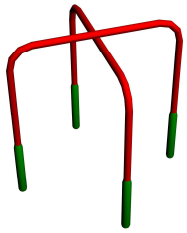
Direct, rebar chair.

Prefabricated element, made out of a thin steel rebar with plastic tipped legs in order to prevent corrosion of the support area between the rebar chair and the formwork.



Indirect, S-shaped mesh spacer.

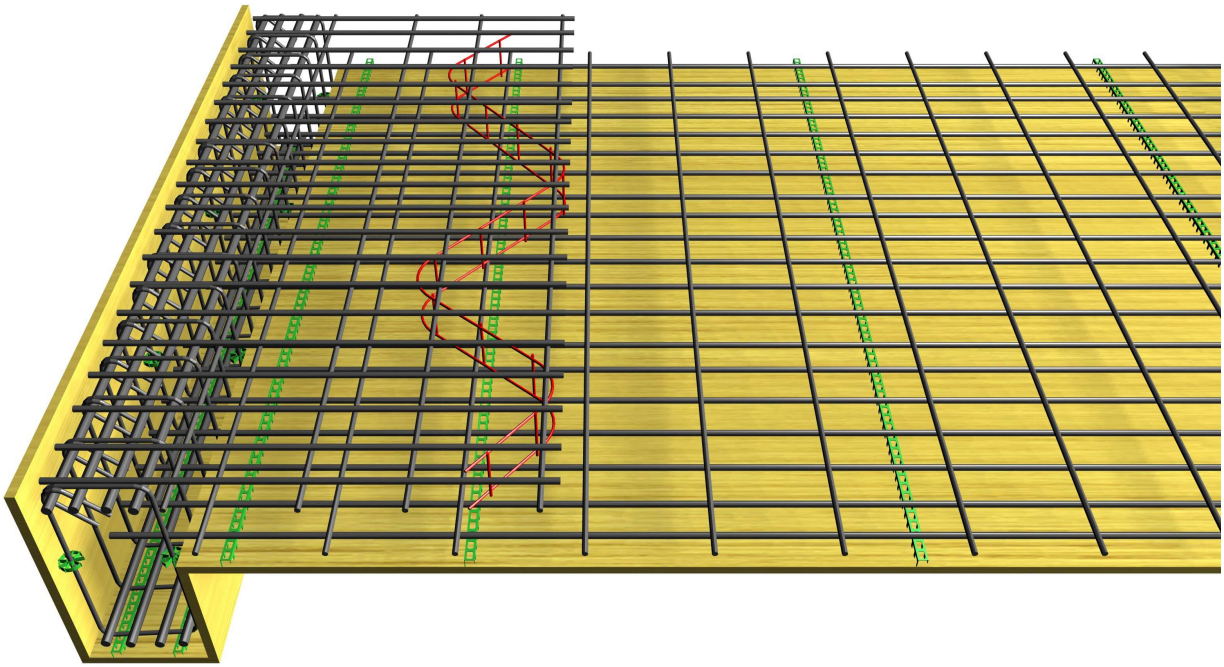
Prefabricated, comes in packages of straight lengths. It is formed in an S shape during the implementation.

Indirect, folded mesh spacer.

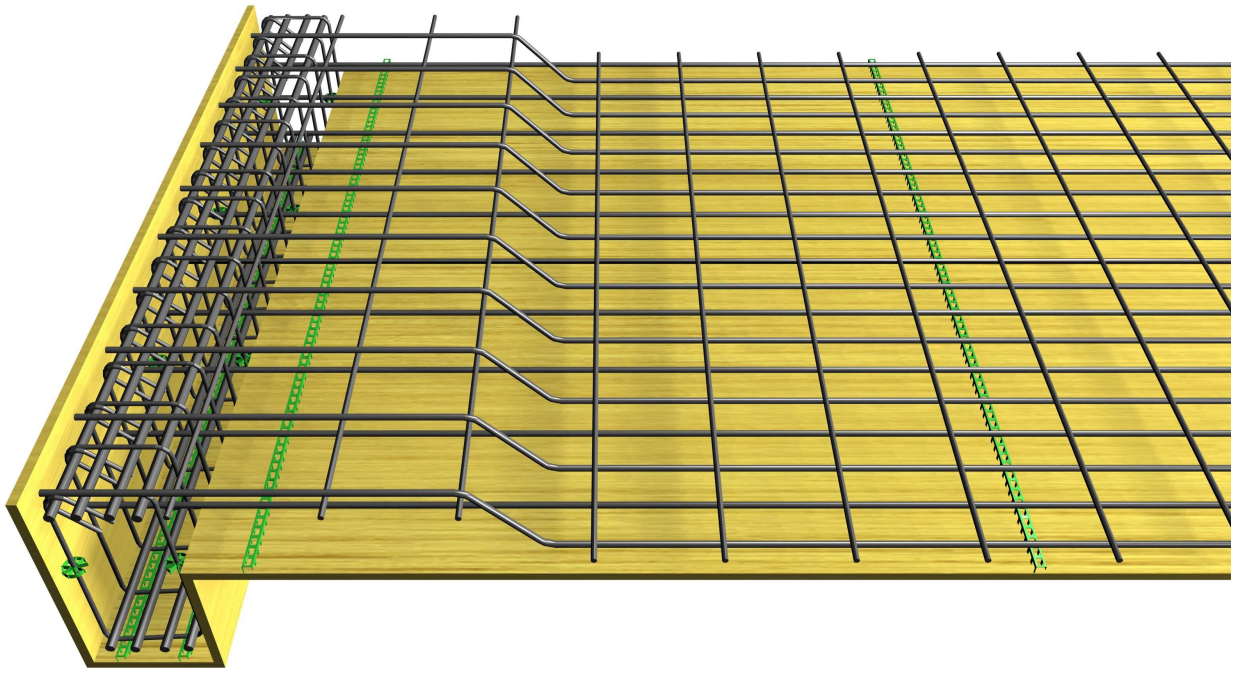
It is easily formed by folding wire of a standard density wire mesh e.g. Ø/200, to the desirable height. In cases of cantilevers apart from spacer it can be used as “J-pin” reinforcement, necessary for the cohesion of the free edges.

