GREEN OVER GRAY

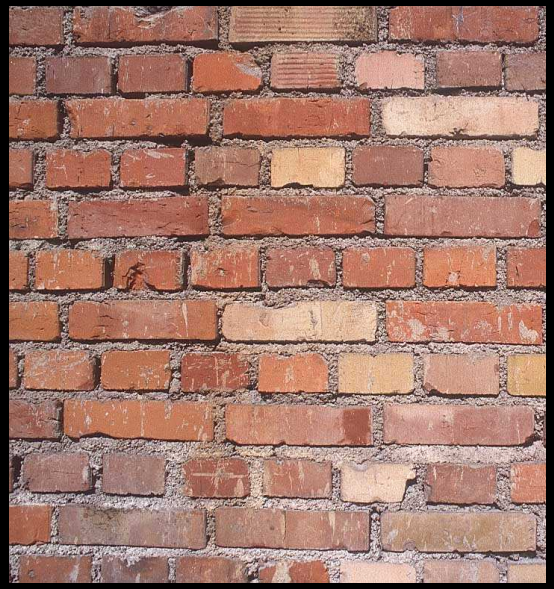
MAKING CEMENT & CONCRETE MORE SUSTAINABLE

A Presentation by Raymond Sih, UAP, LEED AP

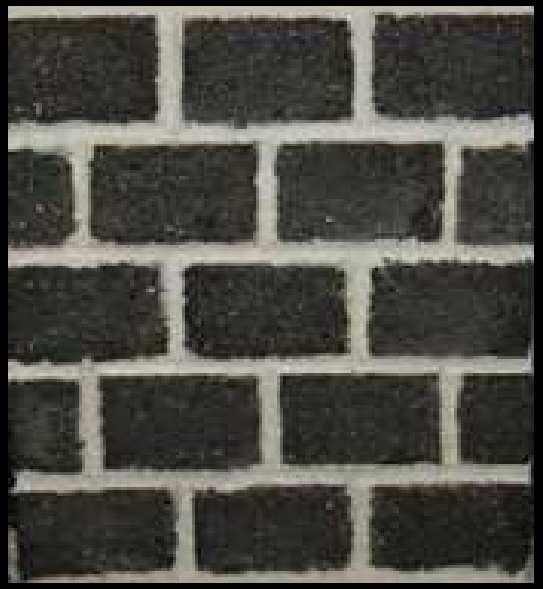
CONCRETE IS THE SECOND MOST USED RESOURCE ON EARTH AFTER **WATER**

SUBSTITUTES FOR CEMENT & CONCRETE ARE NOT AS **VERSATILE**

STONE



BRICK



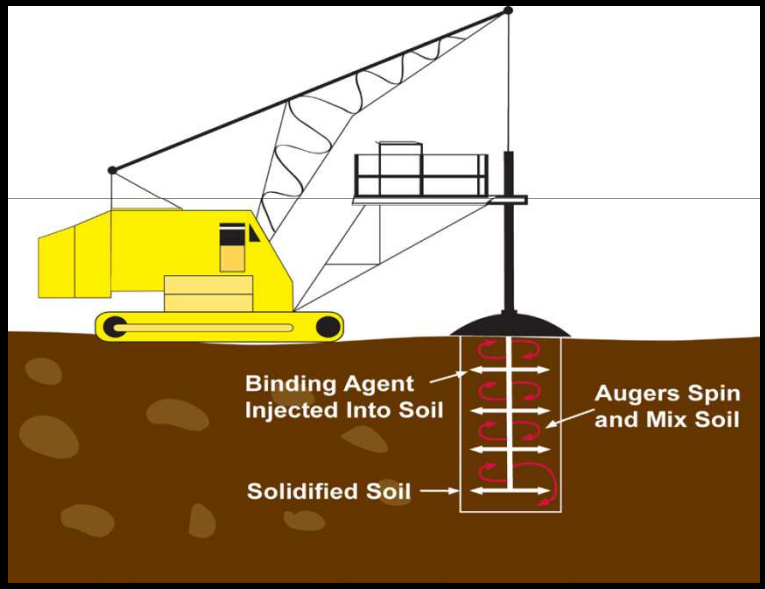
BITUMEN

1. CEMENT CAN BIND VARIOUS MATERIALS LIKE SAND, AGGREGATES & **RECYCLED MATERIALS**

CONVENTIONAL CONCRETE

CONCRETE WITH RECYCLED GLASS

2. CEMENT CAN EVEN **SOLIDIFY** & **STABILIZE CONTAMINATED SOILS**



3. CEMENT IS **LOCALLY PRODUCED**

LAFARGE and BAAC plants are strategically located in the Philippines (Regional Materials); and has Recycled Content (Fly Ash) and S3 (Manufactured Sand).

