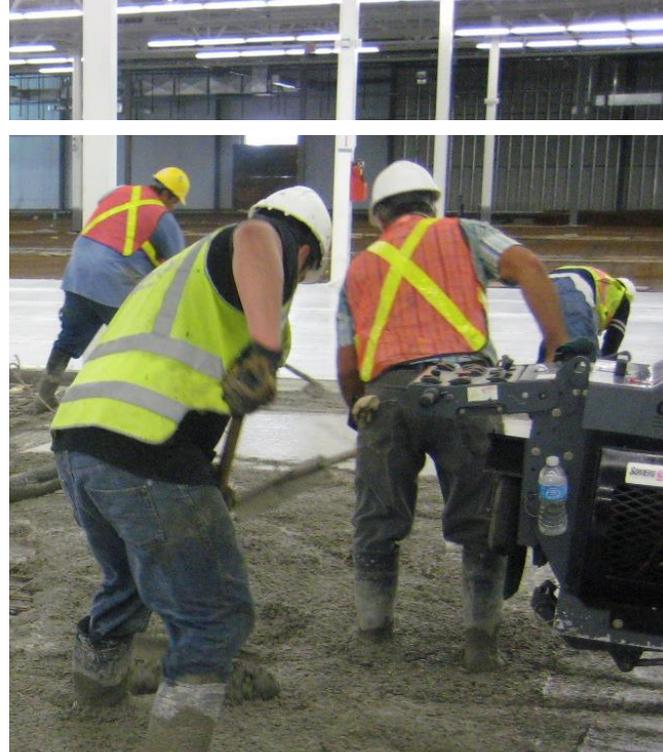




# THE CUPOLEX® SOLUTION



CONCRETE  
SLABS ON  
GRADE



[www.cupolex.ca](http://www.cupolex.ca)

**PONTAROLO**  
ENGINEERING 



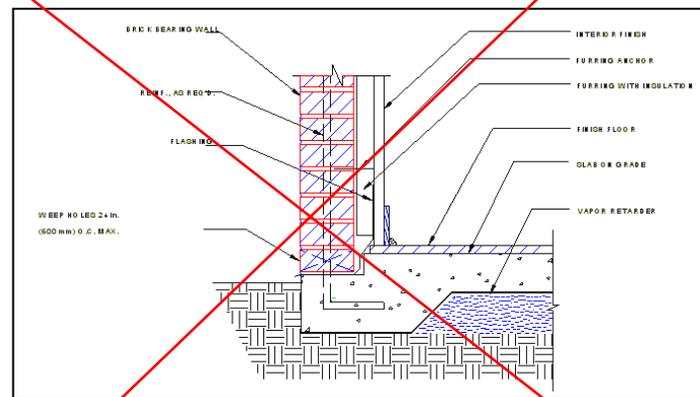
## SLABS ON GRADE – IDENTIFYING THE PROBLEM

Slab-on-ground is a well-used building solution in North America and other parts of the world, and they are very well known to not provide healthy interior environments. The slab on ground is in direct contact with the typical draining layer such as a gravel, sand or a compacted subbase and under complicated hydrothermal conditions. When not properly applied, moisture damage in slab-on-ground structures may result, leading to mold growth, chemical reactions and material emissions associated with an unhealthy indoor environment. Slabs on the ground typically are prone to a degree of damage caused by moisture. Typical moisture failures of slab-on-ground structures are due to the lack of a capillary breaking drainage layer under the slab, lack of thermal insulation, and incorrect placement of the vapour barrier. In addition to the moisture problems, the soil may be a source of radon, methane and many volatile organic compounds (VOC) that may enter indoors through the slab on ground.

Because the construction of concrete floors on the ground necessarily focuses a great deal of attention on the performance of concrete, especially when the results of such construction are less than satisfactory, the concrete industry has the strongest incentives for doing everything possible to encourage the highest standards of workmanship. This is particularly true since the shortcomings of most slab-on-ground construction have far more to do with faults or oversights of workmanship than to inherent shortcomings in concrete itself.

Building designers and developers strive to assure better results and protect themselves and their product from criticism. They are constantly facing the following challenges when designing and installing slabs on ground:

- slab curling and shrinkage,
- radon,
- vapor intrusion,
- improving indoor air quality,
- reducing the environmental impact of building,
- lowering building costs and the carbon footprint,
- reduce the cycle time of building,
- reduce aggregate use,
- moisture and mold prevention,
- expansive and challenging soil conditions.



