



## THE CUPOLEX® SOLUTION



EXPANSIVE  
SOILS



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

PONTAROLO®  
ENGINEERING 



## EXPANSIVE SOILS – IDENTIFYING THE PROBLEM

The problem of “expansive soils” is well known to engineers and builders. It affects construction sites throughout the US and Canada and other areas of the globe, and particularly those in the desert, Rocky Mountain and the mid-continent regions.

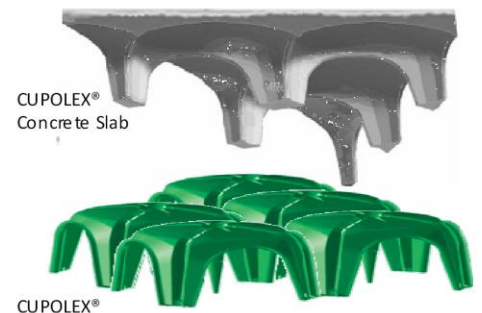
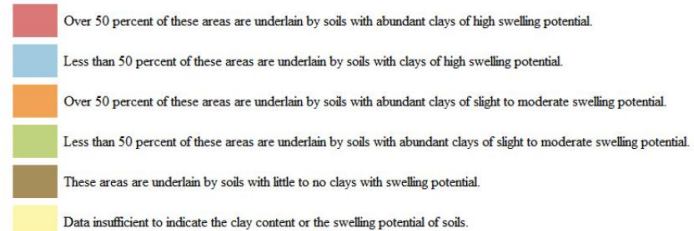
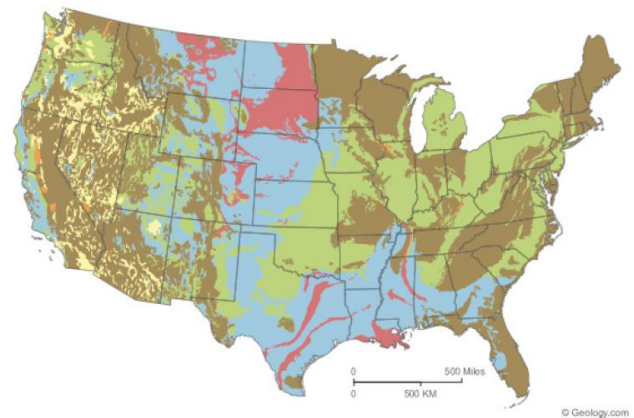
Whether the cause is ‘clay heave’ from naturally occurring shrinkable or swelling clay soils, expansive shale or overburden recovery associated with excavation, if the movement is restrained the lateral and uplift forces produced are massive.

To avoid the buildup of these potentially damaging forces, slabs and foundations must be designed to accommodate any ground movement that is anticipated.

## THE CUPOLEX® SOLUTION

CUPOLEX® is a patented concrete forming system made from 100% recycled plastic. Concrete is placed over the modular dome forms to create floating or structural slabs with an under slab void that results in minimal concrete contact with the soil, provides a capillary barrier against moisture - yet uses less concrete and rebar than a standard slab with equivalent load bearing capacity. The unique patented concrete geometry which Cupolex forms minimizes the contact area on the soil which does not restrain the potential swelling of soils beneath the slab. The minimal concrete in contact greatly reduces the lateral and uplift forces that are produced compared to a conventional slab bearing on the soil throughout the total slab area. The Cupolex slab in contact with the soil ranges from 4% to 10% of the total slab area creating a space into which soil can expand without causing damage.

Cupolex slabs do not restrain uplift forces and furthermore the dead loads of the concrete slab usually are greater than the uplift forces from the soil resulting in protection of the structure. In extreme swelling soil conditions, suspended self-bearing Cupolex slabs would be constructed.



## FEATURES

- Quick and simple to install
- Minimizes the need for skilled labor
- Supplied on short lead times
- Tailored to any type of site requirements
- Saves aggregate, concrete and steel
- Speeds construction
- Lowering building costs
- Reducing the cycle time of building
- Maximum control of concrete curing
- Providing a higher quality floor surface;
- Solution for Structural Weight Limits
- Contributing to GREEN or LEED certified building

