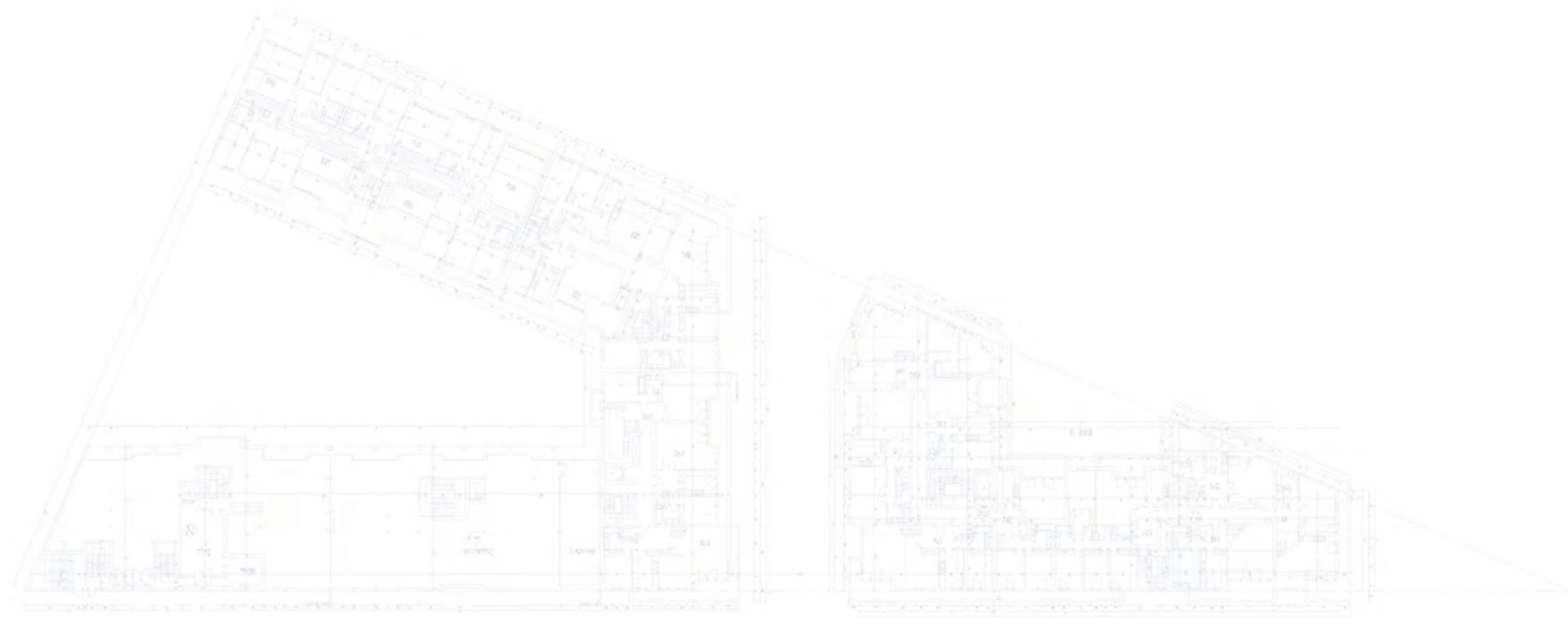


THE WORLD LEADER OF STAY-IN-PLACE FORMWORK



A STRUCTURAL STAY-IN-PLACE SYSTEM TO BUILD MONOLITHIC CONCRETE CONSTRUCTIONS

DESCRIPTION



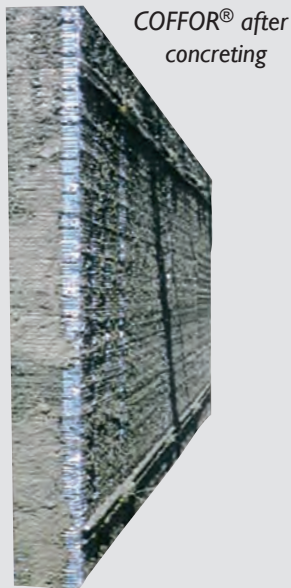
COFFOR® before concreting

COFFOR® is a patented structural stay-in-place formwork system for concrete constructions.

COFFOR® is composed of two filtering grids made of rib lath reinforced by vertical stiffeners. The grids are connected by articulated rebar loops that fold for cost effective transport. The volume used by COFFOR® is 7 times less than the equivalence in bricks, concrete blocks or Insulated Concrete Formwork (ICF).

