Maximising durability and sustainability in the Middle East climate using precast concrete

مرحبا

Welcome

Why sustainability?

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

The Middle East has **five per cent** of the **world's population** but only **one per cent of the water.**

Source: World Bank

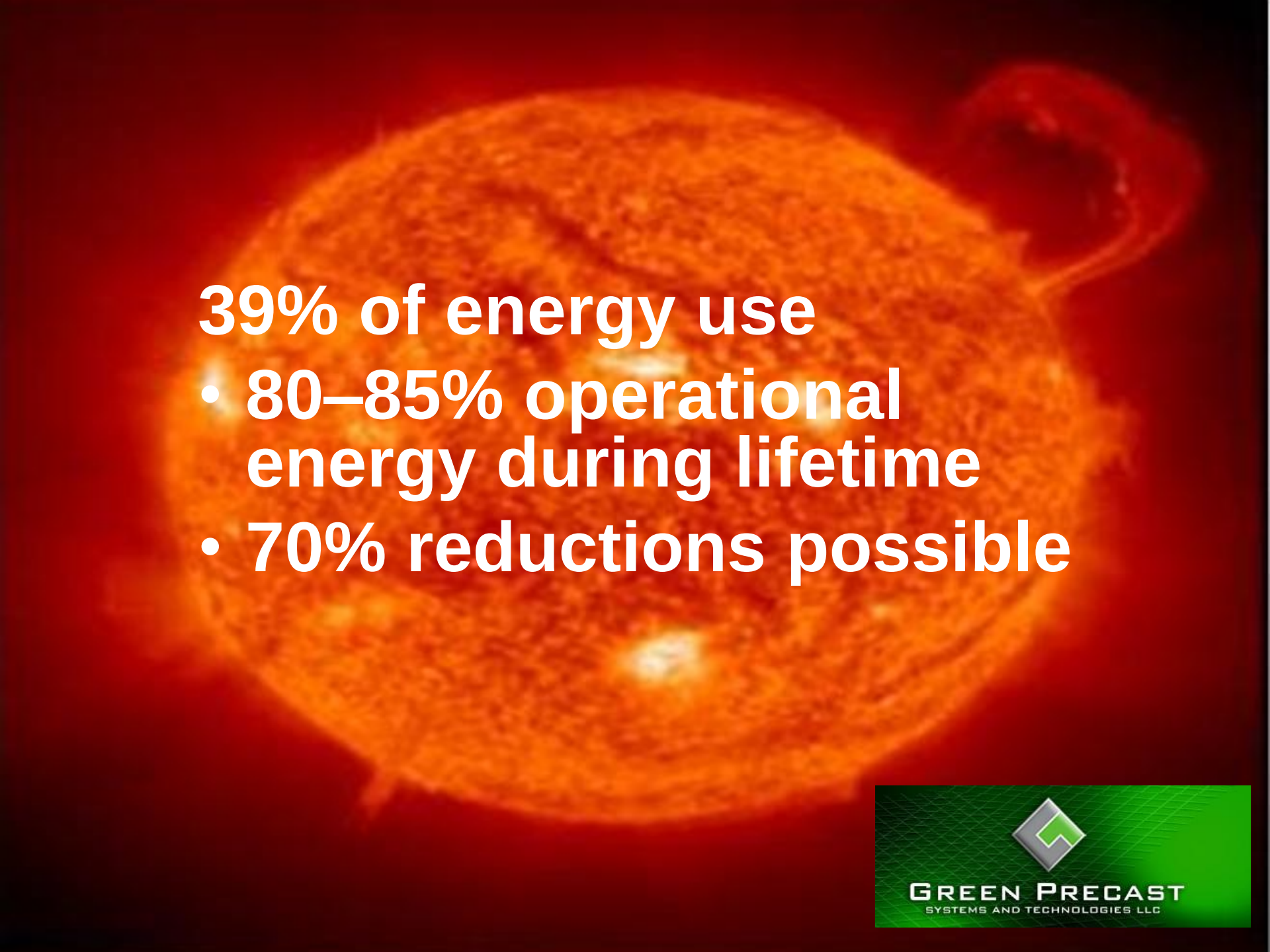
Every day the worldwide economy burns an amount of energy the planet required **10,000 days to create** - the stored solar energy is burned and released by utilities, cars, houses, factories and farms.

Source: Paul Hawken, *The Ecology of Commerce*

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC


GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

What is the environmental impact of buildings?


