Urban Albedo: Digital tools for urban resilience and growth

Environmental and resilience benefits of high Albedo Concrete

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Who are we?

AGGREGATES
MARINE AGGREGATES
ASPHALT
CEMENT
PRECAST CONCRETE
READY-MIXED CONCRETE
DIMENSION STONE
SILICA SAND
AGRICULTURAL LIME
MORTAR
INDUSTRIAL LIME
mpa
essential materials
sustainable solutions
Mineral Products Association
The Trade Association for the Aggregates, Asphalt, Cement, Concrete, Dimension Stone, Lime, Mortar and Silica Sand Industries

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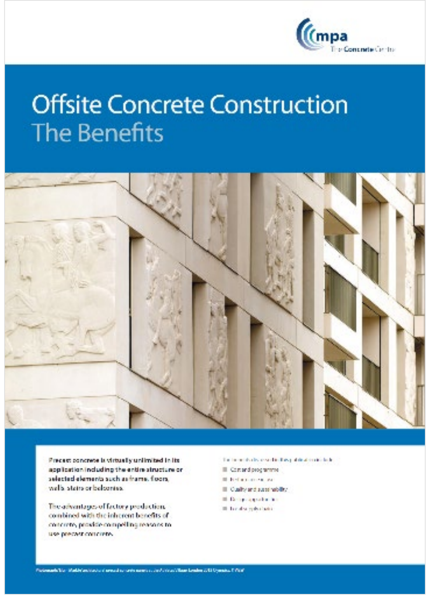


www.concretecentre.com
www.sustainableconcrete.org.uk

- Free resource for specifiers
- Concrete Quarterly
- Publications: general and technical
- Practice workshops
- Seminars and conferences
- Training courses
- Webinars
- Concrete Elegance Lectures

