Cellolite Blocks™

Cellular Lightweight Foam Concrete

THE ULTIMATE PREMIUM GREEN BUILDING MATERIAL

BUILD WITH CELLOLITE FOAM CONCRETE GO GREEN

Introduction of Foam concrete

Lightweight concrete has extreme importance to the construction industry. Most of current concrete research focuses on high-performance concrete, by which is meant a cost-effective material that satisfies demanding performance requirements, including durability. Lightweight concrete can be defined as a type of concrete which includes an expanding agent in that it increases the volume of the mixture while giving additional qualities such as lessened the dead weight. It is lighter than the conventional concrete. The use of lightweight concrete has been widely spread across countries such as USA, United Kingdom and Sweden.

The other main specialties of lightweight concrete are its low density and thermal conductivity. So its advantages are that there is a reduction of dead load, faster building rates in construction and lower transport and handling costs.

Lightweight concrete maintains its large voids and not forming laitance layers or cement films when placed on the wall. Sufficient water cement ratio is vital to produce adequate cohesion between cement and water. Insufficient water can cause lack of cohesion between particles, thus loss in strength of concrete. Likewise too much water can cause cement to run off aggregates to form laitance layers, subsequently weakens in.

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What is the light weight concrete?

Light weight concrete (foamed concrete) is a versatile material which consists primarily of a cement based mortar mixed with at least 20% of volume air. The material is now being used in an ever increasing number of applications, ranging from one step house casting to low density void fills.

Light weight concrete has a surprisingly long history and was first patented in 1923, mainly for use as an insulation material. Although there is evidence that the Romans used air entertainers to decrease density, this was not really a true Light weight concrete. Significant improvements over the past 20 years in production equipment and better quality surfactants (foaming agents) has enabled the use of foamed concrete on a larger scale.

Lightweight and free flowing, it is a material suitable for a wide range of purposes such as, but not limited to panels and block production, floor and roof screeds, wall casting, complete house casting, sound barrier walls, floating homes, void infill, slope protection, outdoor furniture and many more applications. Not everyone knows that density and compressive strength can be controlled. In the light weight concrete this is done by introducing air through the proprietary foam process which enables one to control density and strength precisely. Normal concrete has a density of 2,400 kg/m3 while densities range from 1,800, 1,700, 1,600 down to 300 kg/m3. Compressive strengths range from up to 40 MPa down to almost zero for the really low densities. Generally it has more than excellent thermal and sound insulating properties, a good fire rating, is non-combustible and features cost savings through construction speed and ease of handling. The technology is the result of over 20 years of R&D, fine tuning the product and researching the possible applications. It is used in over 40 countries worldwide today and has not reached the end of its possible uses. Lightweight concrete is concrete weighing substantially less than that made using gravel or crushed stone aggregates. This loose definition is generally agreed to cover a broad spectrum of concretes ranging in weight from 12 to 120 pounds per cubic foot. Many types of concrete fall within this range; some are cellular concretes made with foam or foaming agents; some are made with lightweight aggregates; and some cellular concretes also contain 5 lightweight aggregates.

Other lightweight concretes may contain some normal weight sand. The compressive strength of these concretes covers an even broader spectrum, with structural lightweights at 6000 psi and higher at one extreme, and cellular fill concretes at 5 psi at the other extreme Lightweight aggregate concrete is usually chosen for structural purposes where its use will lead to a lower overall cost of structure than would be expected with normal weight concrete. The generally higher unit cost of lightweight structural concrete is offset by reduced dead loads and lower foundation costs. There may be a special advantage when existing structures are being altered or expanded.

