Principles and methods of building construction(volume 2)

author:

Engineer Mohammad Tayyebi

www.Mohammadtayyebi.com

Famous	:	Tayyebi, Mohammad, 1362
Title and name of the author	:	Principles and methods of building construction /Author: Mohammad Tayyebi
Publication details	:	Tehran, Zarrin andishmand, 1400
Appearance profile	:	5vols, tables, graphs
ISBN	:	V 1:978-622-759161-3. V2:978-622-759163-7. V3:978-622-759164-4. V4:978-622-759165-1. V5:978-622-7591-66-8
Cataloging status	:	Fipa
Topic	:	Buildings --Iran
Topic	:	Construction industry--Iran
Congress Ranking	:	145 TH
Dewey Classification	:	690/02955
National Bibliography Number	:	7601615

Head Office: No. 1182, 5th Floor, Unit 19, Farvardin Building, between Daneshgah and .Abu Reihan St., Enghelab St

Contact number: 09905445006 - 66176087
Website: Andishmandpub.com
Email: Andishmand.pub@gmail.com

Zarrin Andishmand Publishing

Principles and methods of building construction(2)

Author: Engineer Mohammad Tayyebi

Printing: First1400
ISBN: 978-622-759163-7

Editor and page votes: Faranak Haji Abdullah
Cover Designer: Reyhaneh ameri poya
Publisher: Zarrin Andishmand Publication

Dedicated to my father

A steadfast mountain and supporter of me throughout my life

Dedicated to my mother

The stone of patience that taught me the alphabet of life

Dedicated to my brothers

Kind companions of my life.

Introduction:

For a long time, shelter has played a vital and decisive role in human life and settlement. Due to the extraordinary progress of man in all sciences, the construction industry is no exception to this rule. In order to have strong and safe structures to protect the lives and property of residents, it must be accompanied by up-to-date knowledge to prevent accidents in buildings. Special attention to the principles and methods of building construction from demolition to joinery are basic and very important issues in the construction industry that in this book (Volume 2) I have tried to mention as much as possible, which are:

Construction and execution of concrete structures and their components, false ceilings and its types, methods of strengthening concrete structures and waterstop. I hope to take a very small step in the development of the construction indus**try** by writing this book.

With respect

Mohammad Tayyebi

Table of contents

Chapter 3

Construction and execution of concrete structures

What is a concrete structure?

Today, it is recommended to build the foundations of all buildings with reinforced concrete, especially in seismic areas such as the cities of southern Khorasan, the slopes of the Alborz mountain range, Qazvin, and even for light and one-story buildings, concrete foundations of the strip type are very It will be convenient. The load distribution angle in concrete foundations is between 30 and 45 degrees. Therefore, such foundations can be made in steps or in the form of an incomplete pyramid and save on additional consumption of concrete.

Concrete structure is a structure that is made of concrete or usually reinforced concrete (cement, sand, sand and steel in the form of plain or ribbed rebar). If reinforced concrete is used in columns and beams and foundations in the building, that building is considered a concrete structure.

Advantages of concrete structures

1. The main material of concrete, which is sand, is cheap and accessible.

2. Concrete structures that are designed and executed in accordance with the principles of regulations are more resistant to harsh

environmental conditions than structures made of other materials.

3. Due to the high ductility of concrete, it is possible to build a variety of concrete structures such as bridges, columns and… in different shapes.

4. Concrete structures are very resistant to high temperatures caused by fire. Experiments have shown that if a temperature of 1000 ° C is generated for a reinforced concrete sample, it takes at least one hour for the temperature of the steel inside the concrete, which is covered with a 2.5 cm thick layer of concrete, to reach 500 ° C.

Different parts of the concrete building

1. Foundation

2. Columns

3.Beams

4. Side beams (beams)

5. Stairs

6. Shear wall

7. Ceiling

Execution stages of concrete building

According to what we said in the previous two chapters, after determining the location of the foundation, it is time to rebar binding.