COFFOR® is very light: less than 11 kg/m² (2.25 lb/sq ft). A standard panel 1.22 m x 2.70 m (4' x 9') weighs 35 kg (77 lbs). COFFOR® can easily be carried by 1 or 2 workers.

After COFFOR® is placed, concrete is poured inside. Excess water is eliminated by gravity through the grids. The fluid concrete becomes semi-solid decreasing pressure against the grids.



COFFOR® after concreting



COFFOR® can be carried by hand

This explains why COFFOR® can be so light compared to traditional heavy waterproof formworks.

COFFOR® remains in the construction to reinforce it after the concrete is poured.

COFFOR® is primarily used for building walls in all types of construction: single-family homes, multi-unit apartment buildings, lavish residences, luxurious high rise buildings and all types of industrial

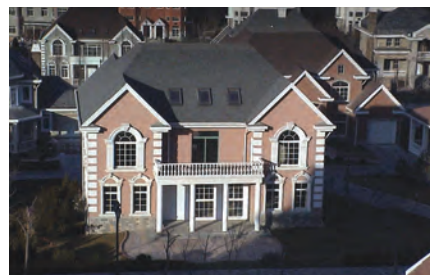


34-story building

or commercial buildings. COFFOR® is so versatile that it is used for radius walls, blind walls, retaining walls, slabs, floors, inclined or flat roofs, infrastructures, foundations, columns, beams, rehabilitation, reinforcement, swimming pools, water tanks, civil works and much more.

There is no limitation of wall height or number of floors.

COFFOR® is cost effective compared to other construction systems.



Villa



7-story building



12-story building

COFFOR[®] is 2 to 3 times faster than other construction systems as every step of the construction process is simplified. On average two workers can perform all steps of the construction process in just 10 minutes per m² (less than 1 minute per sq ft).



Fast placing



Concreting with a pump

Possibility to pour a whole floor in one pass: reduces preparation time and eliminates lost time in rotating standard formwork.



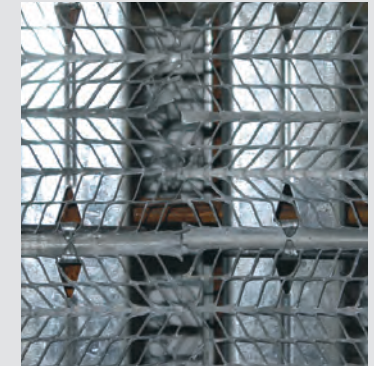
Close view of COFFOR[®] after concreting

No stripping as COFFOR[®] stays in the wall.

Anti-cracking welded wire is no longer necessary: given the presence of the C profile, the rib lath, their proper bonding to the concrete and their respective steel section, the anti-cracking welded wire (a requirement with traditional waterproof formwork) is eliminated. In addition, the rapid elimination of excess water decreases concrete shrinkage, dramatically reducing the occurrence of cracks.

Construction shutdowns due to weather conditions are reduced:

- Work can continue in high winds without a crane.
- Work can continue in low temperatures as the rapid elimination of excess water reduces occurrence of ice formation.



COFFOR[®] grids



Less shutdowns due to weather conditions



Bonding of finishing is excellent

Time spent placing thermal insulation is eliminated: COFFOR[®] INSULATED already integrates the insulation material - eliminating the necessity to come back to place it.

All types of finishing bond exceptionally well due to the COFFOR[®] herringbone rib lath.

Time is saved building slabs/floors: using COFFOR[®] with the external sides higher than internal sides eliminates the need to place edge formworks and need to remove them after the slab is poured. It is possible to place the forms of the upper slab before the concrete pour of the walls.

Construction speed is increased by only adding unskilled labor, contrary to other formwork systems which depend on labor and cranes.

COFFOR® IS SIMPLE TO USE...

Every step of the construction process is simplified:

- Placement, alignment, bracing.
- Setting of openings.
- Rebar insertion (if necessary).
- Service conduit penetration.
- Concrete pour.

Workers are trained on the COFFOR® technology in just 2-3 days: training is performed quickly and directly on-site. In addition, workers are keen to learn since COFFOR® is by far less physically demanding than other construction methods such as heavy formworks, bricks, concrete blocks, etc.



