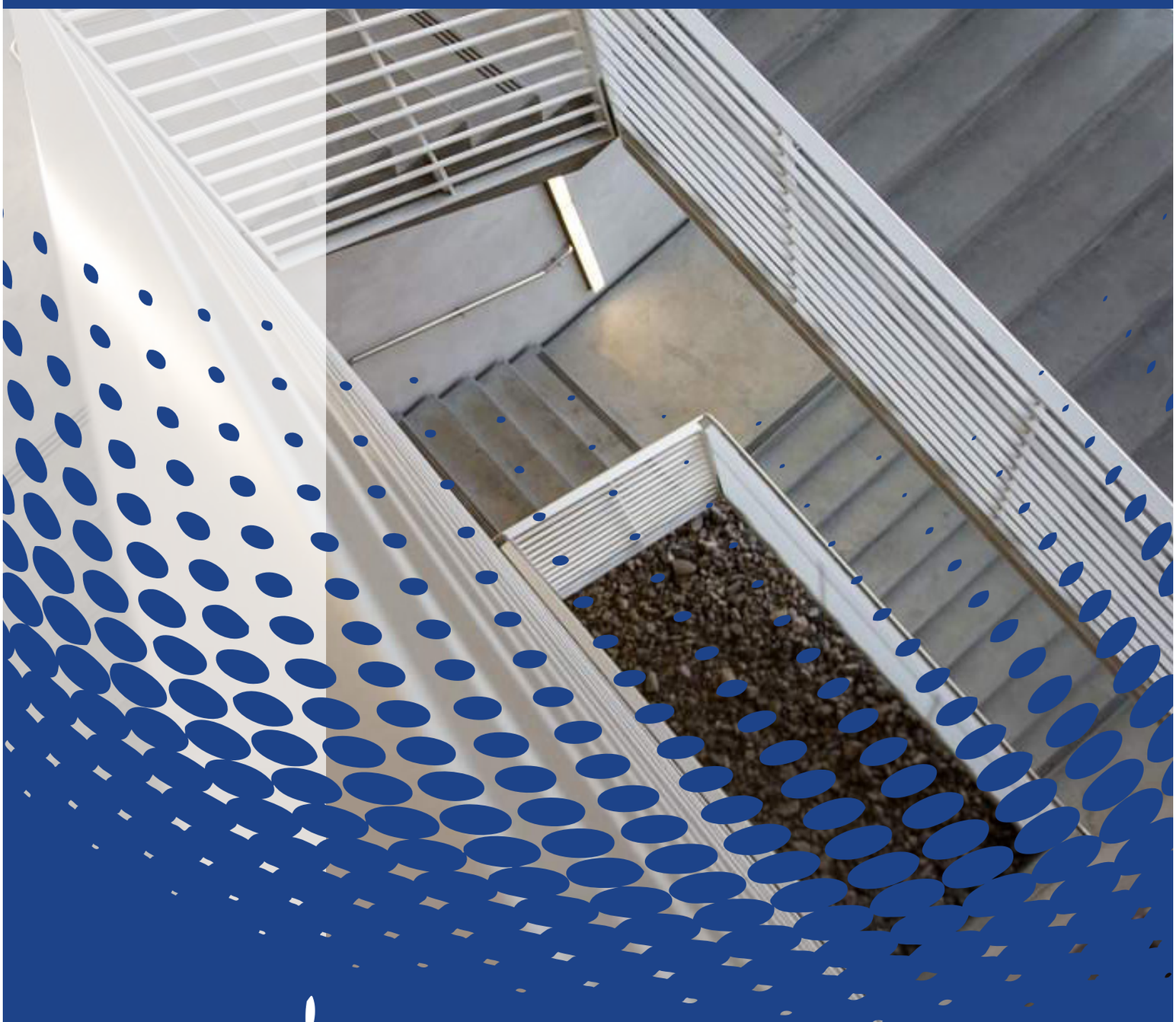
Perlite Construction Applications

Loose Fill Perlite • Perlite Underslab Insulation • Textured Coatings



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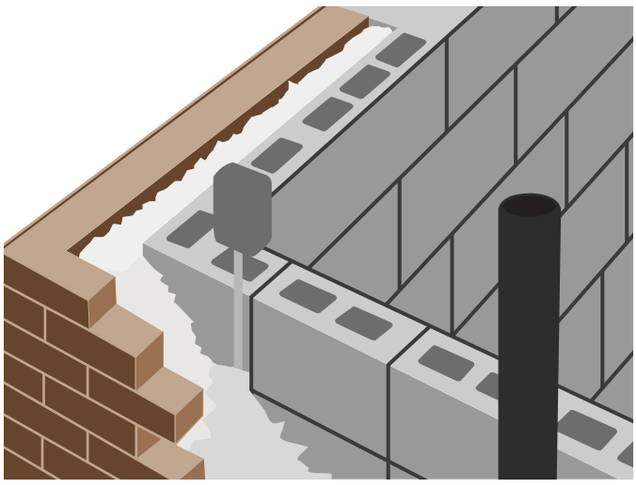


PERLITE MASONRY INSULATION

Insulation

Thermal performance tests have shown significant energy savings when perlite is used to fill the cavities in concrete masonry structures.

Standards, Specifications and References

Perlite is represented in the standards by ASTM product specification C549. The ASTM test methods used to evaluate loose-fill Perlite insulation are listed below.

- ASTM C549 "Specification for Perlite Loose-Fill Insulation''
- ASTM C520 "Test Methods for Density of Granular Loose Fill Insulations"
- ASTM C1363 "Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus"
- ASTM E 84 "Test Method for Surface Burning Characteristics of Building Materials"
- ASTM E 136 "Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C"

Non-Combustible:

Perlite attributes-

- The temperature range for perlite fusion is 1,260-1343°C.
- Perlite is a Class A (highest degree of fire resistance), Class 1 building material
- Flame spread 0; Smoke density 0

4 Hour Fire Ratings

Underwriters Laboratories Design No. U905 shows that a 2 hour rated 8, 10, or 12 inch (20, 25, or 30 cm) concrete block wall is improved to four hours when cores are filled with perlite. UL Designs U901, U904, and U907 also achieve 4 hour fire ratings.