Rebar bimding

Depending on the number of floors of the building, the rebars used in rebar binding concrete buildings are determined in terms of volume and diameter. The more floors a building has, the greater the density of rebars used in the foundation, as well as their diameter. rebar binding is one of the most sensitive and accurate parts of a concrete building because all tensile forces in the building are supported by rebars. Therefore, great care must be taken in the rebar binding of concrete buildings. Bars up to 12 mm in diameter can be bent by hand, but bars larger than 12 mm are best bent with a mechanical device equipped with a pulley. The diameter of the pulley is proportional to the diameter of the bar and must be determined by the calculating engineer and the workshop engineer.

Formatting

After rebar binding, it is time to form the foundation. Formwork is done in order to shape the concrete and maintain its quality and strength. The use of metal or wooden molds is common at this stage. In the last step, concreting of the foundation is done. Prior to concreting, make sure that the formwork is closed properly and that there is no gap between them. The space of the molds must be completely and evenly filled with concrete. They use vibration to do this properly.

Forms made for concrete are often made of wood, but metal forms are also used for series work.

In addition to shaping the concrete, the formwork and scaffolding under it also support its weight until it hardens. Accordingly, if it is not done carefully enough, it may overturn during concreting and cause damage. In large buildings for formwork, calculation must be done and an executive plan prepared, but in small buildings, due to the small volume of concrete, there is no need to calculate and prepare a plan for formwork and scaffolding.

The shape of the concrete pieces with their size to be poured must be provided by the mold. The board and wood used for formwork should be completely dry and should not deform against moisture, because the deformation of the formwork causes the deformation of the concrete and is effective in the form of beams and columns. In Iran, a board known as Russian wood is usually used for molding.

Criteria for selecting the template type

In construction projects, especially concrete projects, the choice of formwork is one of the important parameters and will have a great impact on the cost and time of the project. Due to the existence of different types of molds and different molding systems, in order to select a specific type of mold among the types of building molds, the following should be considered:

1- Appearance and achieving a smooth surface in the facade concrete

2 - Economic cost (initial cost of mold, ancillary costs, skilled labor, installation costs, maintenance, assembly, warehousing, etc.)

3 - Reuse and repeat them

4 - Productivity: the amount of work done (in terms of square meters of mold) for each hour of manpower.

Types of formatting in terms of gender

1.Brick

2. Wooden

3.Metal

4.Plastic

Types of formatting based on shape

Templates can be square, rectangular and circular. Square, rectangular and circular shapes are mostly used in the execution of columns and beams.

Types of formatting based on position

Templates can be categorized by location, which are:

• Foundation formatting

• Column formatting

• Beam formatting

• Wall molding

• Roof molding

Brick mold

It is mainly used for formwork of the foundation, so that around the foundation, a brick wall is executed and after taking the concrete, they remain in place (permanent formwork). It should be noted that in brick formwork it is necessary to observe the following:

• The inner surface of the brick should be covered with plastic before concreting so that it does not absorb the concrete juice.

• The minimum wall thickness is 20 cm.

• Use cement sand mortar in brick lining.

Wooden mold

This type of molding is usually made of coniferous wood. Because this type of wood is lighter and softer than broadleaf trees and their deformation is less against moisture.

Its advantages are lightness, ease of implementation, low heat coefficient, simplicity of connections, etc. But low reproducibility (10 times) is one of its main disadvantages. Certainly, due to the protection of the environment and the existence of various molds with different materials, wood mold will not be one of the priorities of molding.

Poly wood composite mold

The term wood-plastic composites refers to composites made of wood (in any form) and thermoplastics, also known as poly wood.

Plastic effectively covers the surface of the wood as a thin layer. The high resistance of these composites to moisture is a direct result of its structure.

These composites have several benefits and properties, including the following:

• They are recyclable and its wood waste and recycled plastics are valuable and usable.

• The production method is very convenient and they are easily produced and made using traditional wood processing methods.