HOWEVER, CEMENT MAKING IS **ENERGY INTENSIVE** AND **RELEASES CO2**

3. TO REDUCE CO2, CEMENT PLANTS CAN USE MORE **EFFICIENT** CEMENT KILNS

LAFARGE reduces its carbon footprint by using AF and recycling Waste Heat, decreasing dependence on coal.

Alternative Fuels, AF

30+% substitution rate of coal as alternative fuel in our manufacturing process.

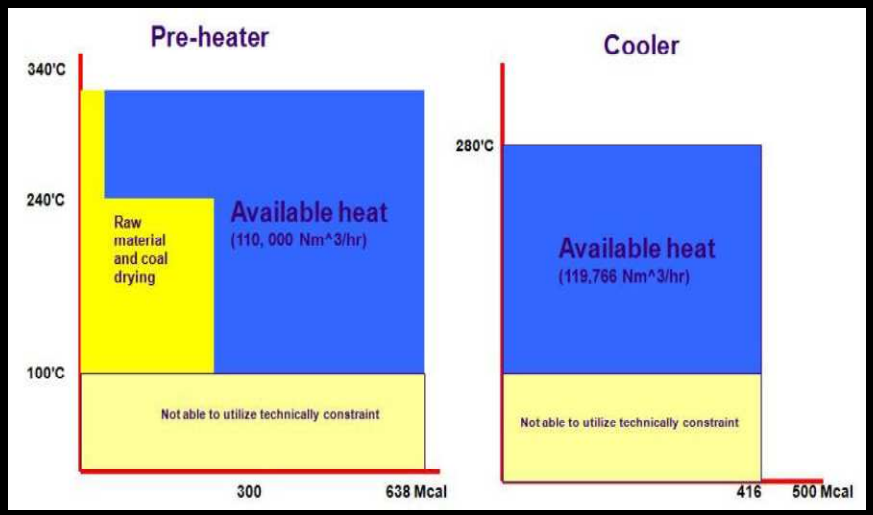
- Cement Industry is heavily dependent on fossil fuels
- Lafarge uses sustainable alternative fuels, such as rice husks and saw dust as substitute for fossil fuels
- These materials would have otherwise been left to rot or be burned along the roadside of rice mills and plantations
- 50% substitution by 2015

Heat Recovery System

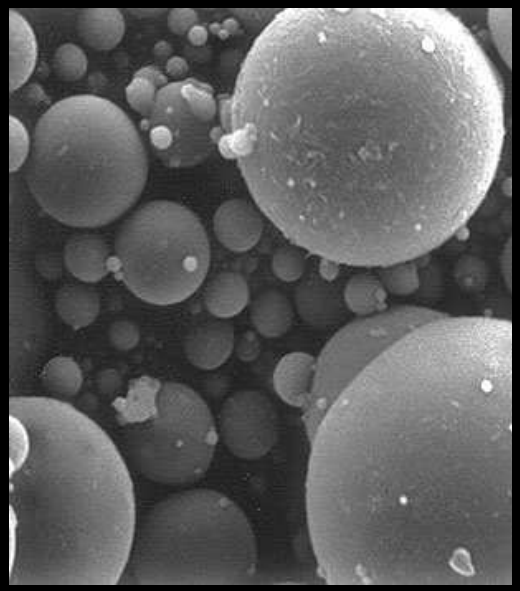
1st Cement company in the Philippines to invest in Heat Recovery System