R and U Values for Hollow Masonry walls.

Block Thickness	Perlite Fill	R-Value	U-Value
15cm	Without Perlite	1.80	0.56
	With Perlite	2.58	0.39
20cm	Without Perlite	1.96	0.51
	With Perlite	3.26	0.31
25cm	Without Perlite	2.08	0.48
	With Perlite	3.82	0.26
30cm	Without Perlite	2.14	0.47
	With Perlite	4.32	0.23

Perlite is an inorganic, naturally occurring mineral and is as permanent as the walls which contain it. It supports its own weight and will not settle or bridge.

Economical

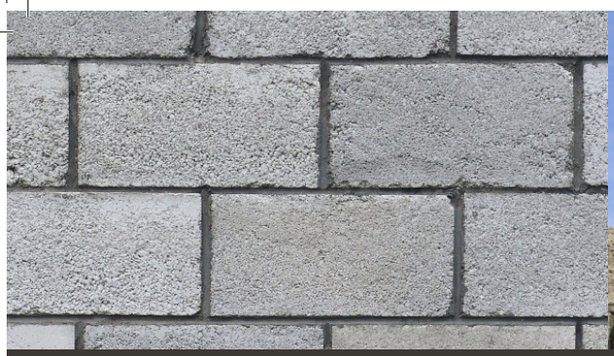
Perlite loose-fill masonry insulation offers excellent thermal and fire resistant properties at an economical cost. It is lightweight and pours easily and quickly without requiring special equipment or skills.

Thermal Resistance Values for Veneer & Cavity Wall Calculations	R-Value K*m2/W
Outside Air Film	0.03
Common Brick (w/ holes)	0.04
Face Brick (no holes)	0.08
Air Space in Cavity 20-100mm	0.17
25 mm cavity filled w/ perlite	0.55
50 mm cavity filled w/ perlite	1.10
75 mm cavity filled w/ perlite	1.65
100 mm cavity filled w/ perlite	2.20
Reflective Air Space	0.54
Furring (non-reflective air space)	0.18
Gypsum or Plaster Board 13 mm	0.08
Gypsum or Plaster Board 16 mm	0.10
Inside Air Film	0.12

Guidelines for use

- *Materials*

It is recommended that the loose-fill perlite shall conform to the requirements of ASTM Designation C549.