Unskilled worker trained on-site



No more heavy materials



Light bracing (steel tubes) with COFFOR®

No specific tools are required apart from those generally available on all construction sites such as gloves, hammers, shears, electric saws, pliers, plumb lines, steel wire, tubes, light planks, ladders, etc..

Possibility to build in difficult areas such as city centers since COFFOR® can be used **without a crane**. Local authorization, approval by neighbours as well as an overhead path for the crane are no longer necessary. Space requirements on-site are reduced.

Security is improved: heavy and cumbersome objects are no longer necessary as light steel tubes or wood planks are sufficient. Risk of accidents due to unsteady heavy shoring or crane falls are eliminated.

Problems of traditional reusable waterproof heavy formwork are eliminated: investment, availability, transportation, cleaning, repair, rotation, storage, accessories, etc.

Easy setting of openings: placement of doors and windows is easy as COFFOR® panels can be cut on-site using a hand shear or electric saw.

Edge closing is done with wood planks or rib lath. To save time for multiple openings of identical dimension, reusable mock-ups are recommended.



Edge closing with wood planks



Cutting on-site



Vibrating with a needle



Easy rebar insertion

Easy rebar insertion (if necessary):

- Grouped in pairs, vertical rebar are inserted from the top into the axis of the C profiles.
- Horizontal rebar are then slid between the C profiles and vertical rebar.

As the horizontal and vertical rebar are secured, the necessity to tie them is eliminated.

Easy service conduit penetration:

electric, plumbing and heating tubes are easily placed through the grids. Electrical or plumbing subcontractor work is not dependent upon formwork rotation since the whole floor can be poured in one pass.

Visual inspection of the pour

enables control of the concrete setting and eliminates segregation risks. It is possible to pour concrete in the walls and upper slab at the same time.

Vibrating is generally not necessary.

If needed the task is simplified as COFFOR® is transparent. Vibrating is done externally with a wooden hammer or internally with a vibrator.

Building reinforced concrete under water without draining the site:

concrete is poured with a tube in the water directly to the bottom of COFFOR® from the bottom-up. Space between the tube and concrete bed should not exceed 10 cm (4").



Under water construction

Construction mistakes are reduced:

since COFFOR® is transparent, it is much easier to control the quantity, quality and placement of rebar and service conduits before and during the pour. COFFOR® eliminates the risk of void under window openings, eliminating the need to re-do a pour. Occurrence of cracks and waterproofing defects are reduced.



Adjoining walls



Reservation



Foundation



Roof



No access problem

Simplicity and flexibility:

unlike other stay-in-place formwork systems such as Shotcrete or ICF (double polystyrene panels), COFFOR® does not require skilled labor or special equipment and is used with regular concrete without additives.

COFFOR BUILDS TOTALLY EARTHQUAKE RESISTANT SHEAR WALLS



Villa



10-story residential building



Commercial building

COFFOR[®] builds shear walls and shear core that provide earthquake resistant structures. With the looping effect of the rebar connecting the grids, the structures built with COFFOR[®] are of a superior quality than those of other traditional systems.

Shear wall design is the most effective constructive method to provide optimum safety against natural disasters such as earthquakes, tornadoes, hurricanes, typhoons, etc.

Connections between walls and floors are efficient with continuity rebar. Concrete can be poured simultaneously in the wall and upper floor to improve the **monolithic concrete structure**.

COFFOR[®] acts as ductile frames, distorting progressively and retaining resistance capacity prior to failure. Rupture will not occur in a brittle manner.

The zig-zag rebar loops and steel cage **efficiently contain** the concrete and prevent debris from scattering during excessive stress.

Depending on the local seismic construction regulations, civil engineers should determine the structural design, wall positioning, thickness of walls/slabs/floors as well as the quantity and size of rebar to be added.



Efficient confinement



Shear walls would have avoided this earthquake damage...



Earthquake resistant building made with COFFOR[®] shear walls

Professor Victor Davidovici, a leading global specialist in earthquake resistant constructions, head of the COFFOR[®] scientific team said:

“The very nature of COFFOR[®] makes it appropriate to build shear walls and the shear core of a building designed to resist horizontal loads generated by earthquakes. COFFOR[®] is a technology that makes it possible to build shear walls without heavy equipment. The quality of construction is assured by the fact that workers can easily and quickly follow the basic COFFOR[®] implementation rules without any possible mistake.”



