Construction of Reinforced Concrete Building

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2 Site before construction begins

3 Top soil (in this case approx. 1.5 meters deep) under the building will be removed to rock formation level (where the footings will be started). Note strings are used to indicate grid lines.

4 At footings, the loose soil material will be removed and cleaned manually.

5 At footings, the loose soil material will be removed and cleaned manually, and this is a close up photo of the rock.

6 Blinding outline is established by rough formwork, and bottom of footing level is set by at least four level points.
8 At the same time, formwork for footings is being prepared at onsite workshop. Carpenters prepared formwork using marine plywood with white wood backing.

7 Blinding formwork for a group of footings

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9 Footing formwork is assembled at footing location on top of blinding. The blinding will form a good clean surface for footing preparation.

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10 Bitumen paint is applied to bottom of footing (top of blinding) to protect concrete from deterioration by ground water.

11 Footing reinforcement is assembled at onsite steel workshop, and is finally placed at its location.

12 Footing reinforcement is inserted diagonally into formwork to provide additional rigidity. Formwork is properly braced to prevent opening of formwork under the pressure of concrete.
Column starter reinforcement is placed and properly tied. A group of footings are being finalized for casting. Column starter reinforcement is placed and properly tied. Again note formwork is properly braced to prevent opening of formwork under the pressure of concrete. A group of footings are being finalized for casting. Column starter reinforcement is placed and properly tied. Again note formwork is properly braced to prevent opening of formwork under the pressure of concrete. Concrete vibrator (1.5 inch / 40 mm diameter)

Concrete is poured into the footing forms with a pump and consolidated with the vibrator. After casting of footings, formwork is removed and reused for next group of footings.

Ready-mix Concrete is dispatched to site in mixer trucks, and is pumped to its final location by a concrete pump truck.
Column stubs are prepared for casting. Stubs are used to maintain column squareness and alignment.

Column Starters are casted to level of ground beams.

Bitumen paint is applied to sides and top of footings and column necks below ground. Top of column necks will be the start of ground beams.

Site is backfilled and compacted with hand rollers.

Site is backfilled to level of bottom of ground beams. Only part of column necks are still exposed.

Blinding for ground beams is prepared and casted.
Ground beam reinforcement is assembled on site. Note the larger amounts of reinforcement located at the negative and positive moment locations.

Formwork is then prepared for the ground beams.

Alternately, formwork is prepared first. Then reinforcement is completely assembled on top of the formwork, and is later lowered to its final position inside the forms.

The reinforcement is completely assembled on top of the formwork. A lap splice, shown above, is usually used.

Since bars are only 12 meters long, sometimes it is necessary to splice bars to obtain longer bars. A lap splice, shown above, is usually used.
31 A joint between two crossing beams and column at ground beam level. Note that reinforcement must clear each other and adequate space must remain for proper consolidation of concrete.

32 After casting of ground beams, forms are removed, and bitumen paint is applied to sides of beams.

33 Select backfill is used for filling between ground beams. Then polytene sheets are laid, followed by ground slab reinforcement with concrete block spacers to provide cover.

34 Next, column stubs are casted, column reinforcement between ground level and first floor is assembled, column forms are erected, and ground floor columns are casted. Note column bars tying and lapping detail.

35 Curing of concrete is essential at all stages. In this case, columns are wrapped with burlap and wetted several times a day. Top of columns at this stage is the soffit of first floor beams.

36 Cast in situ staircases are casted to first floor level. Note the extra beams required at intermediate landings.
36. Soffit of beams formwork is prepared. Wood extending beyond beam soffit will be used for a platform.

37. Staircase reinforcement.

38. Soffit of beams formwork is prepared. Wood extending beyond beam soffit will be used for a platform.

39. Jacks are used to support the formwork for the beams and the platform.

40. Reinforcement is assembled in its final location with one side of formwork erected. Other side is left open for tying of reinforcement and for inspection. Later, the other side of formwork is erected.

41. Placing of reinforcement.

42. Alternately, the two sides of formwork are assembled, and reinforcement is assembled on top of the formwork. After reinforcement is completed, it is lowered to its final position inside the forms. Note the side platform used for concreting and for inspection.
Beam reinforcement is assembled on site. Note the larger amounts of reinforcement located at the negative and positive moment locations.

Again, note the larger amounts of reinforcement located at the negative and positive moment locations.

After reinforcement is completely assembled, formwork is tied and braced at its top.
A joint between two crossing beams and a column. Note that reinforcement must clear each other, and adequate space must remain for proper consolidation of concrete.

Another view of joint.

Different areas of one building may be at different stages of construction.

After beams are casted and cured, hollow core slabs are erected.

After beams are casted and cured, hollow core slabs are erected.
Next level columns are being casted after erection of hollow core slabs.

Then, the next level columns, beams, and slabs are constructed in the same manner, until the roof slab is erected.

Hollow core slabs are erected at roof level

Where a cast insitu slab is to be used, a similar procedure is used of preparing the beam reinforcement on top of the formwork. However, formwork for slab is also supplied.

After completion of beam reinforcement, it is lowered into its final position, and slab reinforcement is tied.

Beams and foundation reinforcement in position.
In this case, the beams form a two-way grid covered with a cast in situ slab; it is referred to as waffle slab.

Sometimes openings may be required in beams for electric cable trays.

Or sometimes beams must be raised, or recessed. Or cutout for Air conditioning vents.

Careful planning with other trades is a must.

Sometimes, architect’s demands are very challenging. Here, seven meter cantilevers shown.

Solution… 0.25 m x 1.6 m deep beam and proper reinforcement solve the problem.
And extra large columns (0.5m x 1m) used to reduce excessive deflections.

Or, when a 23m x 23m clear spans are required, a 1.2 deep waffle slab is used.

Waffle slab reinforcement.