Water Vapor can readily pass through most building materials, and it is recognized today as being one of the most destructive of the forces that attack the modern home or building. It is a more severe problem today than ever before because of the many ways in which modern construction successfully lowers heat transfer through walls, doors, windows and roofs. Since we have thus made it harder for water vapor to escape from our modern homes and buildings, it has become correspondingly important that we take steps to prevent it from entering.

# THE SOLUTION TO THE PROBLEM



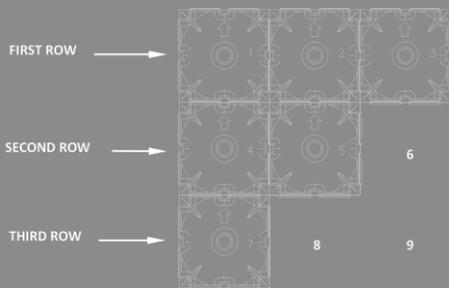
- Provides an excellent moisture barrier under slab void that can be vented in soil with high water content;
- Water cannot leach up through the bottom of the concrete slab significantly protecting the structure from water damage;
- Moisture cannot wick through the concrete by Maintaining the top and bottom of the concrete floor slab dry which cannot contributes to the growth of mold and mildew under flooring overlays and damage to expensive architectural flooring finishes, floor tiles or carpets;
- Ventilating the CUPOLEX® under slab void space will effectively help control Vapor Intrusion, humidity levels, and temperature ranges, which standard slabs cannot control and have been linked to human health, learning, and productivity;
- Replaces fill or gravel that typically is required to bring the slab to level and eliminates the costs associated with importing, compacting, certifying engineered fill and reduces any risk with post construction settlement of the underlying subbase;
- Longer spans can be achieved in pile/beam structural slabs than flat standard slabs;
- Assisting designers to deliver Sustainable features which contribute to GREEN or LEED certified building;
- Maximum control of concrete curing resulting in reduction of slab curling, shrinkage cracks thus providing a higher quality surface;
- Provides under-slab space for running cables, conduits and pipes, simplifying post-construction installation of new wiring and utilities;
- Can provide special CUPOLEX® slab designs on soils with very low bearing capacity, high compressibility, or highly expansive soils.

## ASSEMBLY

CUPOLEX® provides Excellent Flexibility in Working with new construction or remodeled building layouts. The main characteristics of the forming system are speed and simplicity, with maximum benefits being realized when the CUPOLEX® system is engineered during the early design stages in assessing site and soil conditions, considering elevations of various sections of the slab area that may have to be raised or for example if strip footings, walls or other typically formed sections can be incorporated within the system, cost savings and environmental benefits can be realized.

**On average two laborers set 140 m<sup>2</sup>/hr (1500 sf/hr)**

- Layout complies with a grid system
- Each CUPOLEX® Form has an installation arrow
- Forms are installed by starting from left to right and top to bottom
- Ensure that the feet connection pins are correctly inserted into their holes
- Pouring and finishing of the concrete slab in the conventional manner



CUPOLEX® is a unique forming system for the construction of slab-on-ground Aerated Floors. Over the past two decades the idea of pouring concrete over CUPOLEX® permanent void forms has become an increasingly popular slab foundation method.

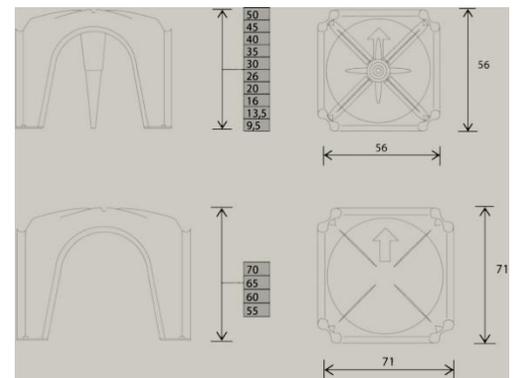
Both slab on grade and structural slabs can be created using this formwork. Besides these advantages, there are significant cost savings to the builder and owner by using the CUPOLEX® flooring formwork in the design of Aerated concrete slabs for Residential, Industrial, Commercial and Institutional applications in sites with challenging soil conditions.