Varied resilience guidance literature

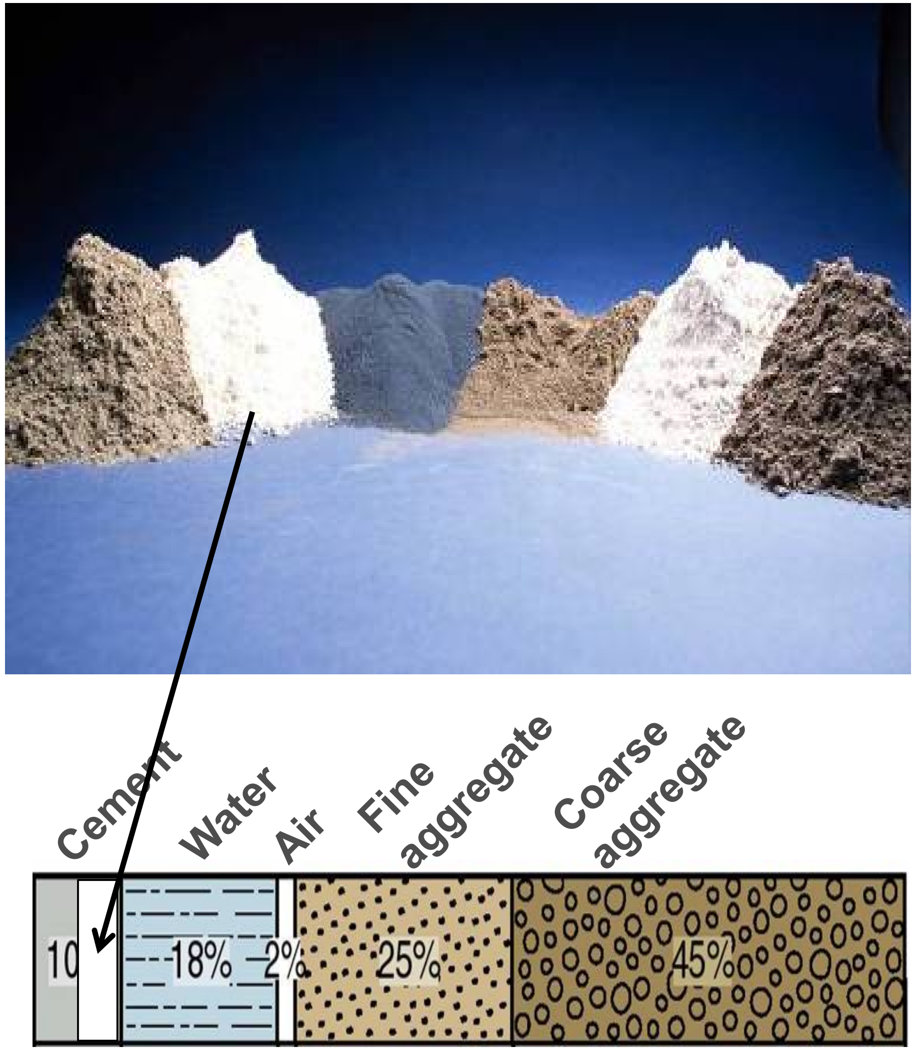
www.concretecentre.com

Some typical values; the albedo (ratio of reflected to incoming shortwave radiation) the darker the greater the increase and rate of thermal absorption and expansion.

Material surface	Solar Reflectance
Black acrylic paint	0.05
New asphalt	0.05
Aged asphalt	0.1
"White" asphalt shingle	0.2
Aged concrete	0.2 to 0.3
New concrete (traditional)	0.4 to 0.5
