

INSUPERL LWC

Perlite Lightweight Insulating Concrete

Insuperl LWC is a specially graded lightweight perlite aggregate conforming to ASTM C-332-1989 Group 1, used for the production of lightweight insulating concrete. The chemical composition of Insuperl is listed in Table 1.

Table 1: Analysis

Typical Elemental Analysis	
Silicon	33.8
Aluminum	7.2
Potassium	3.5
Sodium	3.4
Iron	0.6
Calcium	0.6
Magnesium	0.2
Trace	0.2
Oxygen (by difference)	47.5
Net Total	97.0
Bound Water	3.0
Total	100.00

All analyses are shown in elemental form even though the actual forms present are mixed glassy silicates. Free silica may be present in small amounts, characteristics of the particular ore body. More specific information may be obtained from the ore supplier involved.

The grading of Insuperl LWC is given in Table 2.

Table 2: Sieve Analysis

Sieve Size	mm	Weight % Passing
No. 4	4.75	100
No. 8	2.36	85-100
No. 16	1.18	40-85
No. 30	600 μ	20-60
No. 50	300 μ	5-25
No. 100	150 μ	0-10
Dry Loose Weight (kg/m ³)		
Minimum		Maximum
60		150

Applicable Standards/Specifications

- ACI 304.5R-8** - Batching, Mixing and Job Control of Lightweight Concrete
- ASTM C332** - Specification for lightweight aggregate for insulating concrete
- ASTM C495** - Test for compressive strength of lightweight insulating concrete
- ASTM C513** - Securing, preparing and testing specimens from hardened lightweight insulating concrete for compressive strength

Insuperl Lightweight Concrete

When Insuperl LWC is mixed with Portland Cement binder and water with varying proportions, lightweight concrete with densities between 10-50 lbs./cu. ft. can be achieved.

Uses:

Insuperl LWC is used for the following applications:

- Leveling fills
- Perimeter insulation for floor slabs
- Insulating structural floor decks
- Insulating lightweight roofs, used floors
- Encasement of columns
- Insulation under radiant heat pipes
- Insulation of below grade heating and cooling lines

Benefits of Insuperl LWC:

- Lightweight insulating concrete produced using **Insuperl LWC** has excellent fire-resistance properties and provides the most economical, fire-rated systems in both steel deck construction and concrete substrate construction. Results published in the UL “Fire Resistance Directory”.
- Low sound transmission: Built-up roof deck, corrugated metal roof-deck **Insuperl Lightweight Insulation** was tested found to have transmission loss in decibels.

Nine–frequency Average - 40 dB
Sound Transmission Class - 41

The acoustical value are derived by standard test procedures defined by ASTM E90 and interpretation is made using ASTM E-413 for determination of Sound Transmission Class.

- Substrate irregularities are easily corrected with a layer of **Insuperl lightweight concrete**, thus assuring positive slope.
- Lightweight concrete with cement and **Insuperl** at 1:4 mix can be nailed as it achieves moderate compressive strength.

Properties of Insuperl:

Lightweight insulating concrete produced with **Insuperl** for non-load bearing structures can be designed to have up to 20 times or more insulation value than that of structural concrete and varying densities and compressive strengths as listed in Table 3.

Table 3: **Typical Properties of Mix Designs**

Cement / Perlite Ratio by Volume	Cement Kg.	Perlite M3	Water Ltrs.	Air Entraining Agent Ltrs.	Compressive Strength Range Kg/m ³	Typical Oven Dry Density Kg/m ³	Dry Density Range Kg/m ³	Wet Density Range Kg/m ³	Thermal Conductivity W/M°K
1:4	375	1.0	300	4	2400 – 3500	520	550–650	800±25	0.10-0.11
1:5	300	1.0	290	4	1500 – 2300	490	440–550	730±25	0.09-0.10
1:6	250	1.0	270	4	950 – 1400	430	390–450	650±25	0.08-0.09
1:8	188	1.0	270	4	550 - 900	354	320-390	570±25	0.07-0.08

Insuperl / Sand Insulating Concrete

Lightweight insulating concrete made with **Insuperl/sand** is used over structural concrete, corrugated, rib or cellular steel units to reduce the dead weight of the floor deck on all types of buildings. The compressive strength of the **Insuperl/sand** concrete is sufficient to be used as a substrate for a wide range of floor covering, such as tiles, terrazzo wood and carpeting.

Floor fills have been designed with a wide range of densities 960-1600 kg/m³ using various **Insuperl**/sand mix proportions as shown in the following table.

Material Mix Proportions

Cement m ³	Perlite m ³	Sand m ³	Water m ³	Air Entrainment Litres	Typical Air Dry Density Kg/m ³	Compressive Strength Range KPa.	Wet Density When Place Kg/m ³
1	3	2.2	1.51	3.0	1000	5000-6500	1300±50
1	1.1	2.1	1.05	3.0	1400	14000-16000	1700±50

Air Entraining Agent:

In conjunction with **Insuperl**/sand lightweight concrete, Air Entraining Agent supplied by Arabian Vermiculite Industries (AVI) is frequently used and its control on the job site is an important consideration in the final quality of the concrete. In addition to providing increased resistance to freezing and thawing, air entrainment helps to reduce weight of these mixes. More importantly, air entrainment produces some cohesive mix, which improves workability and minimizes segregation of the heavier mortar from the lightweight aggregate. **Generally, with the above mix designs desired slump of 75mm to 150mm can be achieved.**

Measuring, mixing, transporting, and placing operations for lightweight concrete are similar to comparable procedures for normal weight concrete. However, there are certain differences, especially in proportioning and batching procedures, that should be considered to produce a finished product of the highest quality. The weight and absorptive properties of lightweight aggregates are different and should be properly considered. ACI Reports, ACI-304-5R-8 and ACI-221.2 shall be considered for batching methods.

Quality control for plastic lightweights concrete requires special emphasis with regard to yield, aggregate measuring, and batching methods along with the control of water for slump for aggregate absorption.

Curing:

In order to achieve strength through hydration of concrete, the **Insuperl**/sand concrete shall be cured in accordance with good concrete practice. Generally, **Insuperl lightweight concrete** shall be allowed to dry in normal conditions. In tropical, dry conditions, water has to be sprinkled on concrete for adequate duration to have good hydration of the concrete.