Made from 100% recycled materials, the forms provide the maximum performance and guarantee superior characteristics of stability and resistance in its structure to allow operations that are completed directly above the plastic CUPOLEX® elements before the placement of the concrete.

CUPOLEX® Technical department will provide a full scheme detailing all necessary components, and the optimum height of forms to be used.

## CUPOLEX® FORM HEIGHTS

CUPOLEX® forms are available in various heights to suit any site conditions or design requirements. Made from 100% recycled Polypropylene (PP) plastic, the forms provide the maximum performance and guarantees superior characteristics of stability and resistance in its structure to allow operations that are completed directly above the plastic CUPOLEX® elements before and during the placement of the concrete.



## THE BENEFITS

- Arrives on site packaged and ready to be installed
- Quick and simple to install with basic hand tools
- Can be easily adapted to site variations
- Minimizes concrete wastage
- made out of 100% non-toxic recyclable material which can contribute to GREEN or LEED certified building
- One pallet of CUPOLEX replaces 7.5 trucks of gravel or fill
- Minimizes construction traffic damage
- Manufactured to ISO 9001:2000 high quality standards
- A full range of accessories and field support ensures secure construction

# OVERVIEW OF APPLICATIONS



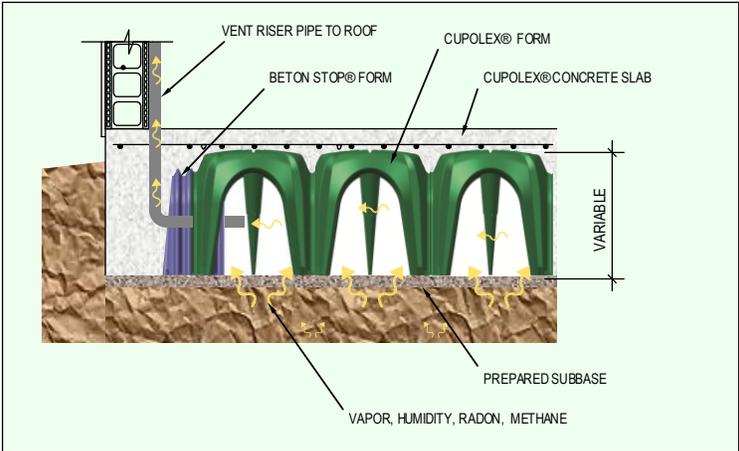
## STANDARD SLAB ON GRADE

### Monolithic Poured CUPOLEX® Slab on Grade

Typically a 250mm (10") or a 300mm (12" ) thick monolithic poured CUPOLEX® floor slab is used for a standard floor such as residential or light commercial using CUPOLEX® H.20mm (8") Forms and H.26mm(10") forms and the corresponding accessory BETON STOP®.

A layer of 6x6 W2.9/2.9 welded wire mesh for crack control is used in the topping throughout the slab. Additional reinforcing is used where increased load capacity is required such as garage areas or heavy loaded floors.

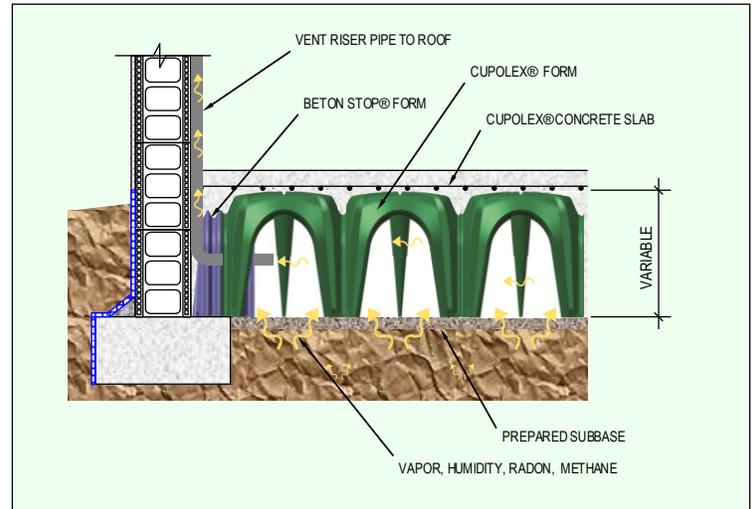
Where top soil layers are thick, higher CUPOLEX® can be used to create a deeper slab. This replaces the fill or gravel that typically is required to bring the slab to level and eliminate the costs associated with importing, compacting and certifying engineered fill.