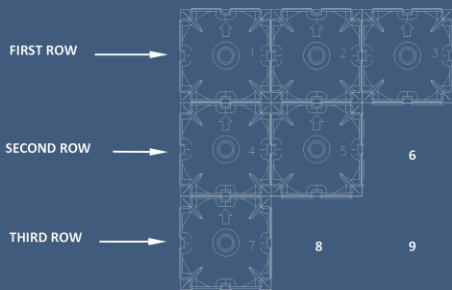


## ASSEMBLY

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



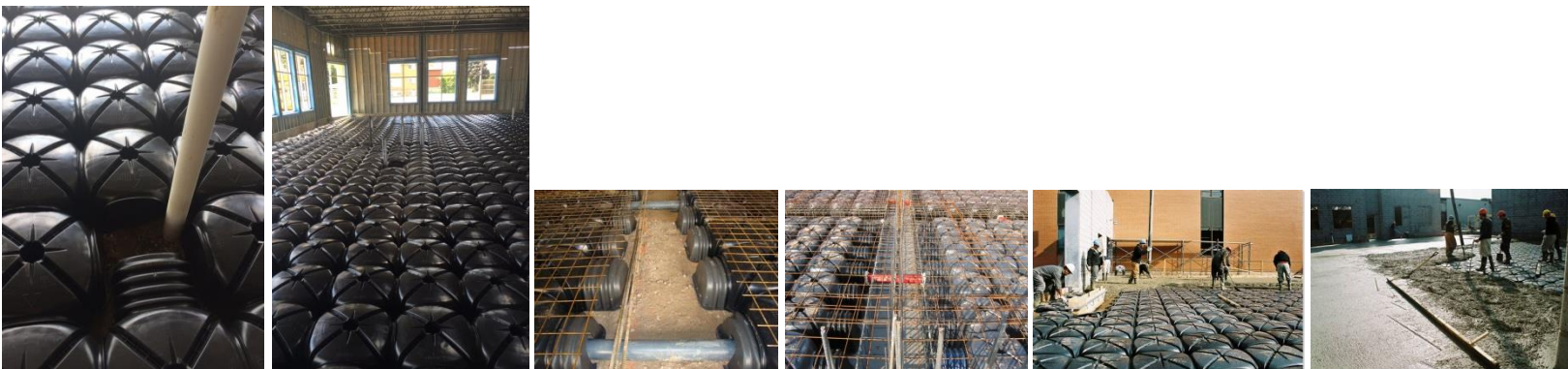
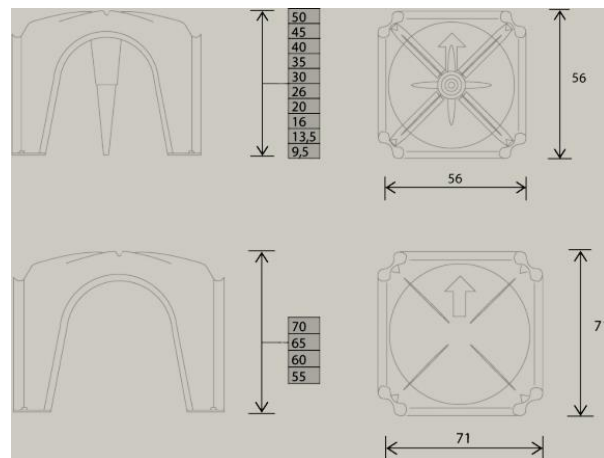
## THE CUPOLEX® ELEMENTS

CUPOLEX® Plastic Dome Concrete Forms are stay-in-place forms to create unreinforced or reinforced concrete slabs on grade and other concrete structures. Concrete is poured over the modular dome forms to create floating or structural slabs on grade. The unique concrete geometry Cupolex creates, forms an under slab void that can be vented to remove moisture and soil gases or provide solutions for various sustainable construction applications - uses less concrete and reinforcing than a standard slab with equivalent load bearing capacity.

CUPOLEX® Patented Forms have unique connecting features. Only, CUPOLEX® forms additional built-in plastic at all pressure point locations and a central reinforced cone support of equal height to the element and positioned in correspondence of the central region, guarantees the absorption of vibrations which occurs during the finishing of the concrete Aerated floor slab.