- An innovative system in Teresa Plant that takes heat from the pre-heater and cooler stages of cement production and converts it directly to electricity
- Capacity to meet approximately 30 percent of Teresa Plant's electricity requirement
- The amount of decrease in greenhouse gas emissions by approximately 12,000 tons of CO_2 per year
- Approved in 2011 as a Clean Development Mechanism (CDM) by the UNFCCC. It is the only CDM in Philippine cement industry
- A portion of the earnings from the Certified Emission Reduction credits will be used to supplement Teresa plant's scholarship program

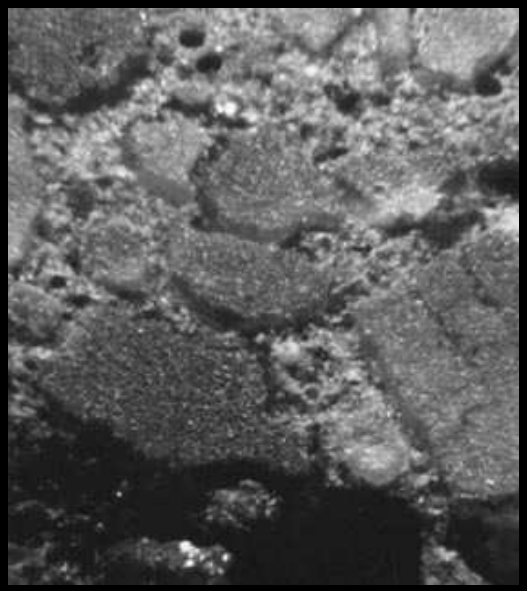
Wasted Heat



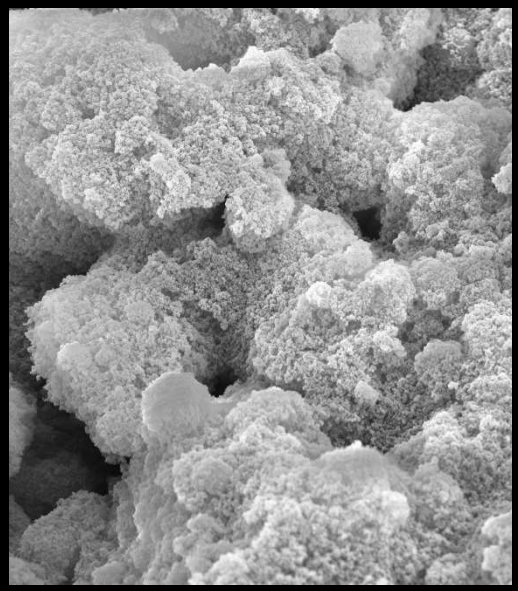
5. TO REDUCE CO_2, CEMENT CAN BE MIXED WITH **SUPPLEMENTARY CEMENTITIOUS MATERIALS** THAT ARE 100% RECYCLED BYPRODUCTS