New concrete with white portland cement	0.7 to 0.8
White acrylic paint	0.8

- Source: Construction Technology Laboratories (www.CTLgroup.com)

Use of low carbon cements



Approx gen mix by volume

- Use of cementitious replacements through specification can reduce ECO_2
  - Ground granulated blast furnace slag (GGBS)
  - Fly ash (FA)
  - Limestone

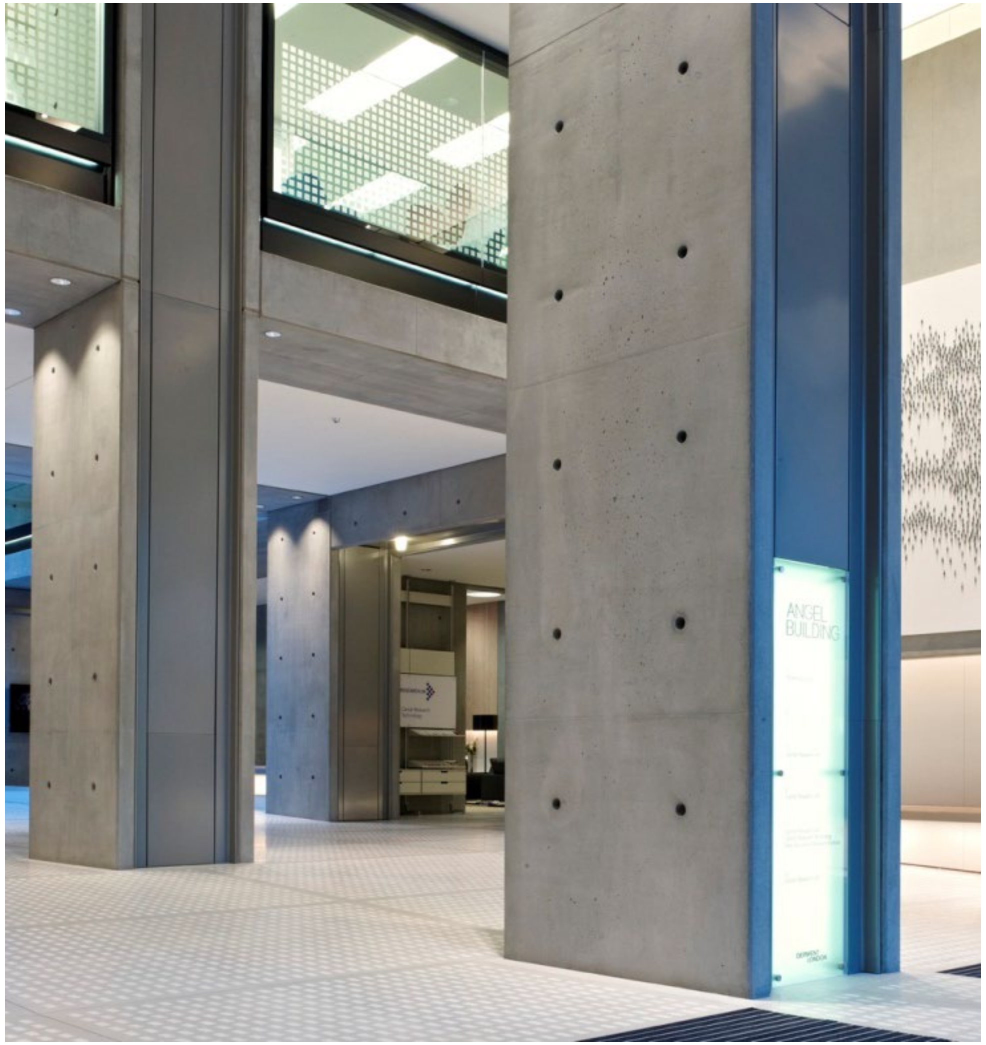
High Albedo

- White cement
- GGBS

High albedo, blue or green roofs and walls ?