Indirect “J-pin” rebar chair.

For sheer use in slabs’ free edges.

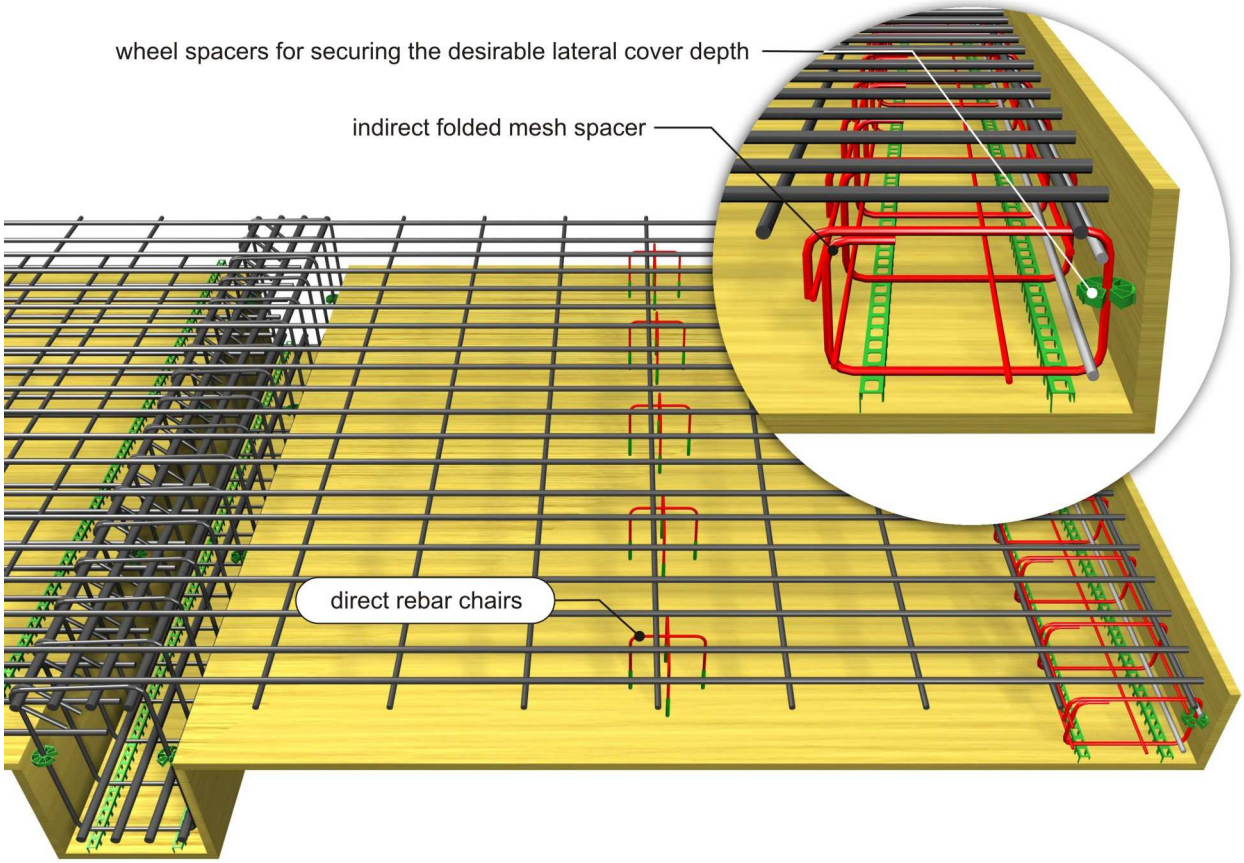


In cases where mesh is used as upper reinforcement in a slab support, its position can be secured with the use of an S-shaped mesh spacer placed on the lower reinforcement grate along the length of the plastic spacer.