## 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.



# HOW CUPOLEX® FLOORS PROTECT BUILDINGS FROM EXPANSIVE SOILS

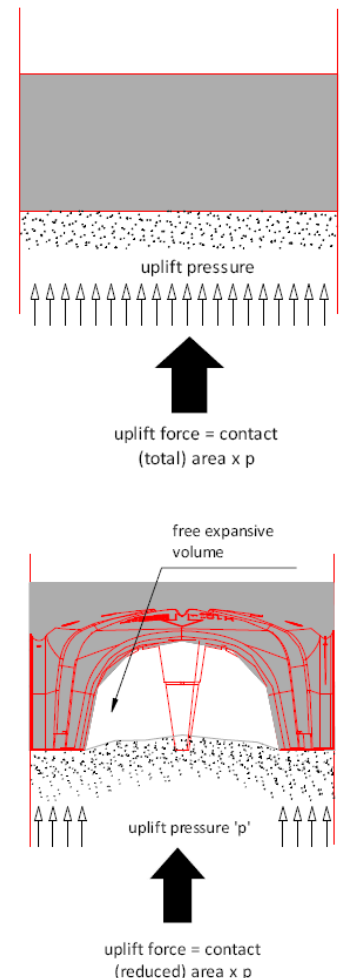
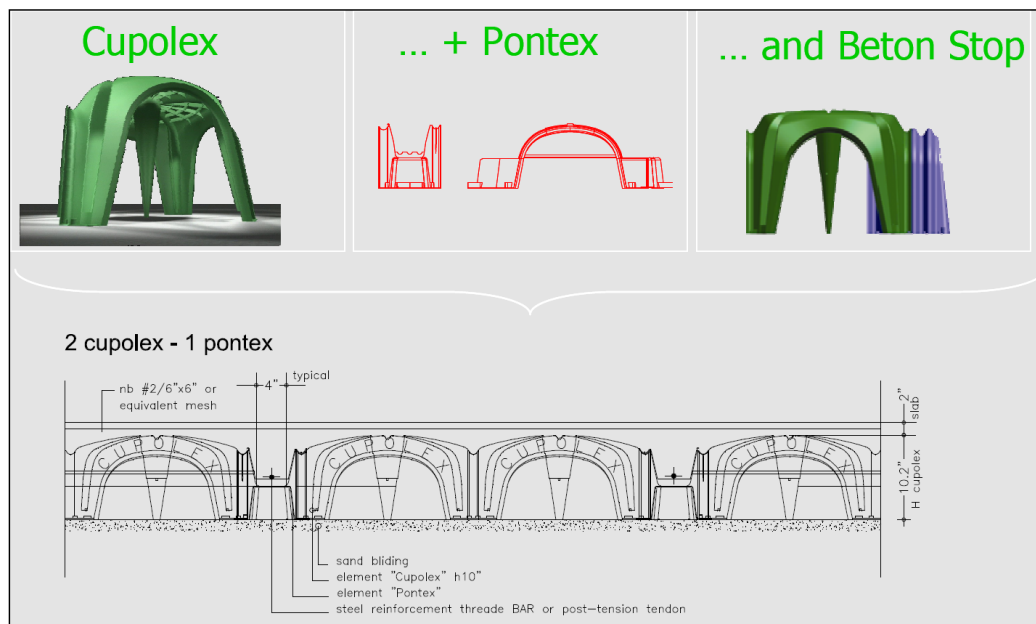
CUPOLEX® is designed to support the weight of any given thickness of concrete plus any common work loading required for placing the concrete slab, during the entire curing period. Unlike other old fashioned void forming systems like cartons or polystyrene, there are no safe load requirements to meet. The only restriction is direct truck loading until the concrete has reached design strength.

When ground movement or expansion occurs, old fashioned systems will compress and buckle when a pre-determined load is reached. Other old fashioned systems gradually absorb ground moisture and lose its strength after the concrete has set, creating a space into which soil can expand. Unlike other anti-heave products, CUPOLEX® does not rely on material degradation or buckling for the system to become effective. Once the CUPOLEX® forms are interlocked together without requiring any sealing of the joints or protective boards installed above, the surface is ready to receive the reinforcement and the concrete.

The materials used are inert and non-toxic. CUPOLEX® is unaffected by water, snow or ice so, in wet weather or when foundations are below the water table, work can continue without reducing its effectiveness. On sites where water pressure is a potential problem or the water table is expected to rise, CUPOLEX® can also provide a cost-effective solution to deal with these circumstances.

## ASSEMBLY OF FORMS

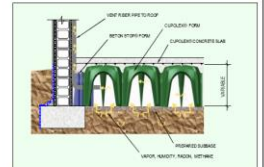
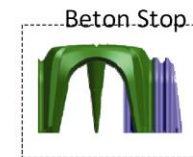
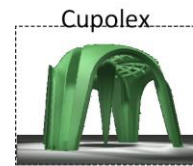
Each unit easily inter-connects to create a self-supporting structure which acts as a permanent form work, replacing gravel, hard fill and provides under slab voids for venting. PONTEX® is an innovative structural element that, combined with CUPOLEX®, can be used to create a one directional or a two directional structural ribbed slab. In order to prevent any voids BETON STOP® provides continuous closures.





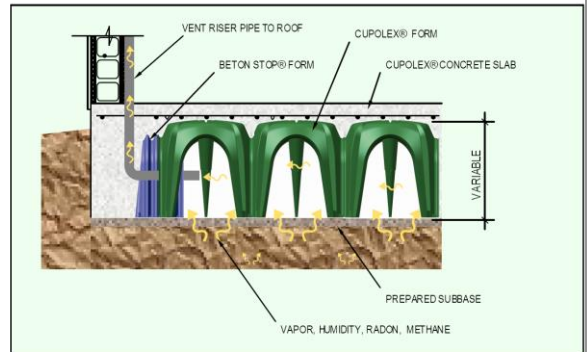
## SITES WITH LOW EXPANSIVE TO NO EXPANSIVE SOIL CONDITIONS

On sites with low expansive to no expansive soil conditions, Cupolex and Beton Stop units are used to design both standard floor slabs and conventional floor slabs. A 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. The wire mesh when placed directly on the Cupolex forms is positioned exactly at the elevation required with no need to be lifted up into place. Where top soil layers are thick, higher CUPOLEX® can be used to create a deeper void in the 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. Venting the under slab will reduce humidity levels that assists in controlling the saturation of the underlying soils that lead to swelling of the subbase.