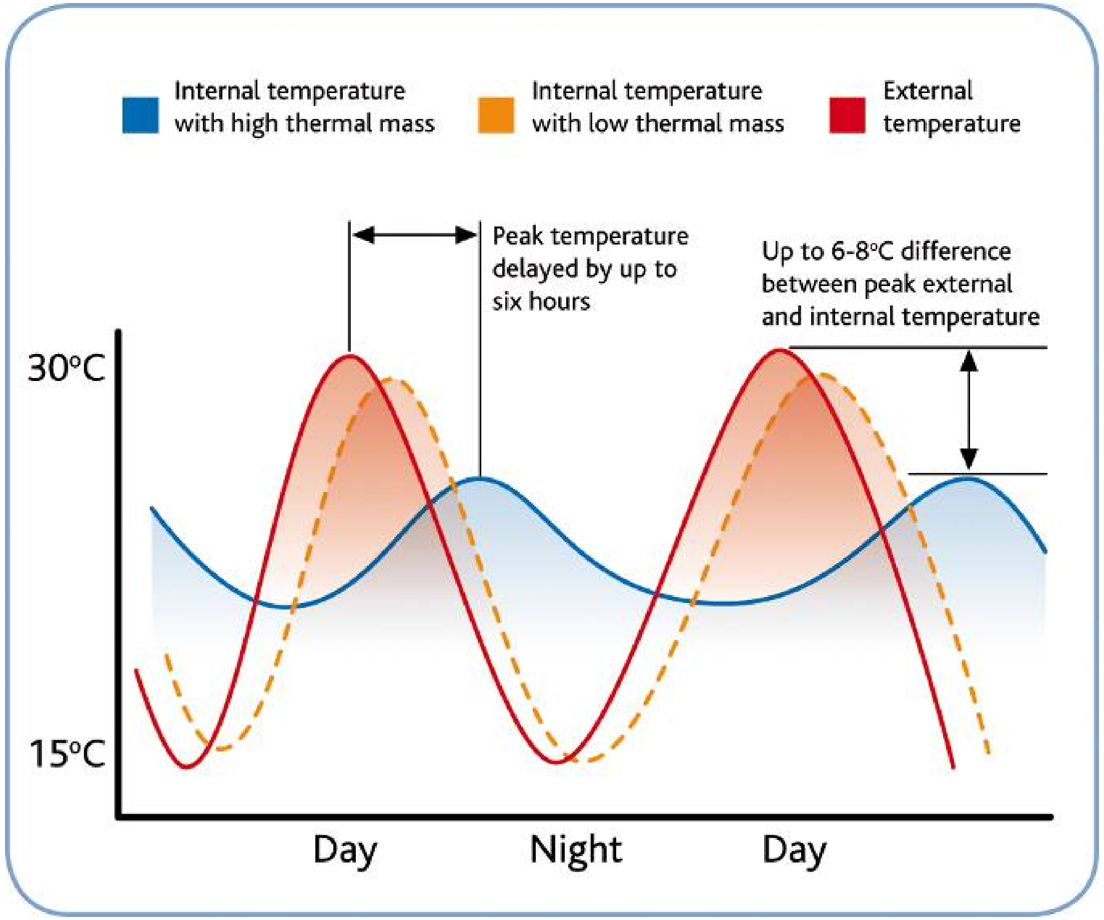
Use of low carbon cements

Aquatics Centre, Diving boards
Zaha Hadid Architects
30% GGBS



Angel Building, London AHMM/AKT
34% fly ash

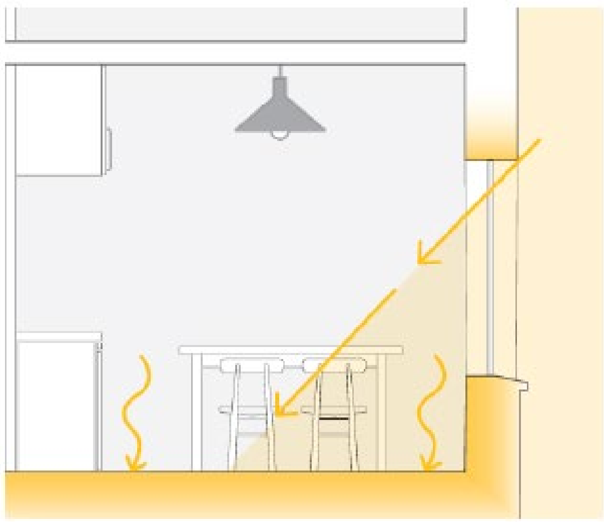
Thermal mass ;night cooling



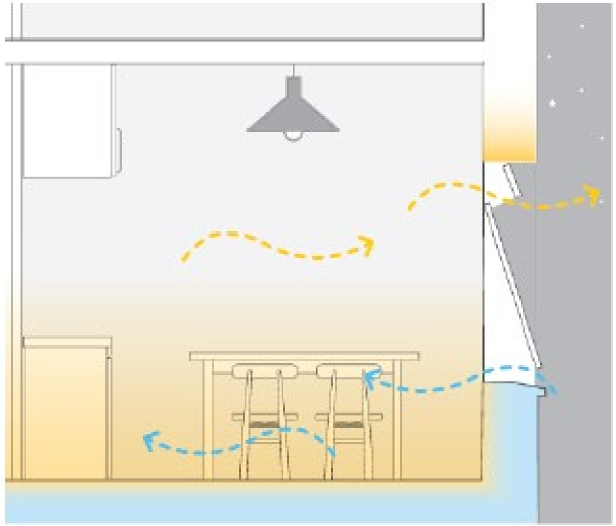
Thermal mass potential for passive cooling in housing …night cooling

"Thermal mass can be used to control overheating when used with adequate ventilation"

NHBC Foundation publication '*Understanding overheating- where to start*'