FLY ASH

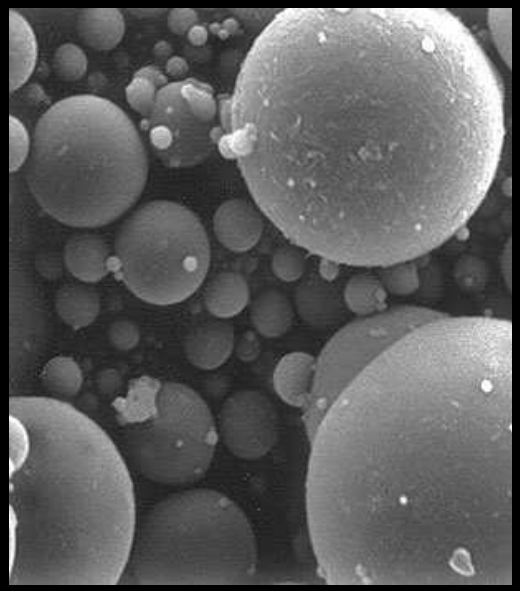


SLAG CEMENT



SILICA FUME

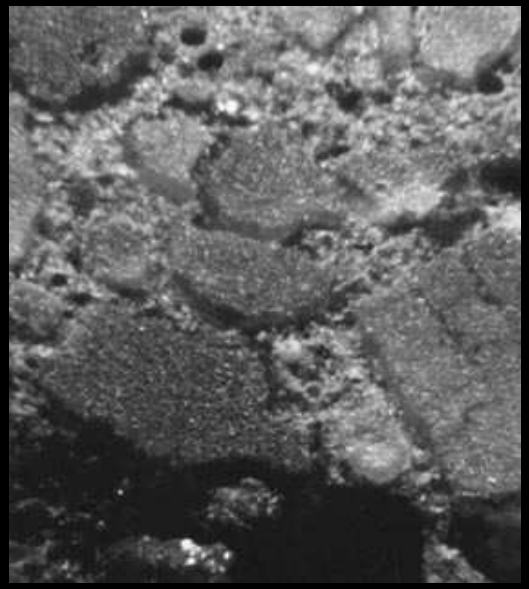
FLY ASH **IMPROVES** WORKABILITY, **SLOWS** CURING & **REDUCES** WATER DEMAND



FLY ASH

BYPRODUCT OF COAL POWER

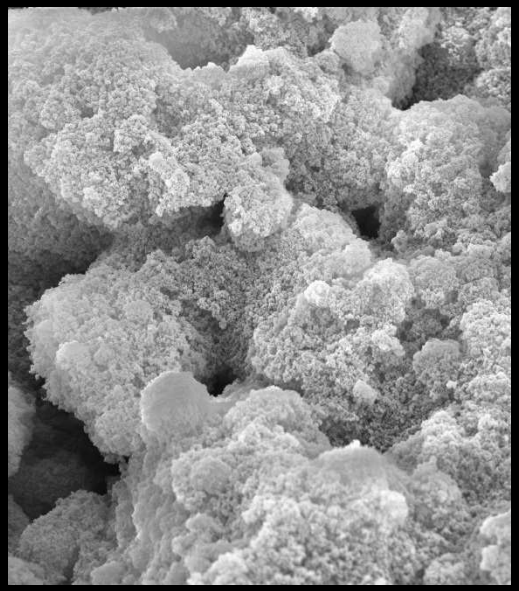
SLAG CEMENT **IMPROVES** WORKABILITY, **SLOWS** CURING & **REDUCES** WATER DEMAND



SLAG CEMENT

BYPRODUCT OF STEEL PRODUCTION

SILICA FUME **IMPROVES** STRENGTH & DURABILITY



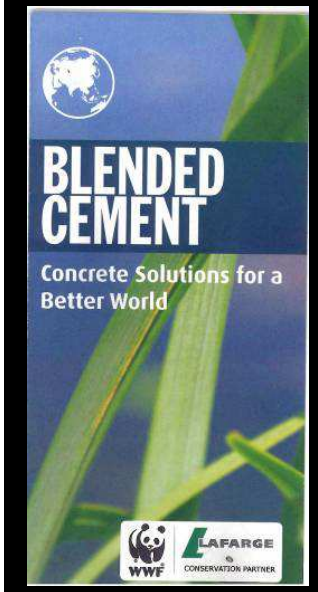
SILICA FUME

BYPRODUCT OF SILICON ALLOY PRODUCTION

LAFARGE Blended Cement

25% lesser total environmental burden points for producing Type 1P than Type 1.

- Reducing the environmental footprint of our products by replacing clinker in cement with carbon-neutral minerals or industrial byproducts (blended cement)
- REPUBLIC PORTLAND PLUS is the only blended cement manufactured in the country using fly-ash