• Optimal hardness and dryness and resistance to external influences

• Dimensional stability (minimum deformation under load pressure)

• Resistance to wear and corrosion

• Excellent thermal properties

• Very low moisture absorption

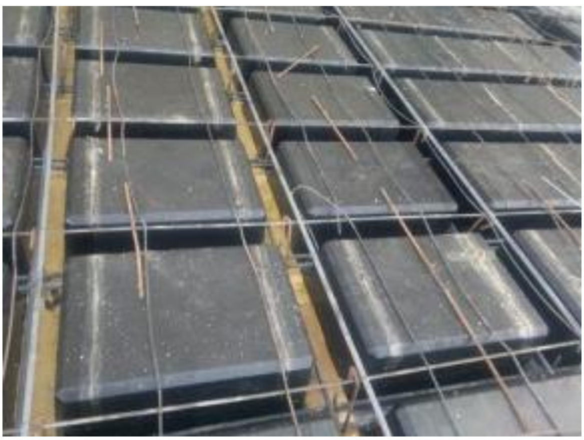
Ply Wood Mold

Plywood is a wood panel made of thin sheets of wood. This product is widely used due to its flexibility, reasonable price and reusability. The use of plywood instead of plain wood is due to its high resistance to cracking, shrinkage, torsion.

Plywood is usually produced in different thickness dimensions. The thickness of plywood used in concrete formwork is usually 18 mm. It is better to use mold oil for easy opening of the molds. Mold oil used for plywood should be (Hydro-based) so as not to damage the surface.

Fiberglass mold - polymer mold

Fiberglass is a composite of glass fibers with polymeric materials in which glass wool is used as a reinforcing material and polymeric materials as a base material. Composite molds (resistant molds made of plastic and fiberglass) that are offered under the brand name of Mahanit are one of these cases.



Metal concrete formwork

Currently, metal concrete formwork is the best-selling and most optimal method because it has important parameters such as easy transport and modular use and is acceptable in any operating system. This template is described in the full modular template section.

Advantages of metal mold:

High execution speed, ease of connections, smooth surface, high resistance, high durability

Disadvantages of metal molds:

Heavy weight, special logistics, relatively high initial cost of mold preparation and ...

Formatting terms

• Triangular: A thin piece of wood with a triangular cross-section that is used to chamfer the corners of a concrete member to the corners of the formwork. Sharp corners are vulnerable.

Free tongue: It is a narrow strip made of wood that is placed in the transverse slit at the seam of two adjacent pieces of wood and causes them to be fastened together.

Formwork cover: Thin sheets of wood or fiber plastic that are pounded on the surface of the formwork (the surface that is in contact with the concrete) and make the concrete surface smooth and even.

• Molding board: the part of the mold that is in direct contact with concrete.

• Mold coil: A wire or screw that connects two opposite pieces together to prevent them from opening.

Fastening:ntally or vertically to harden the mold.

• Cleaning valve: To clean the bottom of the column formwork, a valve is installed at the bottom of it, which is called a cleaning valve.

bracket: A compression member.

• Restraining support: It is called a piece of wood that is installed on the main piece to provide a fulcrum.

Mile restraint: A compression member that is placed obliquely behind the mold to maintain balance.

• Morsel: A small piece of concrete that we place between the rebars and the formwork. Used to provide a suitable distance for covering concrete on rebar.

• stub: In order to place the lower edge of the main formwork in its place, before placing the formwork, small temporary formwork should be placed in the exact location of the wall or column, and after taking the concrete, open these formwork and the main formwork in Is placed in its place.

• Yoke: loops that encircle round molds and prevent them from opening

• Left and right - restraint: A diagonal piece of wood to restrain the mold

• Base: light candle of specified length

Formatting systems

Based on the formatting system or in other words how to format the formatting systems include the following:

1- Buried or permanent mold

The brick formwork in the foundation is of this type.

2 - Traditional mold

The purpose is to use four-lathe timber in making the mold and the long execution time is one of the disadvantages of this method.