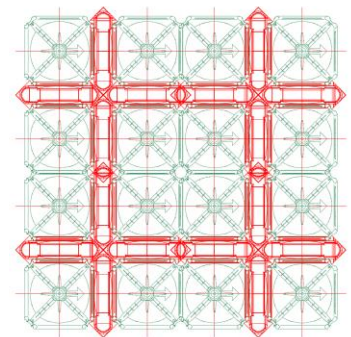
## SITES WITH LOW TO MODERATE LEVELS OF SOIL EXPANSION

Sites with low to moderate levels of soil expansion usually require a standard reinforced or more commonly used today in the South & Mid-West areas, a Post Tension reinforced monolithic, poured slab foundation on grade. Concrete verifications for Cupolex slabs are performed according to national and local standards by using reinforcement threaded bars or post-tensioning tendons. Cupolex forms are installed between edge beams and Beton Stop provides continuous closures to the side opening of the Cupolex forms. The slab and foundation is designed to resist moisture-induced deformations in the soil maintaining the top surface within permissible tolerance. The Engineer designs appropriate protection measures to ensure the long term integrity of the foundations and uses Cupolex to provide protection of the ground floor slabs from being effected from potential soil expansion. Passive or active venting is recommended under Cupolex slabs.



## SITES WITH HIGH TO CRITICAL AND HYDROCOLAPSIBLE EXPANSIVE SOILS

Sites consisting of these types of challenging soils often require very rigid slab designs with appropriate protection measures due to the seriousness structural harm these types of soils can deliver. Cupolex and Pontex units are used to provide a forming system to construct a ribbed slab on grade mat foundation. Beton Stop units are used to form the perimeter and any interior beams. Cupolex with Pontex provides a self-supporting structure to form a ribbed foundation system. Cupolex are used to reduce the slab-soil contact area, provide a lighter but stiffer slab than a traditional trenched ribbed slab and have high punching resistance from arch dome engineering principles. Concrete verifications are performed according to national and local standards by using reinforcement threaded bars or post-tensioning tendons. Passive or active venting is recommended under Cupolex slabs.



## ANCILLARY PRODUCTS

Traditional old fashioned void forming systems for in-situ ground slabs and beams are increasingly being replaced by CUPOLEX® a quicker and less labor intensive alternative. A trend that is encouraged by the emphasis on fast track build programs, lowering construction costs and a shortage of skilled tradesmen. Reacting to this trend, CUPOLEX® has developed a complete design and supply service for an extensive range of slab formwork systems.

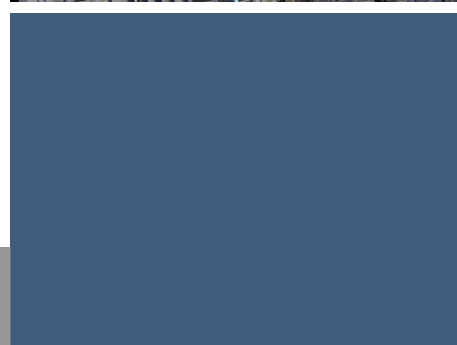
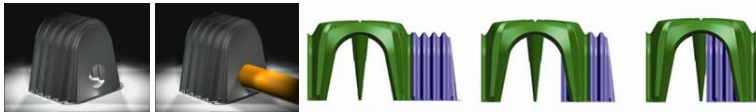
CUPOLEX® is assembled with two ancillary products called PONTEX® and BETON STOP®. All three products are patented, manufactured from recycled non-toxic plastic and they all reflect Cupolex Building Systems' commitment to quality.

- Quick and simple to install
- Minimizes the need for skilled labor
- Supplied on short lead times
- Tailored to any type of site requirements
- Saves aggregate, concrete and steel
- Speeds construction and saves money

**PONTEX®** - The PONTEX® element combined with CUPOLEX® used to create beams or as stiffening ribs for structural concrete slabs & pavements.



**BETON STOP®** - The BETON STOP® element for closing the side openings of the CUPOLEX® forms.



## DESIGN & ENGINEERING



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 expansive soil conditions at your site, visit our Solutions page at [www.cupolex.ca](http://www.cupolex.ca) for a step-by-step road map on using this product.

**PONTAROLO**  
**ENGINEERING**

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