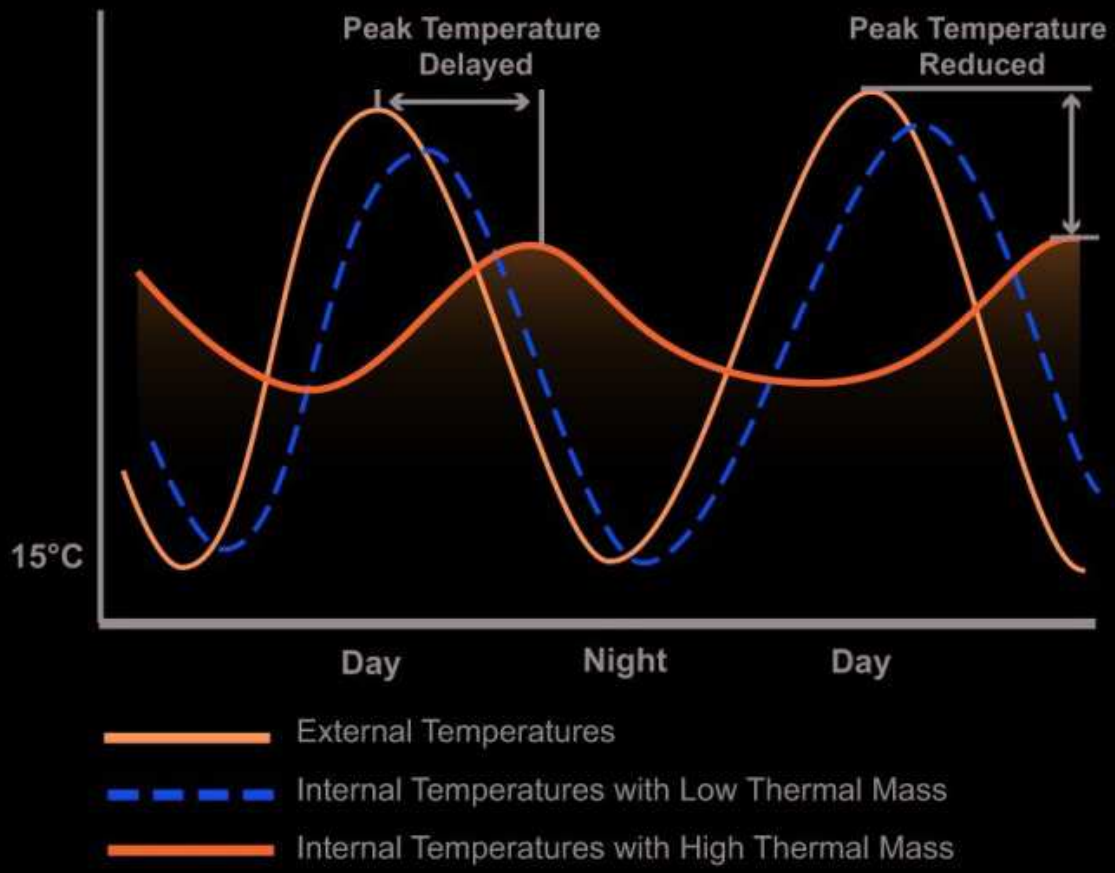
FOR THE ENVIRONMENT

- Lafarge recently participated in a study of construction materials ('life-cycle analysis') alongside WWF Philippines and UP College of Engineering. In comparing the footprint versus ordinary portland cement, REPUBLIC PORTLAND PLUS was found to have a lower environmental impact of around 25 percent