In cases where support upper reinforcement comes from bend up span rebars, its proper placement is achieved by the reinforcement bending and therefore bar chairs might not be necessary.

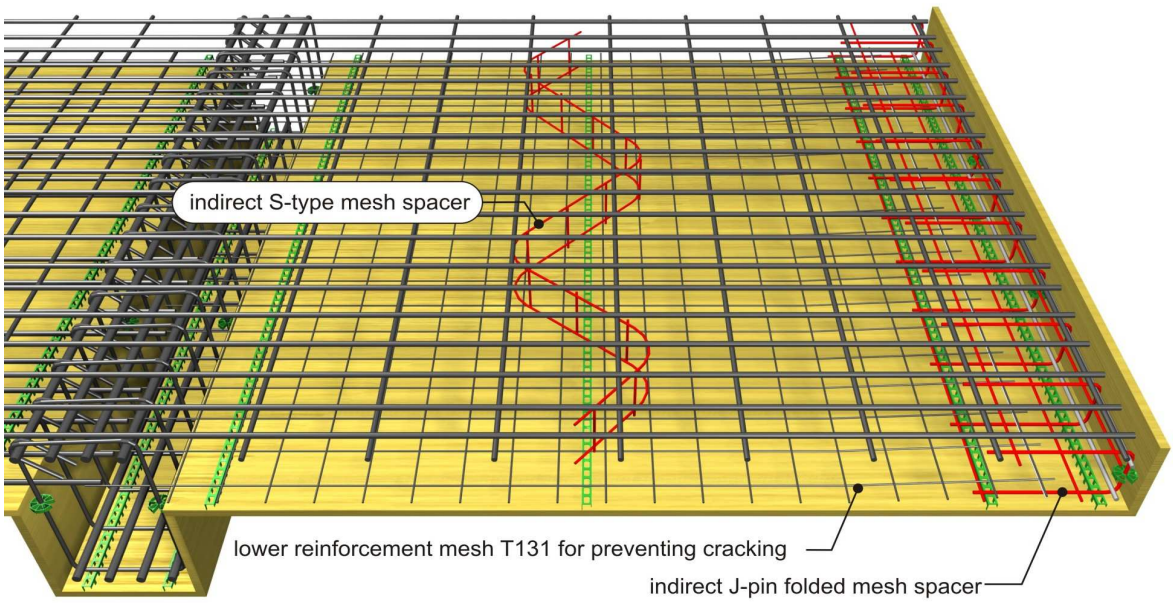
Two indirect S-shaped mesh spacers are placed to the left support of the continuous slab. These are fitted upon the lower reinforcement grate along the length of the linear plastic spacers.



Support of the negative slab's reinforcement with rebar chairs and folded mesh spacersς

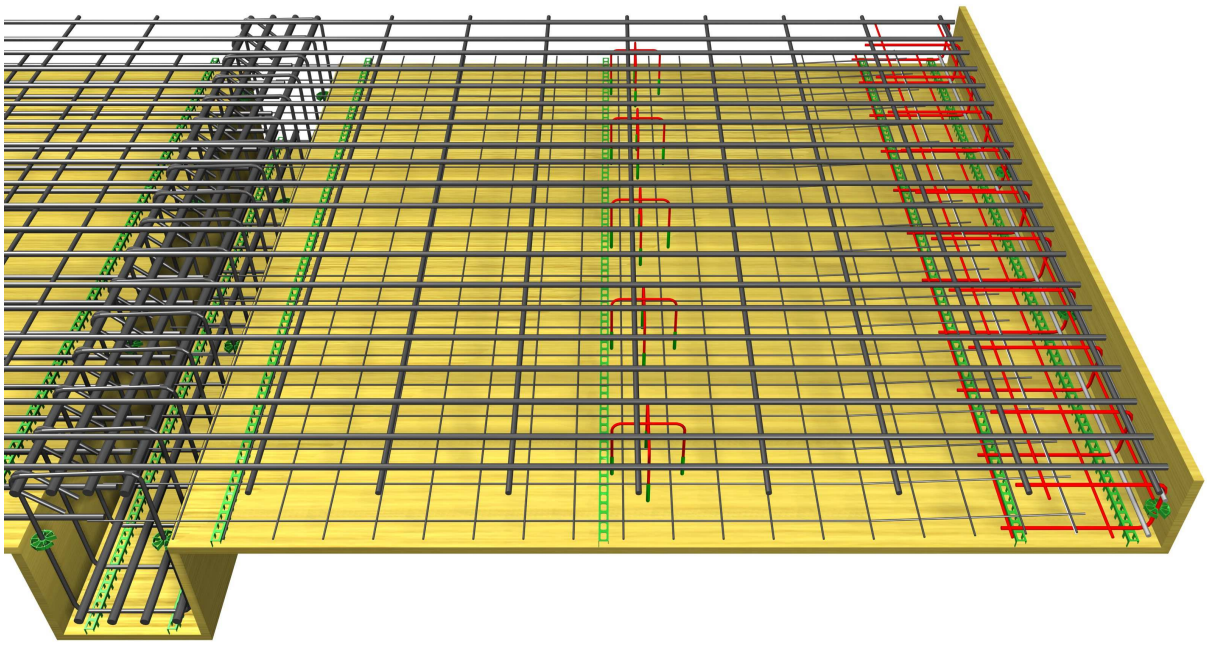
In the right support (cantilever balcony) of the above continuous slab, two rows of spacers are placed. The first row consists of indirect folded mesh spacers fitted upon two longitudinal plastic spacers and the second row consists of a number of direct rebar chairs.