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• *Installation*

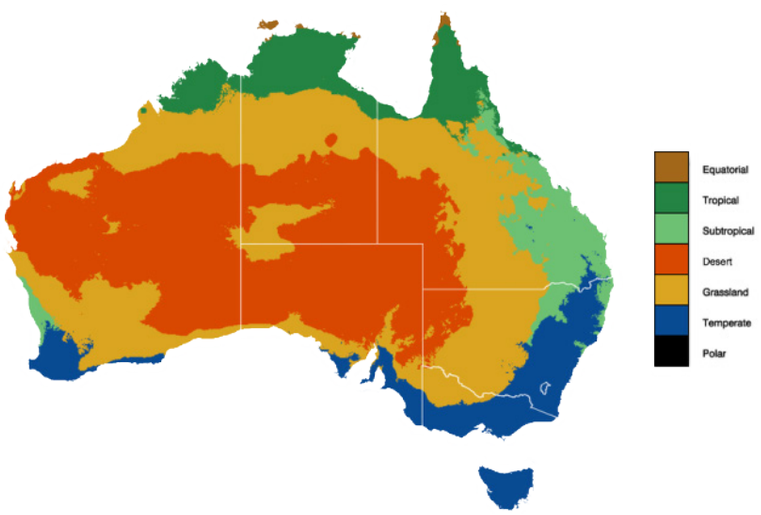
The loose-fill perlite should be installed in the following locations:

- In the cores of all exterior (and interior) hollow masonry walls.
- In the cavity between all exterior and interior walls.
- The loose-fill perlite should be poured directly (or via a hopper) in the top of the wall at any convenient interval (not in excess of 6m). Wall sections under doors and windows should be filled before sills are placed. Rodding or tamping is not recommended.
- All holes and openings in the wall through which loose-fill perlite can escape should be permanently sealed or caulked prior to installation. Screening should be used in all weep holes. (The inclusion of weep holes is considered good construction design practice to allow passage of any water which might penetrate the cavities or core spaces of wall construction.)
- The loose-fill perlite must remain dry. Suitable means should be used as the work progresses to insure that the insulation is protected

Approximate perlite Masonry Block Loose Fill by Area - Number of 100L bags required						
Wall Area 100m²	Core Fill: Block Thickness			Cavity Fill: Cavity Width		
	15cm	20cm	30cm	2.5cm	5cm	7.5cm
	40	60	100	25	45	65

Total area covered by 100L bag of loose perlite				
Number of Blocks Filled	15cm Block	20cm Block	25cm Block	30cm Block
	20	15	11	8
Square Meter of Cavity Filled	2.5cm Cavity	4cm Cavity	5cm Cavity	6.5cm Cavity
	4	2.5	2	1.5

Australian Temperature Zones



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PERLITE UNDERSLAB INSULATION

Concrete slab floors with direct thermal contact to the ground can present challenges to the maintenance of personal comfort in homes and add to heating bills. A solution to break that direct thermal contact is to use a natural insulative material such as perlite .

AUSPERL Perlite conforming to ASTM C549, is provided in easy-to-install, light-weight bags that may be used as insulation below concrete floors as demonstrated in the accompanying photographs and schematic diagrams.

Perlite underslab insulation is a natural, inorganic product that does not rot, support combustion nor provide a habitat for rodents. Because of its neutral pH, the product does not foster corrosion in piping and electrical wiring that may be in the underfloor area.

Benefits from installation of such a system can accrue in both summer and winter. During winter, heat loss through the floor of a building can be decreased, while in summer, differences between floor and air temperatures are minimized and condensation on cool floors is avoided- providing a more comfortable and energy-efficient environment. This system is particularly useful when radiant under-floor heating is employed since the thermal resistance of the perlite will reduce heat loss from the heated slab to the ground below. In addition, perlite is dimensionally stable under varying temperatures and it is not combustible.