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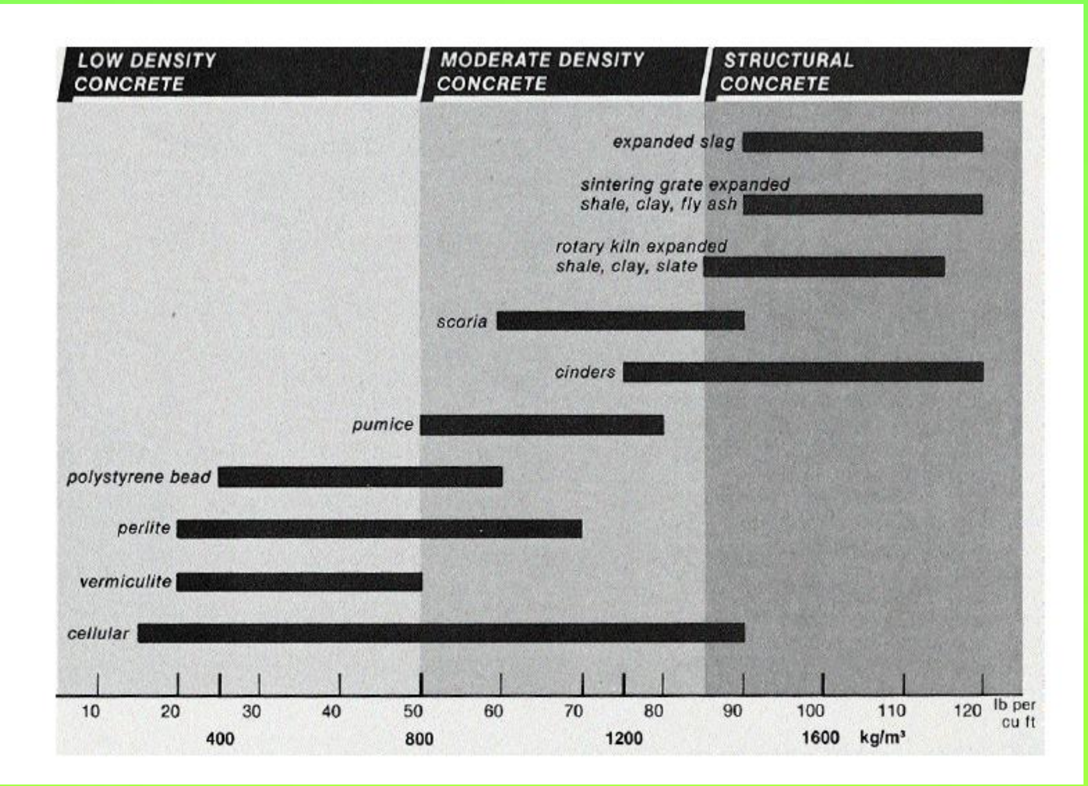


Compressive strength

Lightweight aggregate particle strength varies with type and source of aggregate, and there is no reliable correlation between aggregate strength and concrete strength. All aggregates have strength ceilings, that is, a maximum strength attainable with a reasonable quantity of cement. The compressive strength of lightweight aggregate concrete is usually related to the cement content at a given slump, rather than to the water/cement ratio. In some cases, compressive strength can be increased by replacing part of the fine lightweight aggregate with good quality natural sand.

What is the difference between Lightweight concrete and Aerated Concrete?

