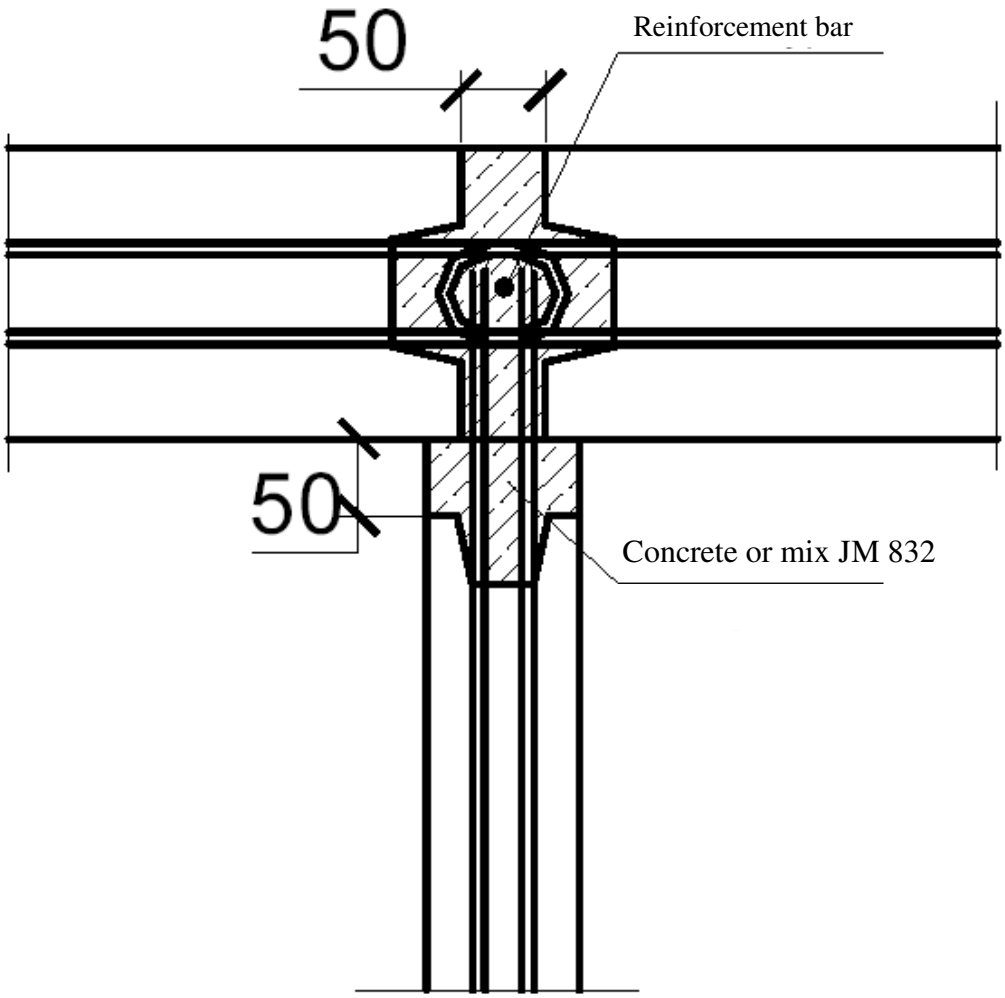


Figure No.12

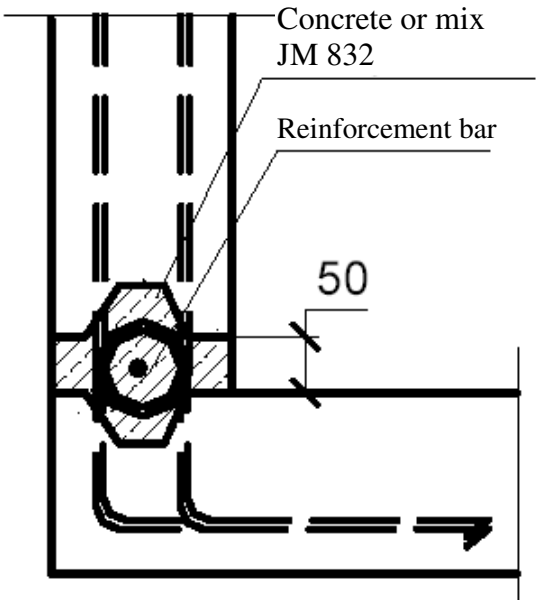


Figure No.13

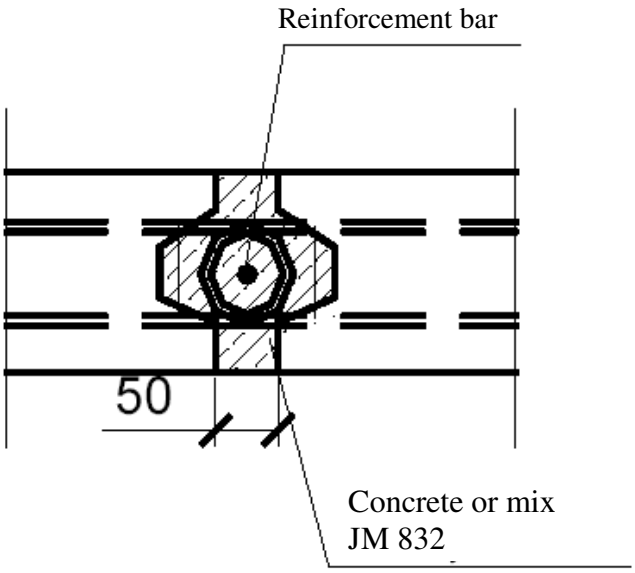
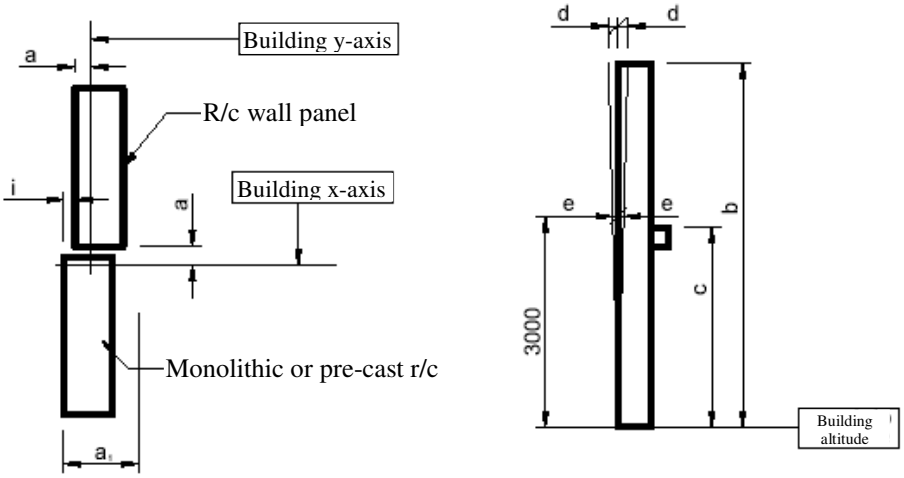


Figure No.14

INSTALLATION OF PREFABRICATED REINFORCED CONCRETE WALLS AND LIFT WELLS

PLAN



CROSS SECTION

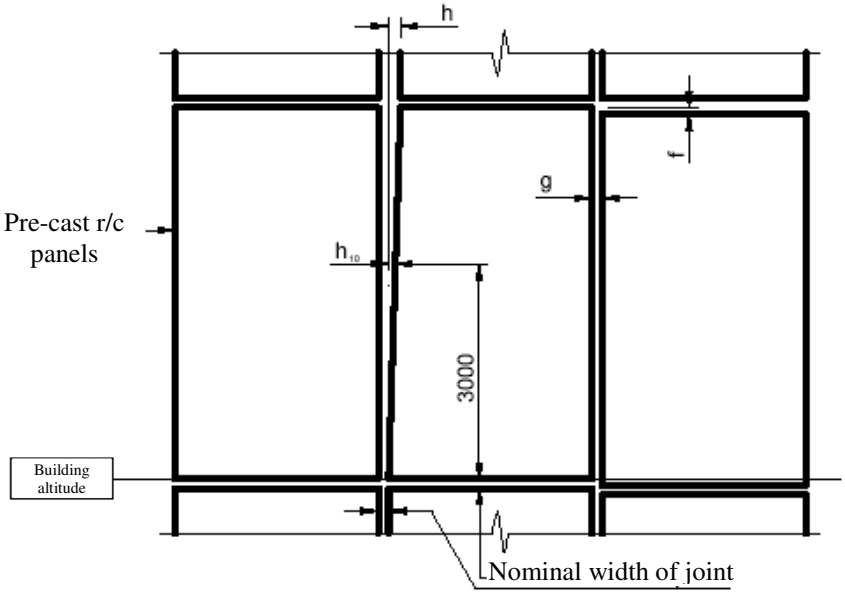


Figure 15

Installations tolerances for wall slabs

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

a = distance from building axis*	± 15 mm
b = deviation of top altitude from the planned	
single panel in places of architectural importance	± 10 mm
single panel in places visible with difficulty	± 15 mm
between adjacent panels in places of architectural importance	10 mm
between adjacent panels in places visible with difficulty	15 mm
c = deviation of support altitude from the planned	
maximum down	15 mm
maximum up	10 mm
d = maximum deviation of structure (< 30 m) top from perpendicular	25 mm
e = deviation from perpendicular in any segment of 3 m height	10 mm
f = maximum shift from the planned edge	10 mm
g = joint width	± 10 mm
h = maximum change in joint	10 mm
h_{10} = change in joint in the length of 3m	10 mm
i = maximum shift from the planned surface	10 mm

NOTES:
* for prefabricated buildings that are taller than 30m, tolerances “a” and “d” may increase every 3 mm up to the maximum value of 50 mm.