Day



Night

Innovative recipes and ingredients

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Carbon capture aggregate

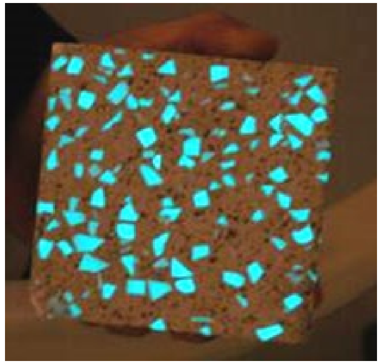


Photo-luminescent aggregate

Self-compacting concrete

Load-bearing light transmitting concrete
LitraCon ®

Insulating aggregate

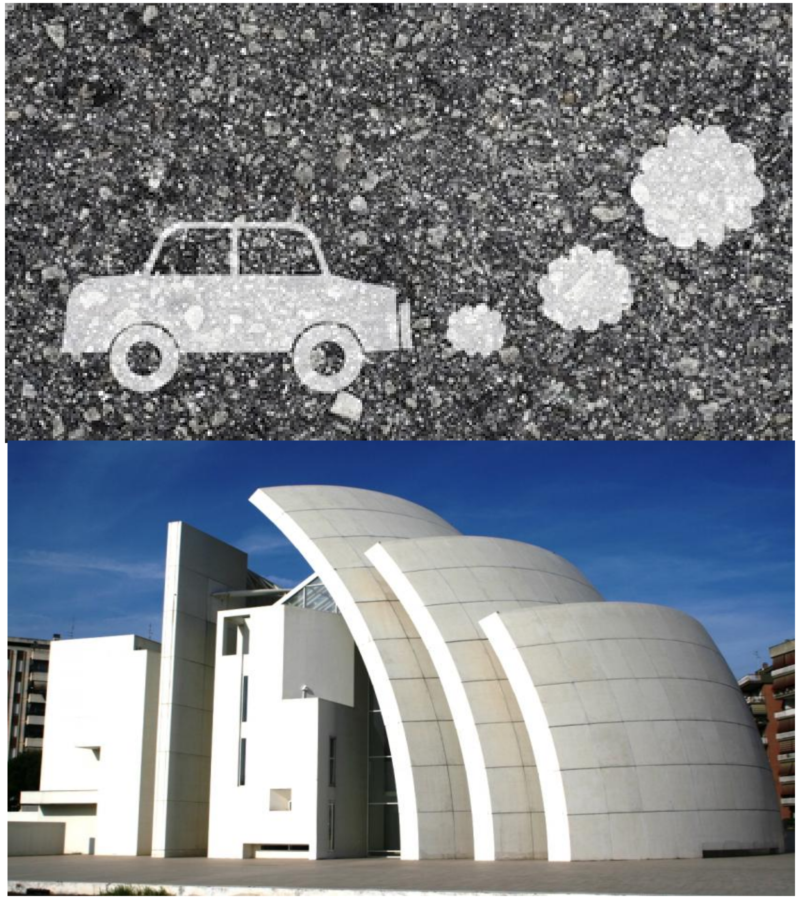
Water permeable concrete

Ultra high performance concrete

Bio-receptive concrete

Lightweight ready mixed & precast structural concrete

Photocatalytic concrete



- **Smog-eating concrete; NOx**
- Photocatalytic concrete uses titanium dioxide (TiO2) which, when exposed to natural sunlight, triggers a chemical reaction. This chemical reaction **catalyses*** the decomposition of dirt on the concrete's surface; which makes it self-cleaning.

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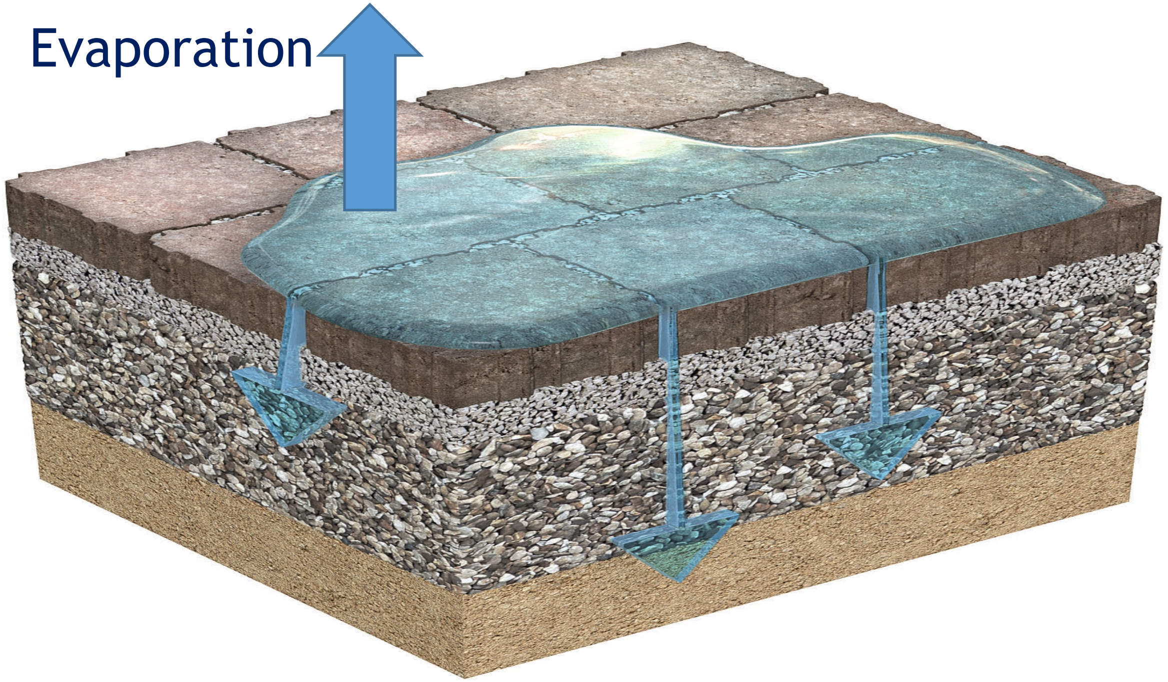
Cool Pavements: In cities constructed in the United States, pavements and roads comprise about 1/3 of urban surfaces, thus absorbing up to 80-95% of solar radiation and in turn warming surface, air and stormwater temperatures. The implementation of ‘cool paving’ assists in reflecting solar energy, enhancing water evaporation and maintaining cooler surfaces as compared to conventional pavements.

10% decrease in reflectance = -4 degC



Thermal stabilization method for pavements built on thaw sensitive permafrost based on the use of high albedo surfacing materials.

- Thank you

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