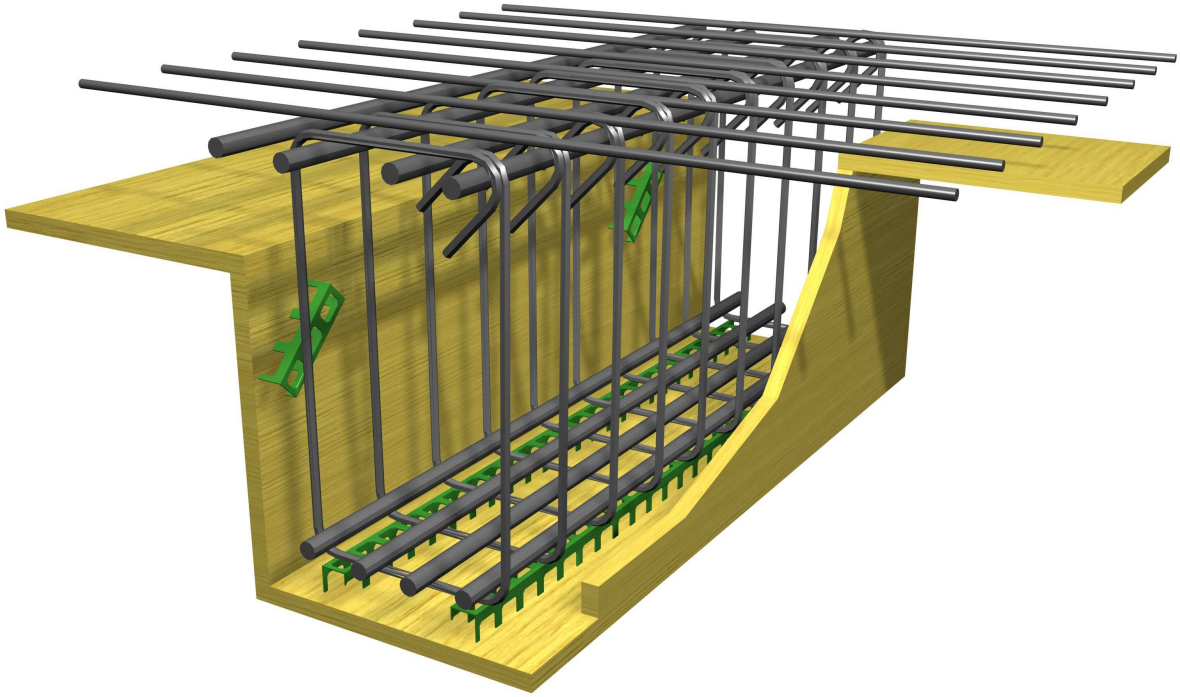
It is mandatory to prevent the folded mesh spacer from lateral slipping and this can be achieved with the use of local spacers. They must be placed right after the implementation of the folded mesh spacer and prior to its wiring with the slabs' reinforcement. When using wheel spacers extra attention should be paid to their vertical placement so as to avoid drifting during concreting. However when they are used in slab "foreheads" (as shown in the above figure) they can be horizontally placed since concrete does not fall directly upon these areas.



Support of the negative slab's reinforcement with indirect S-shaped mesh spacers and folded mesh spacers

Alternatively, when having a light-weight steel mesh as the lower reinforcement of a cantilever it is recommended to use indirect S-shaped mesh spacers instead of direct rebar chairs. In that case it is more practical to place a "J-pin" mesh spacer inside which the mesh will be properly sited.