3 - Panel template - modular

The purpose of the panel mold is to use wooden, steel, fiberglass surfaces, etc., along with wooden, steel, aluminum backs and fittings, including pins, wedges, double bolts, etc. This formwork can be used for all parts of the structure, including roofs, columns, beams, etc., and if the components and dimensions are duplicated, the formwork surfaces can be moved by crane without opening.

In this molding system, mold panels as well as corners in different dimensions are provided by manufacturers that can be used depending on the dimensions required for molding. Male and female wedges are used to connect these modular pieces together. Modular formwork panels are made of a layer of shell made of metal with a thickness of 3 mm, along with stiffening straps. In the side straps, in order to make it possible to connect to other panels, holes with an axis-to-axis distance of five centimeters have been installed.

In order to create angles by this modular system, in addition to these flat parts, corner parts are also used in the formwork, which are attached to the side straps of the panels. These corners are produced in different dimensions and having the proper quality of the joints is essential and so that the concrete sap is not lost.

4- Grid Flex template

In this type of molding, the weight of the molding parts is about 20 kg, which can be carried by the worker and are pushed upwards by the workshop personnel and placed under the roof with the help of special tools. High execution speed, applicability in all geometry and dimensions and proper safety are the advantages of this method.

5- Execution of reinforced concrete buildings by tunnel formwork system

One of the industrialization methods that is currently used by a number of mass builders is the execution of a concrete structure using a tunnel formwork system. This method can be used to provide housing for the poor and middle class due to the speed of implementation, low price and good resistance to earthquakes.

In choosing the construction method of the building, earthquake safety and compliance with valid international and domestic regulations is one of the main conditions. This method, if properly designed and implemented while complying with Iran's 2800 regulations and the ninth issue of national building regulations, has a good performance against earthquakes.

What is a tunnel formwork system?

Tunnel formwork system is a special structural and executive system of reinforced concrete buildings. The name of the tunnel is due to the shape of the integrated metal forms of the walls and ceilings.

In the tunnel system, reinforced concrete walls and roofs are rebar binding, molded and concreted simultaneously, so that the concrete structure of the building consists only of load-bearing concrete walls and concrete slab roofs and does not have any common structural members such as beams and columns.

After the end of each stage of concreting the walls and slabs and with the passage of time and gaining sufficient strength of concrete, it is possible to remove the formwork and transfer the formwork to a higher floor and the skeleton of a floor is completely obtained.

For molding, there is no need to crush the molds and turn them into small dimensions, and they leave the space with the same initial dimensions and seamlessly. The exit of tunnel formwork, after concreting the wall and the roof and closing it, is done by distancing the formwork from the concreted walls and by moving it horizontally on the wheel or roller. The walls that are executed using this method are the main internal walls and some external (lateral) walls.

Structures of buildings with tunnel formwork system do not have major problems from the point of view of seismic performance, and the experience of past earthquakes has proved the proper behavior of this structural system in comparison with other systems.

How to implement a tunnel formwork system

In this method, first rebar binding and then installation of electrical circuits in the walls is done. Simultaneously with these measures, the formatting of the openings required for the installation and the door and window is performed. Then, the formwork on both sides of the wall is formed back to back, and by placing consecutive formwork next to each other, they form a set of wall and ceiling formwork.

In the next step, roof rebar binding is done and the electrical circuits are installed, and molds are installed to leave the ducts empty. Then, the concreting of the ceilings and walls is done in one step. Execution of polished concrete walls eliminates the need for joinery on their surfaces.

In buildings with a tunnel formwork system, in some cases, to increase the ease and speed of execution, non-structural components such as partition walls, stairs and facade panels are considered prefabricated and after completion, the main structure is attached to it. This system only It is used for mass production projects and has no economic justification in small projects.