COFFOR[®] shear walls

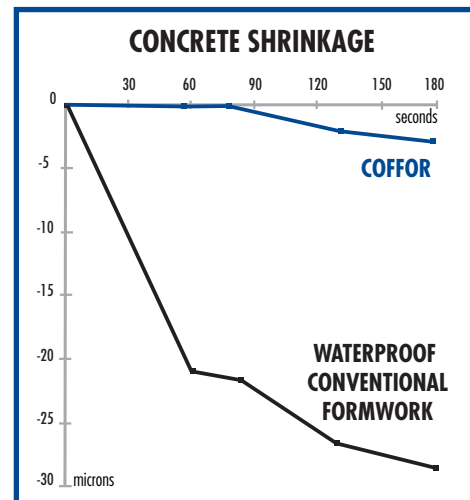
CONCRETE QUALITY IS IMPROVED WITH COFFOR®

Concrete quality is improved with COFFOR® by the rapid and natural elimination of excess water from the concrete. Problems linked to bleeding, water rise, shrinkage, creep, increased porosity and concrete ageing are for the most part eliminated.

Tests made in France at the C.S.T.B. (Centre Scientifique et Technique du Bâtiment) and l'Ecole Nationale des Ponts et Chaussées as well as those made in Switzerland at l'E.P.F.L. (Ecole Polytechnique Fédérale de Lausanne) and l'Ecole des Ingénieurs de Genève indicate that the rapid elimination of excess water in COFFOR results in :

- 8-10% greater compression strength.
- 30% higher elastic modules.
- 10 times lower (2μ vs. 25μ) concrete shrinkage.
- 25% greater tensile strength.

Less than 1-2% of concrete escapes through the COFFOR® grids during the pour. The results show that this does not affect the superior quality of concrete with COFFOR®.



Concrete shrinkage



Laboratory tests



COFFOR® KIT

COFFOR® KIT

COFFOR® KIT is delivered by the factory with all parts and accessories to make a complete house rapidly and cost effectively. Since they are made of monolithic concrete, they are more resistant than other kit houses. COFFOR® KIT is particularly appropriate for:

- Relief operations after major disasters (earthquake, hurricane, fire, etc.).
- Mass housing programs that need to be realized in short time frames.
- Housing displaced populations after a war, political crisis, etc.
- Construction in areas where access is difficult.
- Individuals who wish to build concrete houses quickly without heavy equipment at a low cost.

COFFOR® INSULATED

COFFOR® INSULATED is delivered by the factory with an integrated insulation on the exterior side. The insulation material is polystyrene or polyurethane of various thickness 40 mm (1 5/8"), 60 mm (2 3/8"), 80 mm (3 1/8") or any other thickness upon request.

Concrete is poured in COFFOR® directly along the insulation material to form a monolithic structure that improves the thermal quality, eliminating cold bridges.

Cost saving with COFFOR® INSULATED is significant since no time is spent adding insulation to the walls after the shell is completed.



COFFOR® INSULATED

MORE ADVANTAGES



Spacious Design

COFFOR® OFFERS MULTIPLE CREATIVE POSSIBILITIES

Creativity is not limited by technical constraints: the flexibility of COFFOR® allows any type of architecture including sloping/radius walls or roofs, blind walls, etc. Adaptation of the panels to non-repetitive designs or even last-minute changes directly on-site are easy as the rib lath can be cut with a simple hand-shear or circular saw. Small projects are realized cost-effectively since the cost of designing and producing special sheeting is eliminated.

COFFOR® IS ENVIRONMENTAL FRIENDLY

COFFOR® technology helps protect nature, reduces the depletion of natural resources and saves energy.

Forests are preserved as the intensive consumption of wood is reduced. Pollution brought about by the burning or dumping of wood debris from construction sites is decreased.

Potentially polluting oil to clean metal sheeting is eliminated.

Use of bricks is decreased, reducing the amount of natural resources used as well as the energy to make them (China has banned the use of bricks for this reason).

For low rise buildings, it is possible to use other filling materials than concrete.

The external placement of thermal insulation provided by COFFOR® INSULATED makes it far more efficient than bricks in eliminating cold bridges, saving heating and air conditioning energy.

COFFOR® builds concrete structures that last and do not require maintenance and repairs like other construction systems (wood, bricks, etc.).