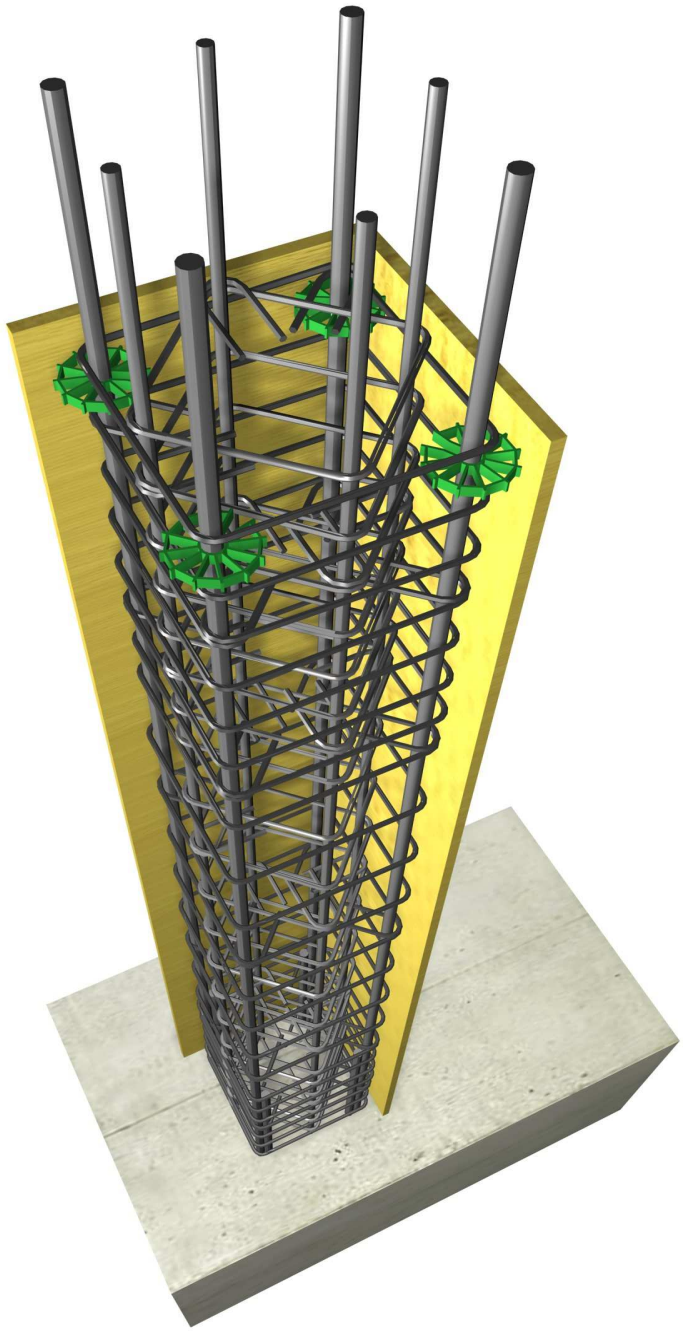
Lateral spacers do not bear any loads, therefore it not necessary for them to be heavy duty. Moreover they should be placed after the implementation of the stirrup cage inside the beam's formwork and prior to the wiring of the beam's rebars to the slabs reinforcement.

The use of lateral longitudinal plastic bars (like the ones placed at the bottom part of the beam) creates two problems: a) it does not enable the implementation of the stirrup cage inside the beam's formwork and b) it obstructs the proper concrete casting of the beam. If the stirrup cage has been industrially producted, it will have secondary longitudinal connecting bars. In such a case, pieces of vertically fitted plastic bars may be used.

Column reinforcement covering

The minimum required cover depth for beam rebars usually ranges between 25 and 35 mm depended on the environmental conditions present throughout the building's service life. The 25 mm apply to a dry climate and the 35 mm to a seaside location.

Forming the desirable covering of column reinforcement is quite a simple task. For example, four (4) individual spacers placed at the column's upper part, are enough since the column's base rebars are wired together in the lap-splice areas.



Especially for columns, the use of spacers for creating the required cover depth helps in the proper centering of the vertical rebars. Therefore when the reinforcement of the next storey is being placed no extra time (with a corresponding additional cost) will be spent in bringing the rebars to their proper position.