Effective R-Value of perlite
Thermal conductance/resistance

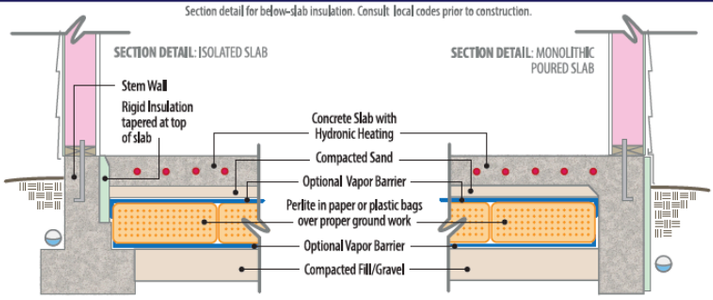
Section Thickness of Perlite Loose Fill Insulation	Thermal Conductance "C"	Thermal Resistance "R"
(SI)	(SI)	(SI)
(2.5cm)	(1.82)	(0.55)
(5.1cm)	(0.91)	(1.10)
(7.6cm)	(0.61)	(1.65)
(10.2cm)	(0.45)	(2.20)
(12.7cm)	(0.36)	(2.75)
(15.2cm)	(0.30)	(3.30)
(17.7cm)	(0.26)	(3.85)
(20.3cm)	(0.23)	(4.40)

*"("values expressed in Btu/h • ft2 • °F (W/m• K) were calculated using maximum thermal conductivity"k"factor or 0.32 Btu in/h .ft2 • °F (0.046 W/m•K) at 75° F (24° () mean temperature.

"R" values expressed in h • ft2 • °F/Btu (K • m2/W) were calculated using the formula R = 1/C.

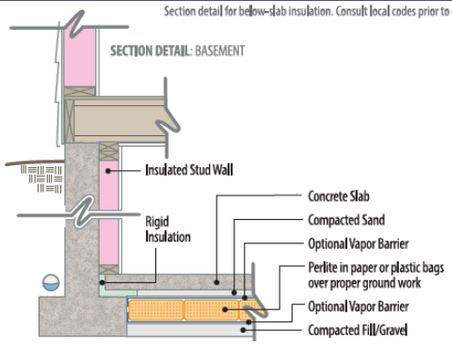
PERLITE BAGS BELOW HEATED SLAB-ON-GRADE FLOOR

Section detail for below-slab insulation. Consult local codes prior to construction.



PERLITE BAGS BELOW BASEMENT SLAB FLOOR

Section detail for below-slab insulation. Consult local codes prior to construction.



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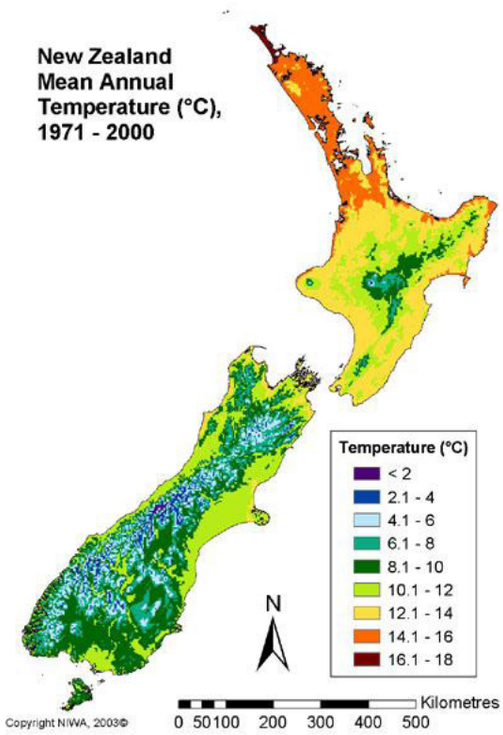