Tunnel mold system parts

Tunnel formwork has different parts according to the nature and method of application, each of which has a special simplifying and structural role in execution. We refer to them below:

Corner of Ramka:

One of the weaknesses of traditional concrete structures is the concrete columns and walls. Concrete Ramka, which has long been common in the execution of concrete structures, despite helping to increase the accuracy of column and wall molding, due to the increase in cold joints, is technically flawed. In the tunnel formwork system, due to the same thickness and dimensions of the walls, Ramka concreting is done simultaneously with concreting the walls and ceiling. To do this, Ramka corner is used with corner support bases on the lower form.

Duct opening format:

Due to the modularity of the system and to increase the execution speed, the duct formwork in this system is made non-prismatic and after concreting, it is easily separated from the roof.

Four mold lifting horns:

Due to the large dimensions of the roof and wall formwork parts and their high weight, the formwork can be moved from one floor to another with the help of a crane or tower crane. In order for the mold piece to remain level during transport and to be easier to install, the mold is lifted from where it was previously perforated with the help of four mold lifting horns.

Panel wheels and screws

Under the roof panel and the wall, a series of metal wheels are provided, which allows the mold to move on the roof. This movement is especially important after the roof concrete has set and to take the formwork out from under the roof. Once the mold is in place, use a screw to align it, in which case the wheel lifts off the ground. During molding, the mold is placed on the wheel again by loosening the screw.

Cone metal spacer:

Due to the constant thickness of the walls in this system, a conical metal spacer is used to maintain the distance between the molds. This spacer has a thick edge, which makes the mold less damaged when tightening the mold retaining screws. In addition, the conical nature of the piece makes it easy to separate the piece from the concrete after molding.

Mile jack:

Mile jack is a metal diagonal piece with adjustable length that connects the bottom of the wall formwork to the end of the roof formwork. Its task is to level the roof formwork before concreting (by increasing the length) and releasing the formwork from under the roof (by decreasing the length).

Advantages of tunnel formwork system

Modular design:

Modular design is possible with this system.

Less weight:

With a basic design, this system can be a little lighter than conventional systems. Consumption of concrete in tunnel construction is more than buildings with steel or concrete frame, but the consumption of rebar and especially iron in this method is significantly less than buildings with steel and concrete frame. Due to the fact that in the tunnel system, the inner walls of the gypsum board are dry-walled, the weight of the building in this method is significantly less than the in-situ concrete system with integrated wall and ceiling forms.

Speed in implementation and cost reduction:

Diagrams of work progress and scheduling of skeleton execution and complementary operations in tunnel formwork structures confirm the very high speed of construction operations and reduce the cost of the building compared to conventional structures. This depends on several factors, the most important of which are as follows:

1.Due to the specific number of sets of tunnel formwork system, there is a precise and systematic time period for rebar binding, formwork and concreting operations, and by planning for the above implementation, time delays, especially in the skeleton section, are minimized and This method is much faster compared to the formwork, rebar binding, concreting and molding operations of columns, beams and roofs in conventional concrete buildings.

2. In the tunnel formwork system, at the same time as rebar binding the walls and ceilings, a major part (about 70%) of pipes and electrical cans and installation sheaths have been done, and as a result, grooving operations on the roof and walls (such as structures Traditional) is removed for the

installation of pipes and cans, which in turn reduces the time and subsequent costs.

3. Due to the integrity of walls and ceilings and the existence of many shear walls in this type of structures, despite the very high resistance to seismic force, the amount of bar used is about 30% less than conventional concrete structures and it saves money.

4.Since concrete walls in concrete structures of tunnel form, in addition to the load-bearing role, also act as main partition walls and even internal partitions, so the brick lining of the building is reduced by about 60%.

5. Due to the creation of smooth and polished surfaces of concrete walls and ceilings in this system, joinery operations including plaster and soil and whitewashing on concrete walls and ceilings are completely eliminated and can be painted directly on them, and this feature saves a lot of money.

6. Despite the initial investment in the construction and supply of tunnel molds, due to the ease of molding using cranes and the possibility of using them in various projects (durability and long life of molds), Significantly reduces molding costs.

