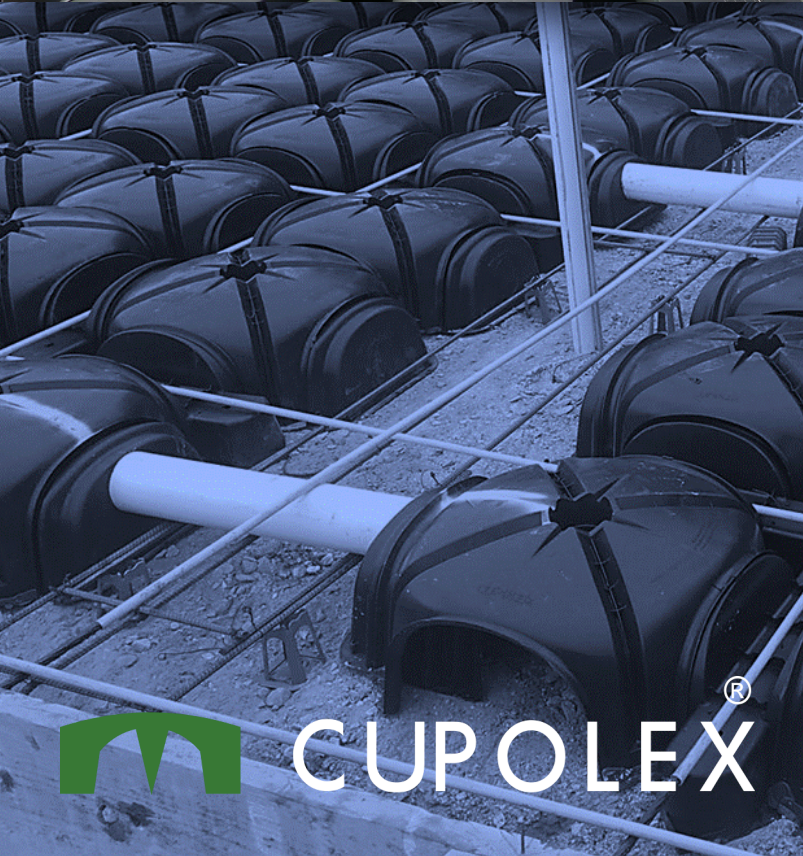




ENGINEERED STRUCTURAL POST-TENSIONED SLAB-ON-GRADE



Expansive Soils
Low-bearing Soils
Monolithic Slabs



CUPOLEX[®]

Design Solutions for Expansive Soils

The problem of “expansive soils” is well known to engineers and builders. It affects construction sites in many sites around the world, and particularly those in the desert, Rocky Mountain and the mid-continent Regions in NA. To avoid the build-up of these potentially damaging forces, slabs and foundations must be designed to accommodate any ground movement that is anticipated.

Sites consisting of these types of challenging soils often require very rigid slab designs with appropriate protection measures due to the structural harm these types of soils can deliver.

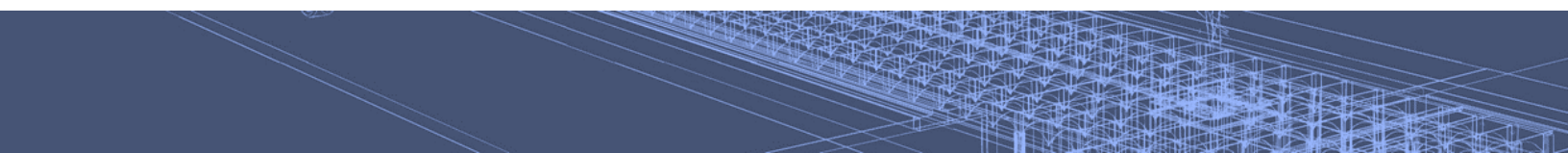
A Quicker and Less Labour-Intensive Engineered Design

Traditional old fashioned void forming systems for in-situ ground slabs and beams used on expansive soil sites are increasingly being replaced by CUPOLEX®, a quicker and less labour intensive alternative – a trend that is encouraged by the emphasis on fast track building programs. Reacting to this trend, CUPOLEX® has developed a complete design and supply service for an extensive range of slab formwork systems that can be designed for sites with:

- Low levels of expansive soils
- Moderate to high levels of expansive soils
- Critical and hydro collapsible soils
- Low bearing and expansive soils
- Post-tensioned slabs
- Monolithic slabs