## Conventional CUPOLEX<sup>®</sup> Slab on Grade

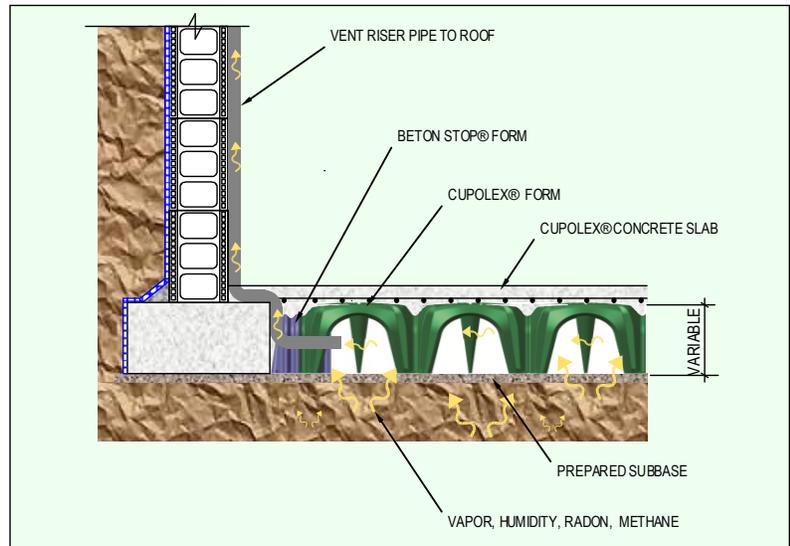
### Compacted fill Replacement, Floating Slabs or Crawspaces

CUPOLEX<sup>®</sup> domes can be placed between foundation walls to replace the compacted fill or gravel. The CUPOLEX<sup>®</sup> units can be installed flush against the foundation wall with using BETON STOP<sup>®</sup>. On sloping sites various heights CUPOLEX<sup>®</sup> from 135 mm (5") to 70cm (28") high can be used, stepping down the site to form a level upper surface. The CUPOLEX<sup>®</sup> slabs can also be stacked if finished floor elevations are required to be higher or the CUPOLEX<sup>®</sup> RIALTO can be used to achieve floor height up to 2.00m. (78").



## CUPOLEX<sup>®</sup> Basement Slabs

CUPOLEX<sup>®</sup> domes can be placed between basement footings to replace the gravel and perform as a venting and draining layer. The CUPOLEX<sup>®</sup> units can be installed flush against the footings without using BETON STOP<sup>®</sup>. The footings and slab can also be monolithically poured by using the BETON STOP<sup>®</sup>.



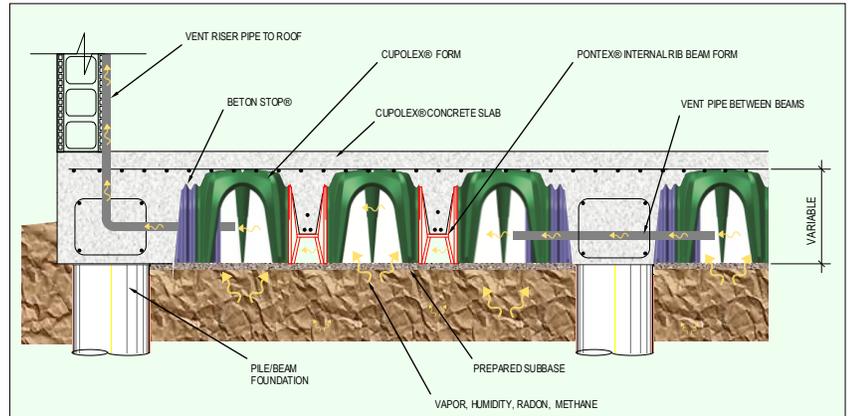


# STRUCTURAL SLAB ON GRADE

## Structural Slab

**Fully Suspended Floor Slab on beam/pile or stem wall foundations and Structural Ribbed Slab** - Reasons for a structural CUPOLEX® floor slab may include:

- Unsuitable ground conditions ( very low bearing pressures) or expansive soils
- Bridging over public storm water and sewer lines
- Slope stability issues



The CUPOLEX® floor slab can be fully suspended on reinforced concrete piles. Additional reinforced internal ribs are used in the slab by introducing PONTTEX®, the structural CUPOLEX® accessory to provide a structure capable of spanning between stem walls or piles. Very little additional work or material is required to provide a structural floor slab system and in many cases exterior footing reinforcement remains unchanged. As with all slabs, each structural CUPOLEX® floor is specifically designed to suit site conditions and pile numbers may be optimized to limit additional costs. Contact our technical department for specific design calculations, drawings and details.



# INDUSTRIAL & COMMERCIAL FLOORS



## Industrial and Commercial Floor Slab

CUPOLEX® can be specifically designed for industrial floors and can very high industrial type distributed or concentrated racking loads can be accommodated with thicknesses ranging from 100mm (4 ") to 150mm (6") over the CUPOLEX® elements.

In industrial applications, the reinforcing cages, pad foundations, load bearing wall lines can be fixed into place first. The CUPOLEX® can then be used between load bearing lines to act as hard fill and to bring the slab up to the required elevation. Thickened slab areas and the floor slab can be poured in one operation.



## Post Loads and Concentrated Loads

Concrete bearing and shear stresses for CUPOLEX® slabs are computed using Design Methods to see whether the stresses are within allowable limits. But for very heavy posts, the required thickness of CUPOLEX® concrete slabs may be great enough that alternative designs should be considered, such as:

- Integral or separate footings under each post or line of posts (post locations would have to be permanently fixed) and formed with BETON STOP®;
- Structurally reinforced CUPOLEX® slabs with steel designed to take the tensile stresses;
- One or more PONTEX® elements added in areas subject to greater loads or exceptional stress;
- Use of a cement-treated subbase under the CUPOLEX® concrete slab.

# DESIGN & ENGINEERING

CUPOLEX® provides free of charge Finite Element Analysis (FEA) calculations. The CUPOLEX® FEA Programs use the schematizations "Plate Model" according to cap. 4 and 5. This numerical schematization is suitable for design purposes and supplies an adequate level of representation of the interaction of the CUPOLEX® floors with the ground. The research and testing documents, available in our Technical Library, prove the validity of the numerical model for design purposes. Contact our technical department for more information on the CUPOLEX® software programs.

The following variables are considered by the CUPOLEX® FEA Programs

- Type of CUPOLEX®
- Thickness of slab
- Levels of reinforcement
- Type of soil & subgrade

The static behavior of the CUPOLEX® concrete floor depends on the following factors:

1) Geometry:

- Dome geometry
- Minimum thickness of the slab above the CUPOLEX® elements

2) Type of soil or subbase

- Position of loads on the CUPOLEX® slab
- Beam grid model (fig.1)
- Plate model (fig.2)
- 3D model (fig.3)

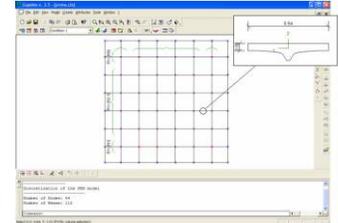


FIG.1

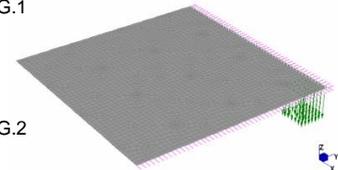


FIG.2

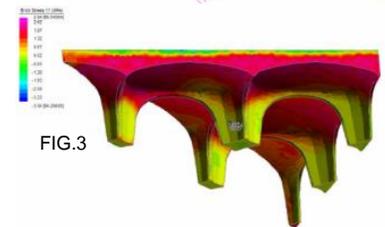


FIG.3

Also a non-uniform contact with the soil is taken into account (for example different yielding)



We provide PE stamped shop drawings through our engineering partners globally, construction training, and installation observation and we work closely with the design team, the contractor, and the owner to ensure the success of the project. Each site is different, and working with project partners to find installation solutions that address specific site needs is a part of the service we provide.

To begin using the CUPOLEX® for your project, visit our Solutions page at [www.cupolex.ca](http://www.cupolex.ca) for a step-by-step road map on using this product.

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