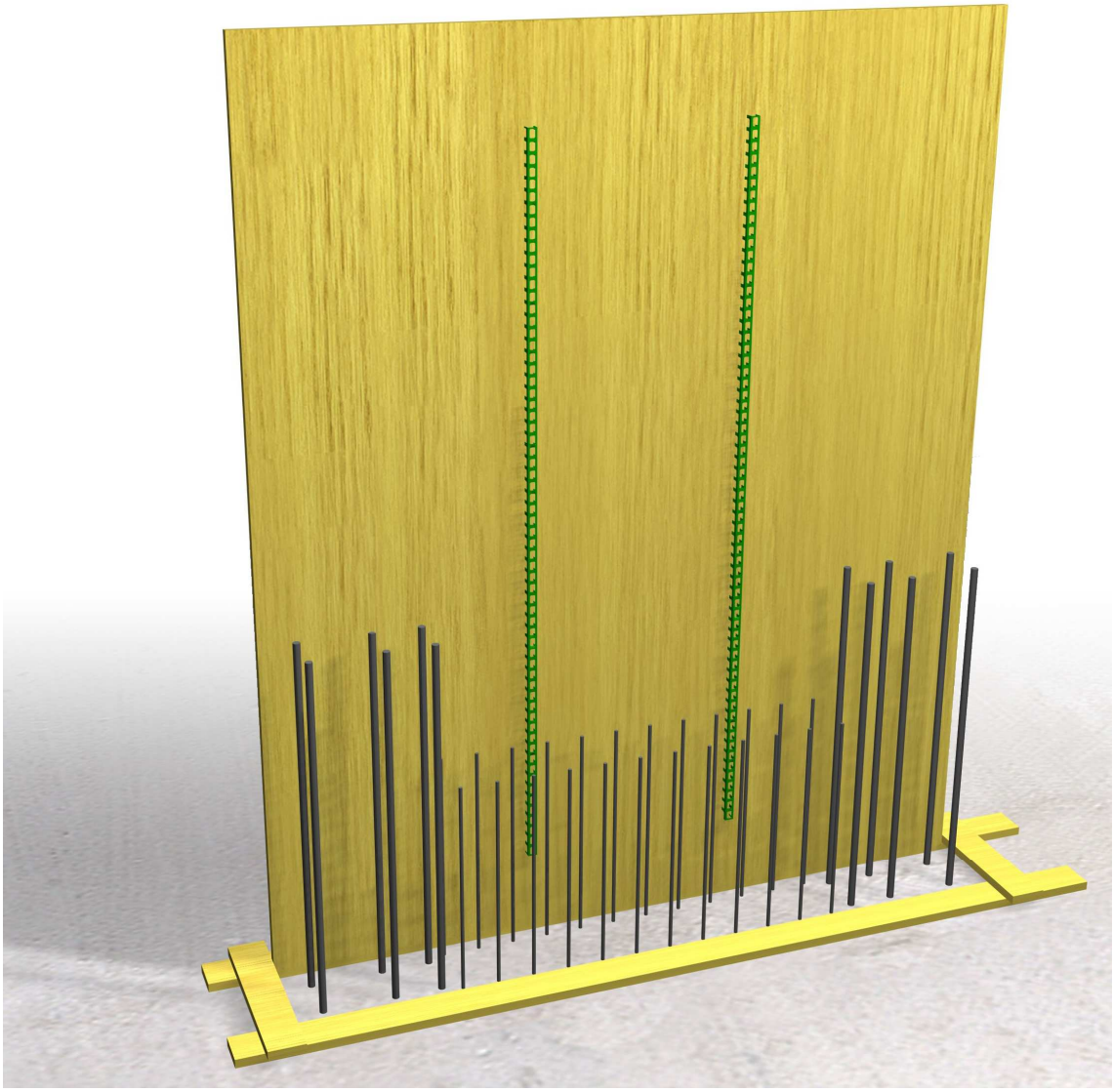
Covering can be secured either with wheel spacers placed on the upper part of rebars (in that area there is no danger to be drifted during the concreting) or with the use of vertical wheel spacers fitted upon the stirrups or finally with the use of plastic pieces vertically positioned upon the formwork.

In every case though, spacers must be fitted after the positioning of the stirrup cage in order to