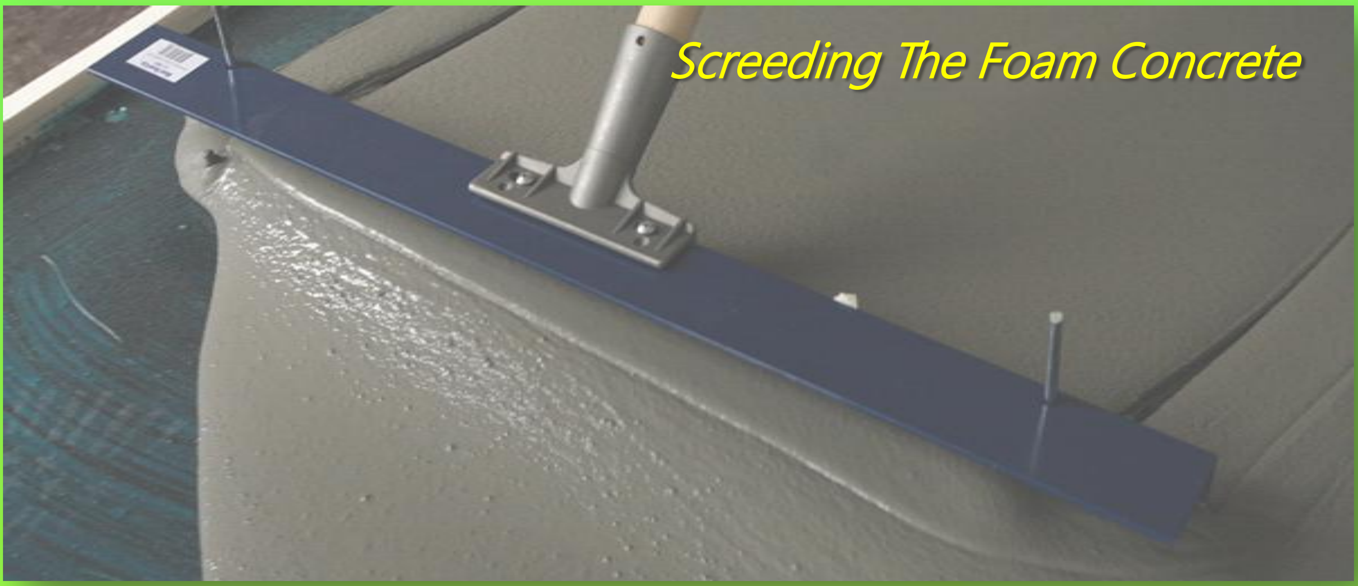
There is confusion between gas and aerated concrete. In aerated concrete the bubbles are formed chemically with the reaction of aluminum powder with calcium hydro oxide and other alkaline compounds. Aerated concrete is a mixing of an air-entraining agent to concrete. The foam concrete is manufactured with a different technique. The CLC has different properties for various requirements thus it is widely used for building projects around the world. It is also contributing to preventing the air, water and noise pollution. This CLC brick has both properties and profitable and its fire-resistance makes it more preferable as construction material by builders and architects.

Foamed Concrete (also known as cellular lightweight concrete, CLC or Aircrete) is a lightweight, free flowing, cementitious material which is ideal for a wide range of applications in the building and construction industry.

In fact, Foamed Concrete is not a single product but a vast range of products which vary according to their precise make up and their strength and density properties.

It can, therefore, be tailored for optimum performance and minimum cost by choice of a suitable mix design for each end use.

By choosing a suitable mix design, foamed concrete can be made with a range of dry densities, from 400 kg/m3 to 1600 kg/m3 and a range of compressive strengths, 1 N/mm2 to 15 N/mm2.

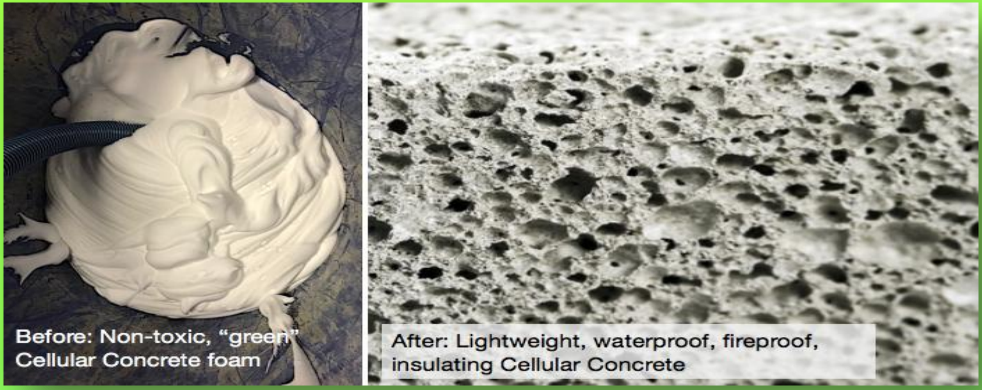


What is foamed concrete used for?