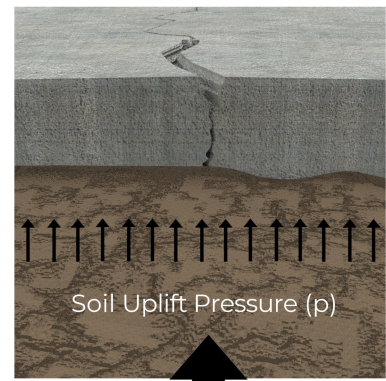
Design Solutions for Expansive Soils

CUPOLEX® with its ancillary concrete form PONTEX® provides a self-supporting structure to form a ribbed slab foundation system. A one-way or two-way stiffened joist is designed as a ribbed slab-on-grade mat foundation with integrated perimeter and interior grade beams or drop panels. CUPOLEX® engineered slab foundations 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 concrete dome engineering principles. Concrete verifications are performed according to national and local standards by using conventional reinforcing bars or post-tensioning tendons.

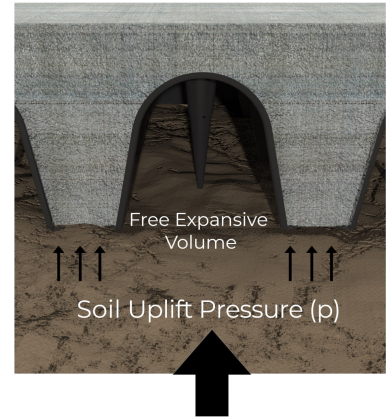


FEATURES

- The structural design using the modular CUPOLEX® dome forms 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, engineered suspended self-bearing CUPOLEX® slab foundations would be designed and constructed.
- Structural Design conforms to both International Building Code (IBC) and Post Tension Institute (PTI) specifications.



$$\text{Uplift Force} = \text{Contact Area} \times p$$



$$\text{Uplift Force} = \text{Reduced Contact Area} \times p$$

CUPOLEX® slabs foundations can be designed to accommodate any ground movement that is anticipated.

ADVANTAGES

- No presoaking of the pad is necessary.
- A post-tensioned or rebar reinforced concrete slab can be designed.
- Forms integrate concrete beams running throughout the footprint and perimeter.
- The completed CUPOLEX® engineered slab foundation design is supported by the subgrade like a raft foundation slab.
- Less contact area with the underlying soils and the voids formed by CUPOLEX® absorb heaving soils and eliminate significant structural cracking.
- Less contact area means less uplift pressure on the slab when soils heave.
- A CUPOLEX® ribbed slab foundation uses less concrete and steel and reduces excavation of soils and fill export when compared to conventional earth formed waffle slab designed systems.
- CUPOLEX® ribbed slab foundations reduce soils prep, materials, and building cycle time and often provide cost savings of up to 20% when compared to other foundation systems.
- Contributing to GREEN or LEED certified building





Protecting Foundations from Potentially Damaging Forces

We identify areas where contemporary slabs and foundations call for improved designs to accommodate for ground movement

The CUPOLEX® system is a proprietary patented plastic concrete forming system manufactured by Pontarolo Engineering Inc. The concrete structures are part of a design package provided by CUPOLEX®. CUPOLEX® engineers design the concrete slabs and foundations by sustainably engineering the geometry of concrete using CUPOLEX® structural dome methodology. On a site-specific basis, CUPOLEX® engineers select the type and size of CUPOLEX® forms necessary to meet the required loading and elevation that will provide the ultimate performance for your project. The forms are supplied to contractors by CUPOLEX® to assemble the formwork and the concrete cast-in-place slabs, as to the design and specifications provided by the CUPOLEX® design engineers.

CUPOLEX® forms are custom made to meet your site-specific requirements such as varying elevation, providing ribbed slabs or post-tensioned slabs, special requirements for delivery and logistics, supporting working-load capabilities and any special impact resistance during installation and placement of the concrete.

CUSTOMIZED DESIGN PACKAGE

- **Value engineering**
CUPOLEX® engineers review each project, provide value engineering, and identify the type and size of CUPOLEX® forms for every project
- **Preliminary drawings**
Design coordination, conceptual designs, sections and details provided to designers
- **Engineered design drawings**
Issued for construction (IFC) and supported with FEA structural calculations, PE stamp, construction documents and specifications
- **CUPOLEX® installation shop drawings**
Issued to contractor with detailed CUPOLEX® formwork installation procedures
- **On-site support**
Construction training and inspections, with completion statements and regulatory compliance reporting where required