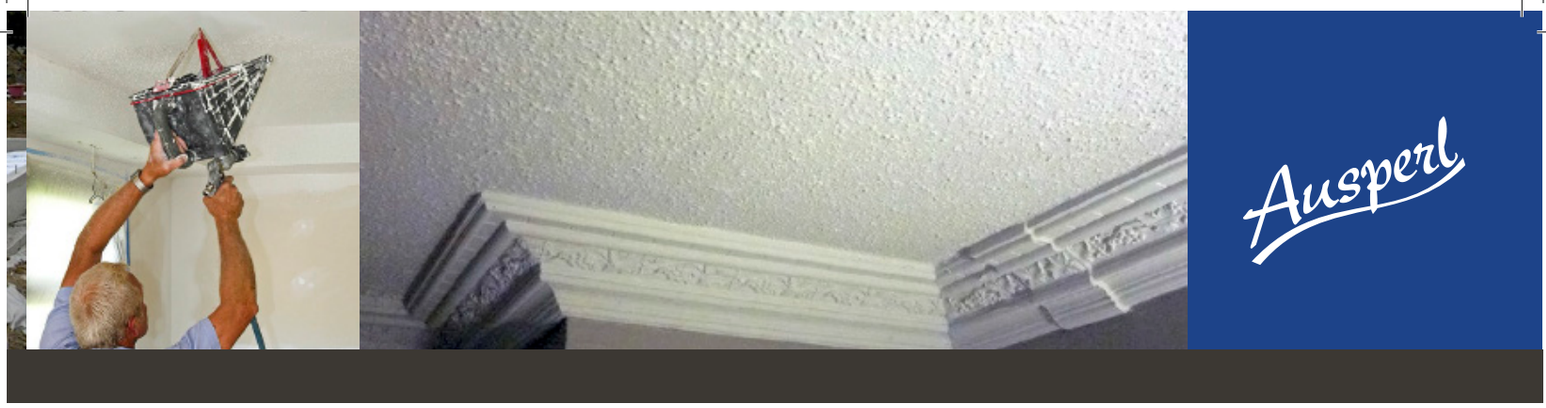

PERLITE TEXTURED COATINGS

Advantages of Perlite

Perlite offers advantages to both manufacturers and applicators of textured coatings. To manufacturers, perlite provides low cost bulk filling and a white color to reduce pigmentation costs. Because perlite is light in weight, shipping and handling costs are reduced. The light weight of perlite textured coatings reduces the tendency of thick films to sag and run.

As a result, applicators can apply heavier coatings in a single pass with subsequent labor savings. In addition, because perlite is inorganic and inert, it does not contribute to yellowing in industrial atmospheres.

Even as a coating, applicators can benefit from perlite's unique insulating properties.

Variety of Textures Possible

Perlite is available in different grades ranging from fine to coarse material. The table below provides general guidance on textures that may be achieved with different perlite particle sizes.

Perlite Particle Size	Texture	Spray Tip Size
0.01-0.2mm	Fine	3-5mm
0.1-3.0mm	Medium	5-6.5mm
1.5-6.0mm	Coarse	8-12mm
*Particle size ranges are approximate and presented for guidance only		

Textured Coating Formulation

On a volume basis, significant quantities of perlite may be used to produce distinctive textures. Trials should be conducted to determine the optimum amount of perlite necessary to achieve the desired texture.

Application of Perlite Textured Coatings

Textured coatings may be formulated for either spray or roller application. Heavy duty spray equipment may be used to apply perlite textured coatings. Typical tip sizes are detailed in the table, left.

When coatings are to be applied with rollers, 18-30 mm long nap rollers or a honey comb foam roller should be used for fine and medium textures. For coarse textures, a deeply patterned roller is recommended for best results.

Aggregate Blending

Expanded perlite is a mineral aggregate and the coarser particle sizes will not withstand high shear rates during mixing. Slow speed mixing with broad paddles is recommended. Mixer horsepower requirements would be approximately 10 horsepower per 1000 litre batch at mixing speeds in the range of 50-200 rpm. Formulations requiring a high level of shear should be mixed with high speed equipment prior to the addition of perlite. Provisions should be made to allow for 40% bulking while perlite is being added to the coating mix.

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