Foamed Concrete can be used for a wide variety of applications within the building and construction industry. By varying the mix design used to make it, its properties can be adjusted specifically for each job or contract. Applications Include:

- **Panels and Blocks for Walls**
- **Planned and Emergency Void Filling.**
- **Roofing Insulation**
- **Leveling Floors**
- **Road Sub-Bases and maintenance**
- **Bridge Abutments and Repairs**
- **Trench Reinstatement**
- **Insulating Underground Hot Water Pipes.**
- **Land Reclamation**
- **Ground Stabilization**

and many Other Uses.



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Advantages Of Foam Concrete

➢Weathering Resistance

Outdoor exposure and accelerated weathering tests have shown that Cellolite foam concrete offers good resistance to wide extremes of weather.

➢Sound Absorption

The coefficient of sound absorption of un-plastered foam concrete of 800 kg/m³ density is approximately 0.35, which is similar to that of acoustic plaster.

➢Fire Resistance

Cellolite foam concrete is an inorganic material and therefore incombustible. Tests carried out in several countries, including tests to ASTM standards, show that a load bearing foam concrete slab wall, 15 cm thick, has a fire resistance exceeding 7 hours.

➢Frost Resistance

Cellolite foam concrete with moisture content of up to 35 percent by weight is frost resistant. Tests have shown that 450 freeze-thaw cycles at this moisture content will cause no damage to the material. Above this moisture content frost damage can occur, but in all normal applications these high moisture contents will not be approached.

➢Water absorption

Due to the cellular structure of foam concrete water absorption of this material is much less than normal dense concrete.

Foam Concrete Offers Many Other Benefits:

- It reduces the dead load of a structure.
- it can be manufactured to precise specifications of strength and density.
- it needs minimum handling.
- it reduces the transport cost.
- it has excellent workability.
  can be nailed, planed, drilled,
  sawn using conventional tools.
- it is flow able and easy to place and finish.
- it can be produced in large volume very quickly (in factories as well as on building sites).
- it provides excellent insulation against heat/cold and sound.
- it will take all traditional surface finishes – paint, tiles, bituminous membranes, carpet etc.
- it is an ideal floor topping to facilitate access to service insulation.
- it is ideal for roof screed and/or floor screed, where insulating, lightweight and mechanical strength is desirable.
- it is vermin and rot proof.
- it is resistant to moisture.
- it is fire resistant.
- it is frost resistant.

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What are the advantages of foamed concrete?

It can be placed easily, by pumping if necessary and does not require compaction or leveling. It has excellent water and frost resistance and provides a high level of both sound and thermal insulation. Foamed concrete is very stable and lightweight, and will not sink into soft ground or impose undue loading on roofs and other structures.

It is very versatile and since it has a huge range of dry densities and strengths, it can be tailored for optimum performance and minimum cost by choice of a suitable mix design. Different mix designs have different quantities of sand, cement, water and foam. Optimizations can be further refined by using different

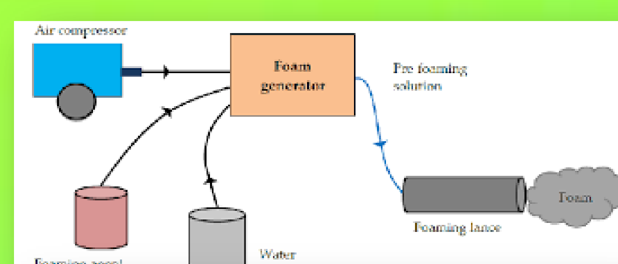
Principal Applications of Foam Concrete

1. Density 300 to 600 kg/m^3,
   Thermal insulation for flat roofing with required gradient
   floor sub-surfaces ,block infill's for sub-floor slabs
   cavity walls filling, general thermal and acoustic insulation
   heat insulating roof slabs

2. Density 600 to 900 kg/m^3,
   Internal partition wall blocks and panels
   roofing slabs
   floor sub-surface for stables, pig sties and poultry farms
   walls, roof and floor sub-surface of large cool rooms
   facade panels
   trench reinstatement

3. Density 900 to 1200 kg/m^3,
   External wall blocks and panels, both structural and non-structural
   general sound proofing in industrial areas.