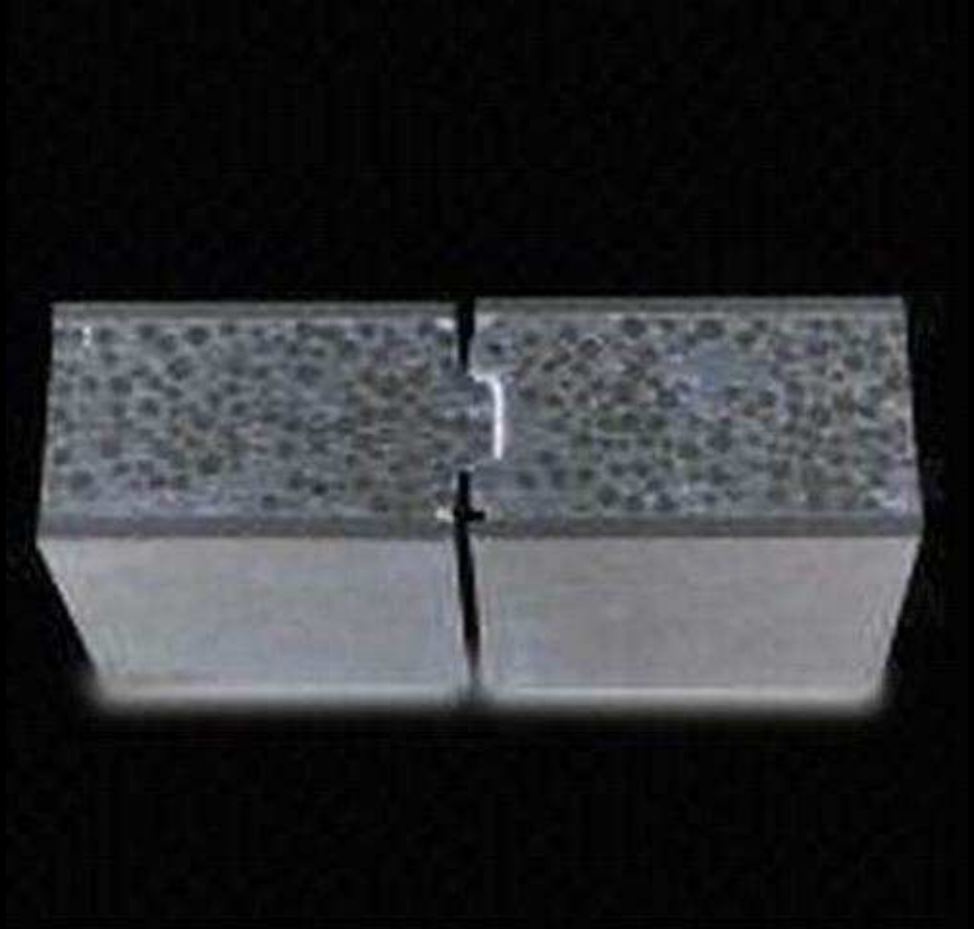
The use of fly-ash can increase the strength and durability of concrete over time, bringing its own enhancement to the product.

LAFARGE and GN Power Partnership (Fly Ash)

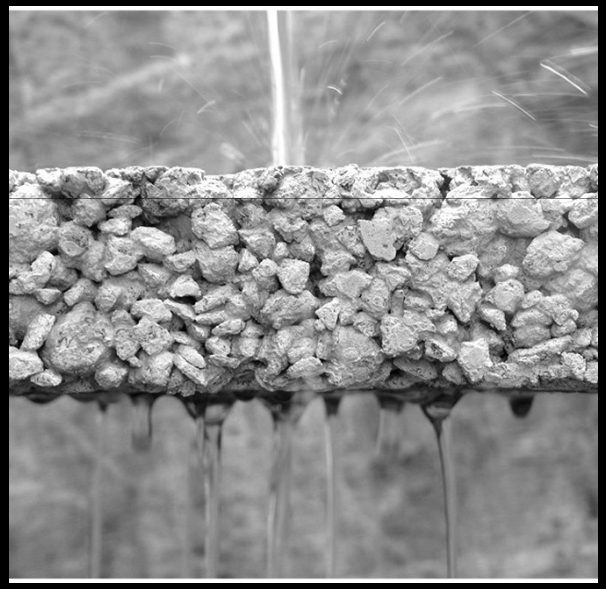
6. CONCRETE HAS A LOT OF **THERMAL MASS** THAT **REDUCES TEMPERATURE SWINGS**



7. **INSULATED** LIGHTWEIGHT CONCRETE CAN **IMPROVE THERMAL PERFORMANCE**



8. **PERVIOUS** CONCRETE PAVING CAN **REDUCE STORMWATER RUNOFF**



POROUS CONCRETE

POROUS CONCRETE PAVING

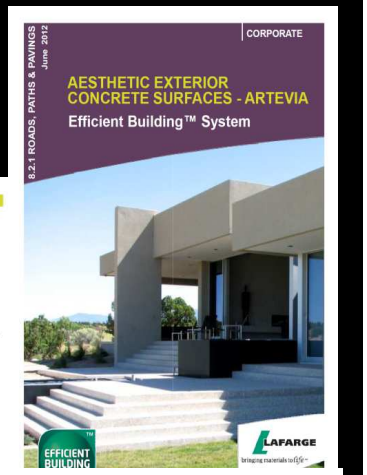
9. **DUST-FREE** CEMENT CAN **IMPROVE INDOOR AIR QUALITY**