7. Due to the passage of electrical pipes and installations in the thickness of the concrete slab, by removing the pumice and applying lightweight concrete on the roofs, a significant reduction in the weight of the building and the cost is done.

8. Elimination of mortar facade from the facades of buildings and the use of exposed concrete as well as precast concrete in the facades will reduce weight and cost and increase the execution speed and durability of the facade. If this system is used,

concrete facades, preferably exposed concrete, with different designs are considered. This will minimize the cost of the facade. for facades that are free and their walls are not built with a tunnel system, there are different options for facades. One of the most common choices is prefabricated concrete panels, which in this case will only serve as a separator. The prefabricated facade made of prefabricated concrete panels makes it have a higher quality and variety, compared to other in-situ facades. Another solution is to build a masonry wall or use 3D components. In all these cases, the facade wall can partially overshadow the performance of the structure. The last solution is the use of light drywall, which can be made entirely (curtain wall), using gypsum and cement boards.

9. The executive manpower in this system is able to perform most of the actions with a little training. Of course, the faultability of rebar binding, concreting, concrete processing and other stages, causes the executor and executing factors to play a decisive role in the quality of the product

and by changing them, the performance quality is changed. In this regard, it is necessary to use skilled professionals who have received the necessary training for this type of performance. In the field of design, it is necessary to point out that if the design company is completely proficient in these methods, the project can be optimized. In the opposite case, the project and executive operations face major problems.

10. Low depreciation and long life of the building in operation

Resistance of tunnel formwork systems to lateral forces:

1.Integrated performance of walls and ceilings and suitable earthquake-resistant reaction to conventional and traditional systems.

2. In the tunnel formwork system method, due to the direct connection of the roof slab to the surrounding walls and their wide connection surface, there is practically no stress concentration at the junction of beams and columns like ordinary concrete structures and the structure resists the lateral force of an earthquake.

3. Due to the high stiffness of this type of structure, practically the stiffness of the non-structural filler walls will not have a significant effect on the stiffness of the whole structure and the result of the initial analysis is quite reliable.

4. Changes in the stiffness of the structural floors at the height of a building is one of the important issues in Regulation 2800. Due to the type of skeleton and structural sections in the floors in the tunnel system, hard changes in altitude are imperceptible and the distribution of seismic forces at heights is much more regular.

5. Ease of execution and supervision of the structure: Due to the simplicity of the network of rebar binding of walls and ceilings and their repetition in the floors by preparing workshop plans for pipes and electrical cans and the location of wall and ceiling openings, Execution of work and technical supervision will be accurate.

6. Meeting the expectations regarding the airborne sound of external walls, and the walls between two residential units

Disadvantages of tunnel formwork system

Architectural limitations:

Due to the special method of tunnel formwork system and the need for multiple parallel walls and the need to predict the exit path of tunnel formwork under the roof, it is clear that there are limitations in the field of architecture that make the freedom of action in designing the main structure of architecture significantly less than systems such as beams, columns, concrete roofs, or steel structures (or girders or bending frames). As a result, the amount of authority in determining the dimensions of spaces is less compared to other named systems.

Thermal insulation of the building:

Meeting the expectations regarding the thermal insulation of the walls, if the thermal insulation is implemented inside, is associated with many problems due to the existence of several thermal stairs, If thermal insulation is provided on the outside of the building, operational problems will increase, Instead the thermal bridges at the junctions to the ceilings and interior walls are completely removed, and the thermal inertia required for residential buildings increases dramatically. The risk of condensation and its problems can be eliminated in the design phase and depending on the type and location of thermal insulation.

Impossibility of use in urban lands with restrictions:

Due to the need for freedom of movement of tunnel forms on the four sides of the building and the lack of economic justification for using this method in small construction projects, this method is used only in large sites and without the usual dimensional restrictions.