4. Density 1200 to 1600 kg/m^3,
   Medium weight blocks and slabs,
   large reinforced slabs and panels,
   walls, either precast or poured in situ
   garden ornaments.



Precast foamed concrete block can be used to particular advantage in tall framed building, the reduction of dead load permitting a lighter frame. The low density and fire resistance of CELLOLITE foam concrete make it particularly suitable for the construction of fire resisting walls in old structures which, in many cases, are not strong enough for the erection of walls of dense concrete or clay bricks.

The properties of CELLOLITE Foam Concrete are such that it has a wide field of use.

The use of foam concrete can be seen from these examples:

- ✓ in lightweight insulating bricks, blocks, roof tiles, etc.
- ✓ in building panels and partition walls of various dimensions either pre-cast or poured on site.
- ✓ in all types of insulation work, including cavity walls.
- ✓ in ceiling panels.
- ✓ in sound proofing applications.
- ✓ in pre-cast commercial, industrial and domestic building panels, both internal and external.
- ✓ in pre-cast exterior wall facades for all sizes of building.
- ✓ in panels and sub-surface for stables, to reduce humidity and dampness and to stabilize temperatures.
- ✓ in sub-surface for sport arenas, e.g. tennis courts.
- ✓ in infill sections between beams of suspended floors.
- ✓ in floor screed with rigid or plastic floor covering.

Typical applications that Cellolite have been asked to specify Foam Concrete for can be split into several groups: Pipes, Mass infill, Void fill, ground reinstatement / stabilization, and encapsulation.,

Pipes

- Sewers
- Decommissioned Gas Pipes
- Drainage
- Water Pipes

Mass Infill

Any large volume to surface area ratio, including:

- Large Tunnels
- Mines
- Shafts
- Addits
- Sink Holes
- Dean Holes
- Car parks
- Road Slaps
- Dykes
- Basement Fills
- Vault Fills

Void Fill

- Typical includes closed pours such as olf coal vaults or basement voids where there may already be a partial fill or decaying brickwork.
- Bridge Arches
- Bridge Strengthening
- Caverns
- Headings
- Generally, void infill's require undercuts or obscured voids to be filled and completely purge air our
- where a normal “concrete” would not successfully fill air gaps or cannot be vibrated.

Ground Reinstatement & Stabilization

- Trenches
- Footings
- Embankments
- Sink Holes
- Temporary Works to Make Safe
- Often these applications require the burial of new utilities or have a specification of low mass loading on an area.

Applications

There are a wide range of applications for CLC. The properties of CLC varies depending on its density which makes it even more applicable than regular concrete. A mix with high density , such as 1800kg/m3, CLC is comparable to regular concrete in strength while a mix with low density, 400kg/m3, is weaker but a lot lighter and has very low thermal conductivity. The density is set based on the application

- Complete Houses

  A house consists of, among other things, a floor, walls and roof. These can all be casted with CLC in different densities. The walls has to be insulating and therefore needs a lower density CLC, 1200kg/m³, while the floors has to be strong and there for a higher density, 1800kg/m³. A roof element could be pre-casted and reinforced at a very low density, 400kg/m³, making it highly insulating and lightweight.

- Formwork infill

  CLC is ideal to use in a formwork. Not only because of it being very fluid and fills under window slots but also because of the accessibility the Aercrete foam tech and its hose gives.

- Road foundation

  As roads are subject to heavy use and exposed to bad weather the foundation has a tendency to move and create cracks in the pavement. Aercrete CLC has been tested and proven to be a perfect foundation to minimize cracking and maximizing the lifespan of the pavement.

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- **Small jobs**

No job is to small or to big for the Foam concrete CLC. Mixes on demand, little to no waste is produced no matter the size of the job.

Garden works

- **High insulation needs**

Using a low density CLC is ideal for insulating anything with the need to keep heat or cold. district heat pipes is also a good example of its properties.