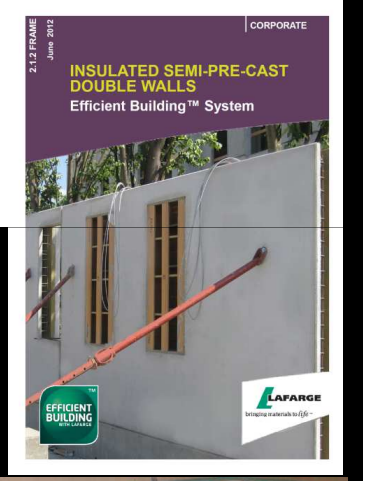
LAFARGE Value Added Products (VAP's) and Efficient Building Systems (EBS) - Global

LAFARGE CENTER FOR RESEARCH (LCR)
LYON, FRANCE – R&D
>50% dedicated for SUSTAINABLE DEVELOPMENT

ARTEVIA® – Decorative Concrete

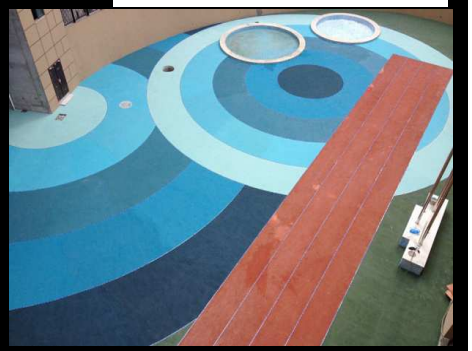
THERMEDIA® & CHRONOLIA® - EBS





AGILIA® – Self Compacting Concrete (SCC)

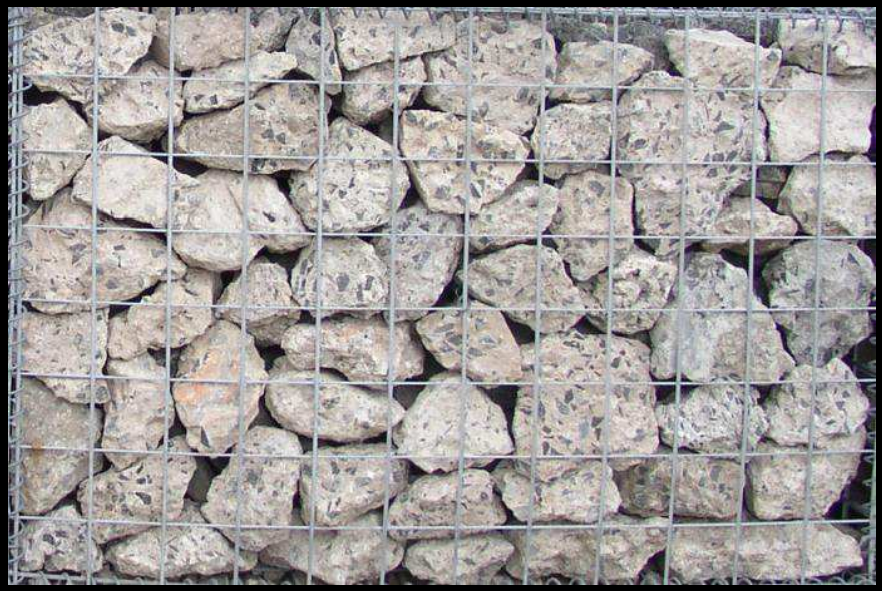
EXTENSIA®



HYDROMEDIA® – Pervious Concrete

10. CONCRETE IS **DURABLE** AND **RECYCLABLE**

RECYCLED CONCRETE AGGREGATE



RECYCLED CONCRETE IN GABIONS

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