COFFOR® IS COST EFFECTIVE

The saving generated by COFFOR® (reduction of construction time, lower labor requirements, less rebar use, construction without cranes, no anti-cracking welded wire, less overhead) make COFFOR® an extremely cost effective building system. Construction analysis may vary depending upon local conditions.



Renovation of a historical 8-story building



Interior of the same historical building



Villa with radius walls



Roofs



Amphitheater of a university

Width: standard panel widths are 1220 mm (48"), 990 mm (40"), 760 mm (30"), 530 mm (21") and 300 mm (12").

Height: panel heights are according to order but up to 5000 mm (16'5"). Panels can be delivered with the exterior side higher than the interior side to eliminate edge formwork on site.

Thickness: once unfolded, standard panel thickness are 150 mm (6"), 200 mm (8") and 250 mm (10"). Other thickness available on request.

Rib lath is expanded metal with ribs produced from commercial quality cold rolled and hot galvanized steel in accordance with

ASTM C 847 with galvanized G 60 according to ASTM A 525 (USA), or according to Z 275 Norme NF A 36 321 (France) or equivalent. Minimum thickness is 0.45 mm (1/64"). The horizontal ribs have a depth of 8 mm (5/16") and are spaced 100 mm (4") apart.

C-shaped vertical stiffeners with five ribs are produced from commercial quality cold rolled and hot galvanized steel RS F47 or according to Z 225 norm NF A 38-322 (France) or equivalent. Minimum thickness is 0.6 mm (1/32 inch). The C profiles are spaced 230 mm (9") apart.

Articulated rebar loops are made of steel rebar. Diameter is 5 mm (1/5"). Elasticity limit is

500 N/mm². Traction strength is 700 N/mm². They are spaced 200 mm (8") apart.

COFFOR[®] INSULATED: same components as COFFOR[®] plus an integrated insulation material such as polystyrene or polyurethane. Standard thickness of the polystyrene or polyurethane boards are 40 mm (1 5/8"), 60 mm (2 3/8") and 80 mm (3 1/8"). Conductivity equal or less than 0.041/m² K. Other insulation material is available on request. Total thickness of the panel is increased by the polystyrene or polyurethane thickness.



Villa in construction



7-story building



Club house



Villa



Warehouse with 12 meter high walls



Social housing

FREQUENTLY ASKED QUESTIONS

Q. What is COFFOR®?

A. COFFOR® is a lightweight structural formwork system to build reinforced concrete. It is a stay-in-place formwork that reinforces the construction.

Q. What are COFFOR® and COFFOR® INSULATED made of?

A. COFFOR® is made of rib lath, C shaped profiles (both produced from hot galvanized cold rolled steel in coil) and articulated rebar loops (produced from steel rebar). COFFOR® INSULATED is made with the same components but includes an insulation material such as polystyrene or polyurethane. See section COFFOR® TECHNICAL SPECIFICATIONS.



Column

Q. What are the dimensions of COFFOR® panels?

A. Standard widths of COFFOR® are 1220 mm (48"), 990 mm (40"), 760 mm (30"), 530 mm (21") and 300 mm (12"). Height is according to order. Standard thickness of COFFOR® is 150 mm (6"), 200 mm (8") and 250 mm (10"). Other thickness are available on request.

Q. What can be built with COFFOR®?

A. COFFOR® is used for building walls in all types of construction: single-family homes, multi-unit apartment buildings, lavish residences, luxurious high rise buildings and all types of industrial/commercial buildings. It is used for radius walls, blind walls, retaining walls, slabs, floors, inclined or flat roofs, infrastructures, foundations, columns, beams, rehabilitation, reinforcement, swimming pools, water tanks, civil works and much more.

Q. Is there a limitation on the number of floors that can be built with COFFOR®?

A. No. The limit is the same as for all reinforced concrete constructions.

Q. What is the height limitation of a COFFOR® wall?

A. There is no height limitation. Walls 12 m (39 ft) high were built by positioning 3 COFFOR® 4 m (13 ft) high panels poured one after the other.

Q. Is COFFOR® reusable after concrete has been poured?

Q. What are the advantages of COFFOR® over Insulating Concrete Formwork (ICF) Systems?

A. COFFOR® has several advantages over ICF Systems: it is structural, has no height limitation, is not fragile, does not require skilled labor, does not require any concrete additive, has no condensation risk and is less voluminous for transport.