Pool works

- **Prefabrication**

To prefabricate elements is often a preferred alternative while building on a large scale. A sandwich prefab wall may consist of outer layers of strong durable concrete while the middle layer is a very low density CLC. This ensures a high quality element with great insulating properties.

- **Floor foundation**

A floor foundation may need both good insulating properties as well as a strong top surface. This can be achieved by casting CLC in two steps. First pour a low density CLC, 600kg/m3, and let it set then cast a high density CLC, 1800kg/m3, as a protective layer on top.

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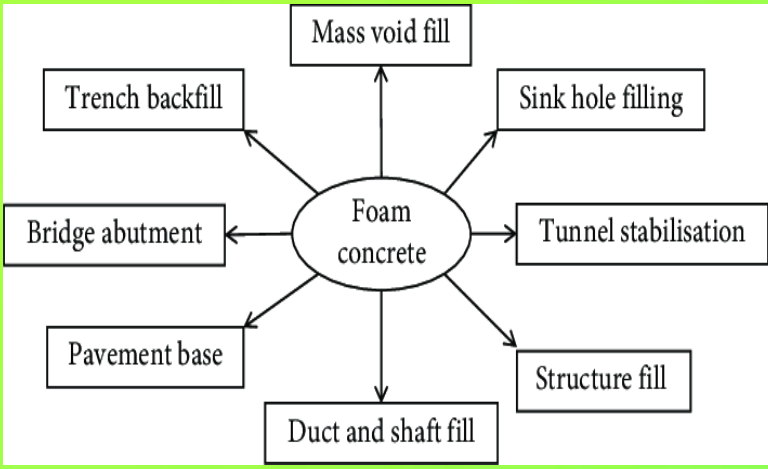
- **Challenging indoor casting**

  Since Foam concrete CLC has less viscosity than regular concrete the Our machine can pump it 200m horizontally or 30m vertically in an easy to maneuver hose.

- **Void filling**

  Due to its low viscosity the CLC is highly suitable for void filling.

Foam



Advantages Of Foam Concrete Roof Insulation

Foam concrete can be applied to roof insulation, floor heating engineering, indoor and outdoor cushions, indoor and outdoor insulation, non-load-bearing walls, new energy-savings bricks, earthquake resistance, sound insulation and other construction projects, in terms of the advantages of roof insulation, because the foamed concrete is high strength insulation material, the compressive strength is 0.25-1.50mpa . According to the engineering requirements, the strength and bulk insulation material made of foamed concrete especially the roofing insulation materials of the upper body, has its unique advantages , which completely solves the advantages of insufficient strength short service life of the previous insulation materials, its water absorption rate is small, and Foam concrete contains a large number of independent bubbles in it and the distribution is uniform and the overall the water permeability of the material is low . its construction fluidity is good because foam concrete has unique liquid and strong foaming ,
strong fluidity, long distance pumping , high working injection capacity , high degree of mechanization , hose pumping , direct long distance pumping .
direct pouring of concrete : more over the construction operation is difficult
and the foamed concrete works on site without occupying other supporting equipment. The construction speed is fast and integrity is good . It is closely combined with the main project, and does not need to leave the gap and vent pipe and has a lower elastic mode. the amount is not easy to cause empty drum cracking using foam concrete made by our foam concrete machine as roof insulation and floor heating material has good effect and it is environmental friendly can be recycle also its cost is very low compared with concrete .more importantly, if you live in the foam concrete house , you will feel warm in winter and cool in summer ,very comfortable.

Foam concrete is extremely fire resistant and well suited to applications where fire is a risk.
Test have shown that in addition to prolonged fire protection, the application of intense heat, such as a high energy flame held close to the surface,
does not cause the concrete to spall or explode as is the case with normal dense weight concrete.