facilitate the implementation of the cage and the proper centering of rebars.

Shear wall reinforcement covering

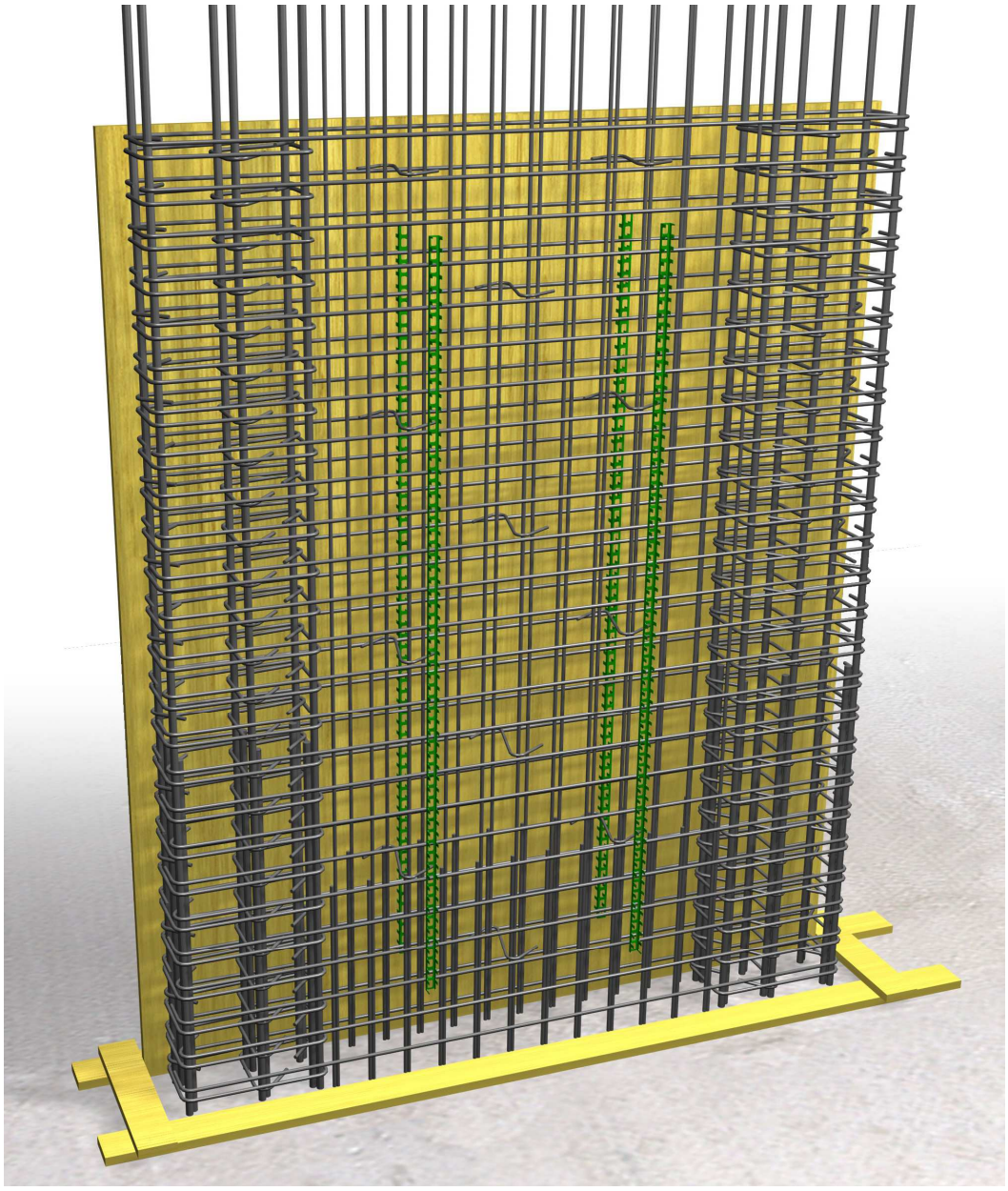
As far as the integrated columns at the wall edges are concerned, the required cover depth is created as mentioned in the paragraph referring to the columns' reinforcement covering. As far as the wall body reinforcement is concerned, its cover depth is created according to the following:

After forming the back of the wall, plastic rods are nailed upon the formwork. These rods have a usual length around 2.0 m and they can be used as one single piece or separate smaller pieces.



The two longitudinal spacers are nailed upon the formwork

After this, follows the implementation of the edge columns, of the body reinforcement and of the spacers that are fitted upon the internal reinforcement grate. That way after the placement of the formwork's last piece the required cover depth and the proper centering of the reinforcement will be secured.



After the reinforcement implementation and prior to 'closing' the shear wall's formwork, the two plastic bars are tied upon the inner reinforcement grate.

In shear walls the most effective way of the reinforcement implementation is to place the reinforcement before the assembling of the formwork. In that case, spacers are fitted upon the rebars.

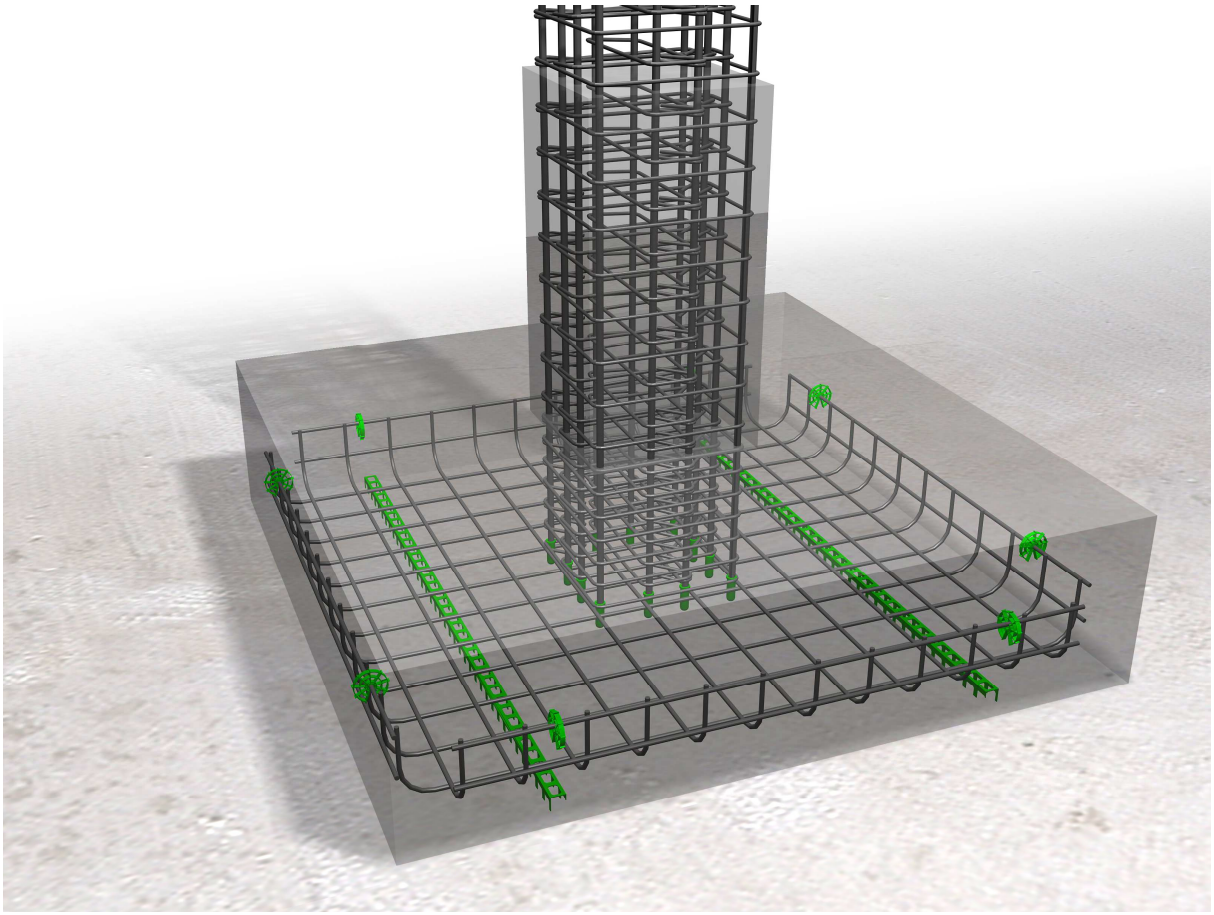
Foundation reinforcement covering

The minimum required cover depth of the foundation reinforcement is around 40 mm for foundation “sited” on ground leveling slab and around 70 mm for foundation “sited” directly upon the ground.

The construction of foundation directly upon the ground’s surface is allowed only in special cases. The ground leveling slab ensures many things like:

1) comfortable area to work on
2) capability of accurate marking of the areas of footings and columns
3) a stable substrate on top of which spacers will be placed
4) avoidance of a muddy foundation ground due to water usage or possible rain

The required covering may be created by point or even better by linear spacers. Because of the weight they bear and due to their required height, it is recommended to use heavy duty spacers.



Securing the cover depth of the spread footing’s reinforcement with plastic spacers

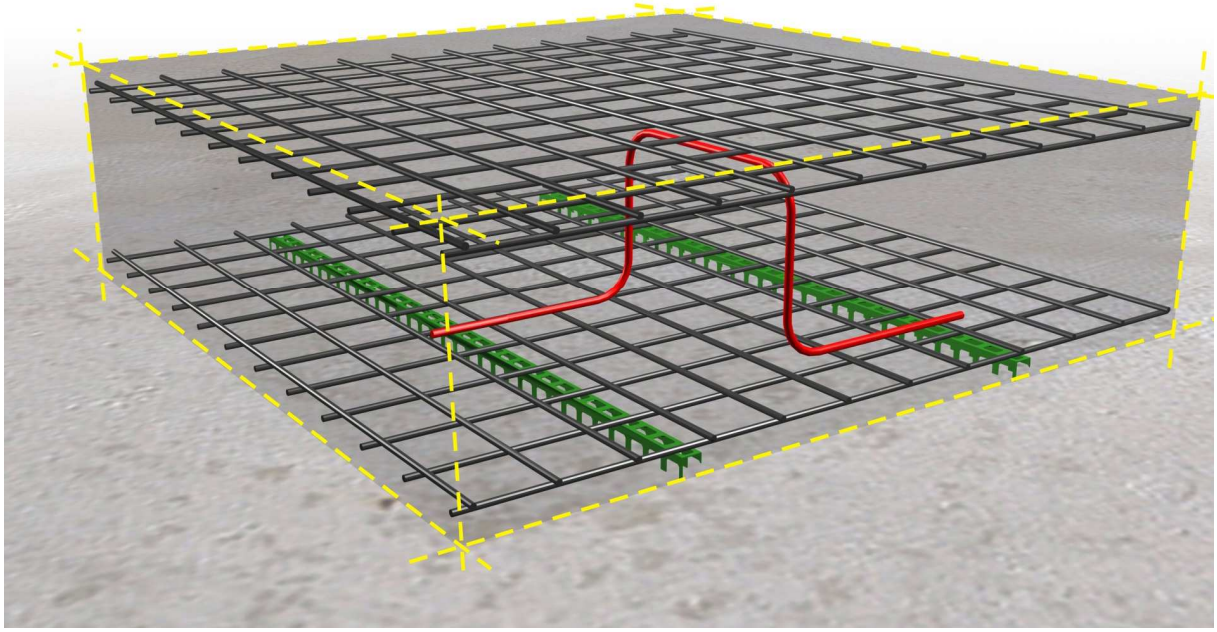
Use of spacers on the sides of the footings is obligatory in order to prevent rebars from slipping. Since they do not bear weight, they can be sparsely placed and they should be fitted vertically to avoid drifting during the concreting process.

Ensuring the proper position of upper reinforcement in foundation slabs

In cases of total or partial raft foundation or when constructing the bottom slab of a pool, the use of rebar mesh as upper reinforcement is necessary.

Just like in superstructure slabs, in the areas around the slab edges, "J-pin" rebars may be combined with open or closed reinforcement mesh.

In the intermediate area, the required cover depth can be created with the use of special steel rebar chairs placed on top of the lower reinforcement grate.



The upper foundation grate is supported by steel spacers, which are sited upon the lower grate