A. No. COFFOR® is not reusable as it remains integrated in the wall after the concrete is poured.

Q. What are the advantages of COFFOR®?

A. COFFOR® offers all the advantages of reinforced concrete systems. Compared to other concrete construction systems, COFFOR®:

- Is faster to implement.
- Is easier to implement (no skilled labor, no lifting device, etc...).
- Offers more creative possibilities.
- Can be used with an integrated insulation material.
- Is available as COFFOR® KIT.
- Is available as COFFOR® INSULATED
- Is environmental friendly.

Q. Why is COFFOR® implementation faster than other construction systems?

A. Every phase of the process is easy and fast:

- Placement, alignment and bracing.
- Setting of openings.
- Rebar insertion (if necessary).
- Service conduit penetration.
- Concrete pour.
- No stripping.

Q. How is electrical and plumbing done?

A. Electrical conduit and plumbing are easily inserted in COFFOR® prior to the pour by cutting the lath with a shear or a circular saw.

Q. How does the cost of COFFOR® compare to other construction systems?

A. In most cases, COFFOR® is cost effective as there is significant time saving: less labor, less rebar, no crane, no anti-cracking welded wire and less overhead.

Q. Are qualified workers required to use COFFOR®?

A. No. Unqualified workers can easily use COFFOR®. Most are trained in 2-3 days directly on-site.



Fast implementation

Q. Is a special concrete mix required with COFFOR®?

A. No. The same concrete mix as in other waterproof formwork systems is used. Maximum aggregate size should be 20 mm (3/4"). Recommended slump is 10-15 cm (4-6"). No special additive is necessary. Concrete is poured with a pump, a bucket or a shovel.

Q. Is vibration necessary?

A. Vibration is not necessary but possible if needed. Concrete placement is easily viewed directly through the grids. Roding or taping the outside surface of the wall is enough. A pencil vibrator 25 mm (1") can be used, staying 40 mm (1 5/8") away from the rib lath.

Q. During pour how much concrete escapes through the COFFOR® grids?

A. Less than 1 to 2% escapes but can be picked up and poured back inside. Laboratory tests show that the concrete quality with COFFOR® is superior due to the rapid elimination of excess water.



Residential building

Q Are special equipment or accessories required?

A. No. COFFOR® is simple to use and does not require heavy infrastructure or equipment such as cranes. No specific accessories are necessary. The only requirements are those generally available on all construction sites such as gloves, hammers, electric saws, pliers, plumbines, steel wire, tubes, light planks, ladders, etc.



Residential complex

Q. Is it possible to use COFFOR® for part of a building and another formwork system for the rest? Can they be combined with prefabricated slabs?

A. Yes. COFFOR® can be combined with any construction system.

Q. Can COFFOR be reinforced with rebar ? How is the rebar placed?

A. For many constructions, no additional rebar are necessary since COFFOR® provides the structural reinforcement. If civil engineers determine that additional rebar are necessary, for example in highrise buildings or constructions in sensitive areas (earthquakes, hurricanes, etc.), they are easily added directly on-site. Vertical rebar are grouped in pairs and inserted from the top into the C profiles of COFFOR®. Horizontal rebar are inserted between the C profile and the vertical rebar. It is not necessary to tie horizontal and vertical rebar as they are secured.

Q. Can COFFOR® be used in seismic areas?

A. Yes. COFFOR® is particularly well-suited for seismic areas as it builds shear walls. The rebar loops and steel cage provide an efficient confinement of concrete and prevent debris from scattering during an earthquake.



Radius wall



27 Km wall

Q. What finishes are used for interior walls?

A. Any interior finish is possible. Plastering is easily applied due to the herringbone mesh that provides an efficient bonding. Drywalls can be pasted as well as wood, tiles, plastic, marble, etc. If an interior thermal insulation is required it is directly applied to the COFFOR® wall.

Q. What finishes are used for exterior walls?

A. Any exterior finish is possible. Stucco as well as any projected finish bond exceptionally well due to the herringbone mesh that provides an efficient bonding. The characteristic of the finish, number of layers and thickness depends on local conditions. In aggressive areas like sea shores, waterproofing may be necessary. Other exterior finishes (wood, marble, etc..) are possible.



24 apartment-villa

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“By its simplicity and transparency, the COFFOR[®] construction process is a rigorous path with no possible mistake.”