FIRE SAFETY :

Foam concrete produce protect from fire spread and correspond to the first degree of refractoriness, which is proved by tests.
Thus, it is can be used in fire-proof constructions. Under the impact of intensive heat,
like blow lamp, on the surface of foam concrete, it does not split or blow, as it happens with heavy concrete.
AS a result, armature is longer protected from heating. Tests show that foam concrete 150 mm wide can protect from fire for 4 hours.
During tests carried out in Australia, an outer side of a foam concrete panel 150 mm wide was exposed to temperatures up to 1200C.

FOAMED CONCRETE FOR TRENCH REINSTATEMENT

This paper shows how foam concrete provides a better and much easier method for backfilling trenches in roads,
than the conventional method of compacting soil or aggregate layer by layer. Foamed concrete is a free-flowing,
self-compacting, cement-bound material, which can be poured into a trench, left to set for 12 to 15 hours,
then surfaced with a bituminous mix. The strength of foamed concrete depends on its density, initial water/cement ratio,
cement content and size of foam bubbles. For trench reinstatement,
the following properties are recommended for foam concrete:
(1) unconfined compressive strength at 28 days of 4 to 6 MPa;
(2) density of 1200 to 1300 kg per cu m.
Tests have shown that, once foam concrete has hardened,
it is resistant to frost. Foamed concrete with a density of about 1300 can be re- excavated using normal trench digging equipment. The author concludes that foam concrete offers many advantages for trench reinstatement. It is easy to use, self-compacting, capable of re-excavation,
and reduces the dynamic loads transmitted to buried service pipes and cables.
Although it is suitable for any trench width,
it is especially good for narrow trenches of width 150mm or less.


Product Applications
Foam cement roof
CLC foam concrete floor
Foam concrete wall casting
Foam concrete machine worksite

Specifications

Many structural lightweight aggregate suppliers have suggested specifications and mix proportioning information pertaining to their materials, and some offer field control and technical service to ensure that the specified quality of concrete will be used. Usual specifications for structural lightweight call for a minimum compressive strength, maximum slump, maximum weight, and both maximum and minimum values for air content. However, the contractor will also be concerned with properties of the freshly mixed concrete, such as bleeding, workability, and finish ability.

Application of lightweight concrete

The primary use of light weight concrete is to reduce the dead load of the concrete structure, which then allows the structural designer to reduce the size of the column, footing and other load bearing elements. Structural lightweight concrete mixture can be designed to achieve similar strength as normal weight concrete. The same is true for the other mechanical and durability performance requirements. Structural lightweight concrete provides a more efficient strength-to-weight ratio in structural elements. Lightweight Concrete is used when structural concerns require. Lightweight Concrete is ideal for roof deck repairs, stair pan fill, elevated floor slabs or overlays on existing floor decks. It can also be used for appliance platforms, curbs, down spout gutters, balconies, floors, fish ponds, walls, setting posts, castings, steps, or virtually any job that would normally be done with standard weight concrete. Use it where ease in lifting and carrying is important. Lightweight Concrete also offers slower temperature transfer rates than standard weight concrete, resulting in improved insulation factors.

Nowadays with the advancement of technology, lightweight concrete expands its uses, for example, in the form of Cellolite with its outstanding insulating characteristics. It is widely used as loose-fill insulation in masonry construction where it enhances fire ratings, reduces noise transmission, does not rot and termite resistant. It is also used for vessels, roof decks and other applications. The use of high strength, high performance lightweight concrete (HSLWC) can result in longer span lengths and lighter weight girders. Previous research at the Georgia Institute of Technology (Georgia Tech) showed that HSLWC bridge girders can be constructed with 10,000 psi (69 MPa) compressive strength concrete with a very low permeability, while achieving up to a 20% decrease in shipping weight.

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Conclusion

Lightweight aggregate concrete has been shown by test and by performance to behave structurally in much the same manner as normal weight concrete. For properties which differ, the differences are largely those of degree. The designer must consider the benefits of lighter weight and better insulation in relation to the extra cost of the lightweight mix. The builder must recognize the few different requirements relative to transporting, placing, and finishing. Much helpful information is available from producers of lightweight aggregates through their field control and technical service.

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