Lack of parking under the building:

Due to the need to extend the load-bearing walls to the foundation and to avoid creating a soft floor, it is not possible to provide parking under the building like traditional building systems. To solve this problem, architects usually have to expand the dimensions of the building on the parking floor compared to the higher floors.

High initial capital:

Due to the high cost of preparing tunnel formwork and the need to prepare and install the tower (due to the weight of the wall and ceiling formwork parts used), the initial costs of the workshop are high compared to traditional construction.

Land slope constraints:

The slope of the project land should also be very low (maximum 5%).

6.Slip Form

One of the concrete forms is sliping forms that are widely used in the construction of structures.
Types of sliping molds are:

- Vertical sliper mold
- Horizontal sliper mold
- Ascending mold
- Bird mold

A• Vertical sliper mold

The basis of this method is that the mold is raised to a height of 1 to 1.5 meters at intervals. While lifting the formwork, concreting and rebar binding operations continue, and the concrete mixture is constantly poured into the formwork from above, and as the formwork moves upwards, the hardened concrete remains from the bottom of the formwork. The speed of the mold is adjusted so that the concrete, while bearing its weight, has sufficient strength to maintain its shape when leaving the mold. This formatting can be done based on continuous motion or it can be programmed to stop at a certain height and then resume its slider movement. The slider mold usually moves at a uniform speed. If the slip formwork has a stop, seams are created that are no different from the fixed formwork in construction operations. The sliding formwork moves along a vertical velocity at a uniform speed, and this velocity is such that each section of concrete remains inside the formwork for the time required for the initial setting.

The vertical sliding formwork method is used for shell structures with fixed or almost fixed wall thickness. Vertical sliding molds are moved upwards by jacks and act on smooth rods or pipes embedded in concrete. These jacks may be manual, windy, electric or hydraulic. Work platforms and workers' scaffolding are also attached to the formwork and move with it.

B.Horizontal sliper mold

This type of formwork is used for pouring concrete on long walls, floors and walls of large canals, concreting slopes, tunnel floors and road surfaces. Because most horizontal slip formwork is performed on a fixed formwork support such as rock or soil, this operation is primarily a consolidation and polishing operation.

The slider molding machine usually moves on a shaped rail or platform. Concrete receiving section is a machine that is designed for uniform distribution of concrete in all sections of the formwork. Compaction of concrete is done by a vibrating pipe that is parallel to the front edge of the formwork and slightly in front of it. Compaction of structural concrete can also be done with manual vibrators. Concrete pipes are also produced in an integrated place using the horizontal slider molding method. The construction of a complete tunnel cover is also done by sliding formwork.

C. Ascending mold

Ascending forms are forms that move away from the concrete surface after each concreting and are moved in a creeping manner (by jack pressure or by using a worker and a crane). These formwork are commonly used for high walls. In the traditional implementation of high walls, it is necessary to scaffold both sides of the wall, but in the method of Ascending formwork, the formwork of each stage relies on the previous stage and the formwork climbs upwards and executes the upper stages of the wall. Each step of the wall in this way is called a lift. In these molds, two series of molds are used and in each section, a series of molds is placed on top of the previous series mold. In this way, a hole is made about 50 to 70 cm from the top of the mold and the mold is lifted by a crane and its foot is fixed in the mentioned hole by a bolt and the mold is fixed by a jack. The first lift hole is also created in the second lift to be used in the third lift.

D. Bird mold

The term bird mold refers to a system whose components are connected to each other to form a large unit called a deck. This system is used for formatting concrete slabs in multi-storey buildings.

After the concrete of each floor has been poured and gained the necessary strength, the bird mold (without embedding components) is separated from the concrete and moved horizontally to the outside of the building to be reused in another position for another slab. The term "bird deck mold" is derived from the fact that the mold is moved out of the building and pulled up to be used on the upper floor level. Each bird mold unit consists of components of different structures such as: trusses, beams, joists and metal or plastic to be used several times to form building slabs. These molds can be used to hold beams, slabs and other structural components.