39% of energy use
• 80–85% operational energy during lifetime
• 70% reductions possible
GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

solar reflective paints reduce heat by 50%

12% of water use

- **50-60%** reductions possible

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Recycle greywater

. . .

and use it for

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC


irrigating gardens with 100% greywater to supply all irrigation and save 30% of water total household use
GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Rooftop gardens

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC


GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

68% of total electricity use

- **Energy conservation has twice the financial return of renewables**
- **Alternative energy creation**
- **Electrical efficient design**
- **Insulation**
- **Passive design**
- **Natural lighting**

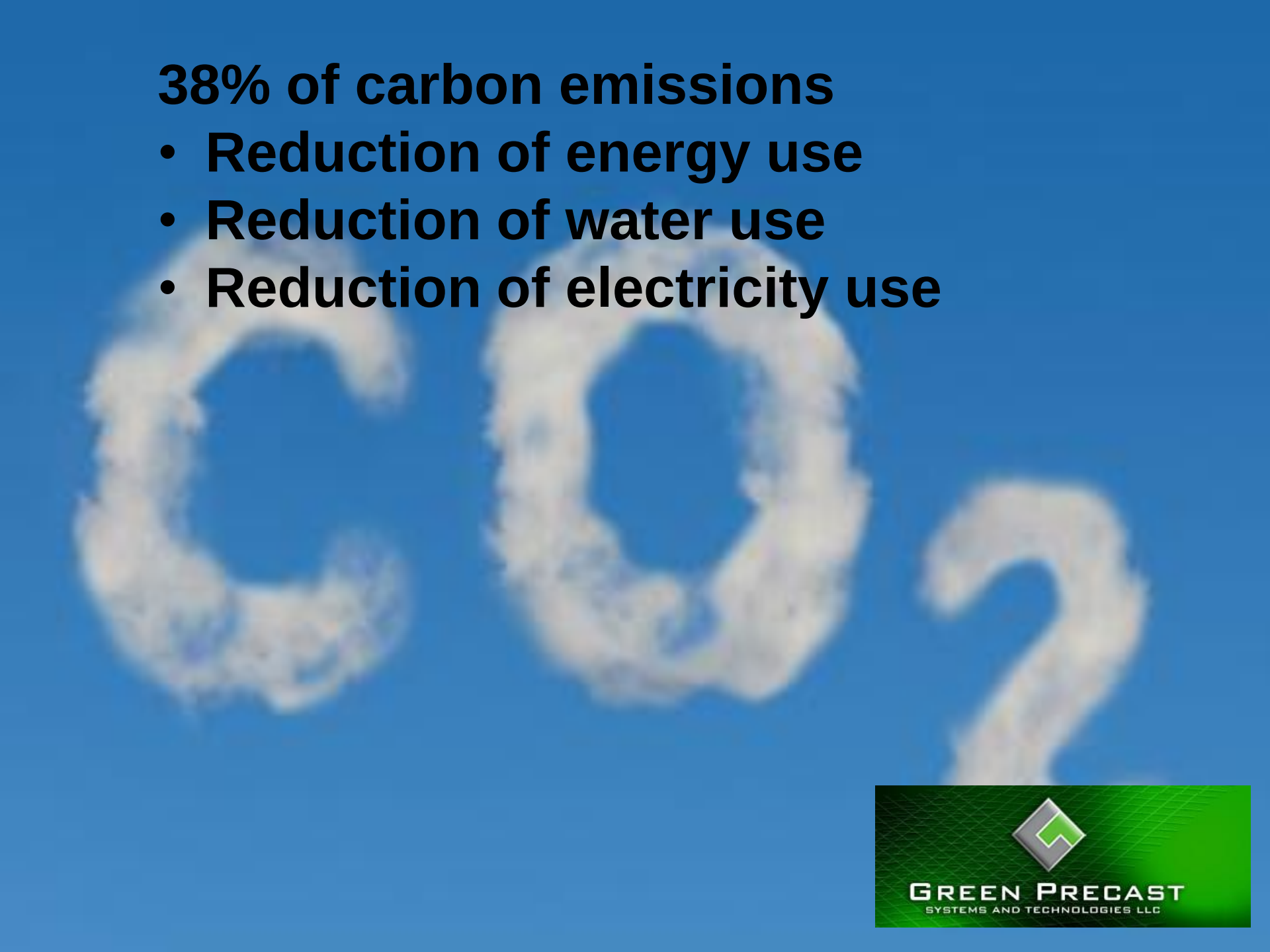
GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

- Lighting consumes 19% of the world's electricity
- Eco bulb's use **80% less** power
- Integration with good daylighting design can **reduce this a further 50%**

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

38% of carbon emissions

- **Reduction of energy use**
- **Reduction of water use**
- **Reduction of electricity use**



A thought . . .

- Buildings mortgage the energy and environmental future

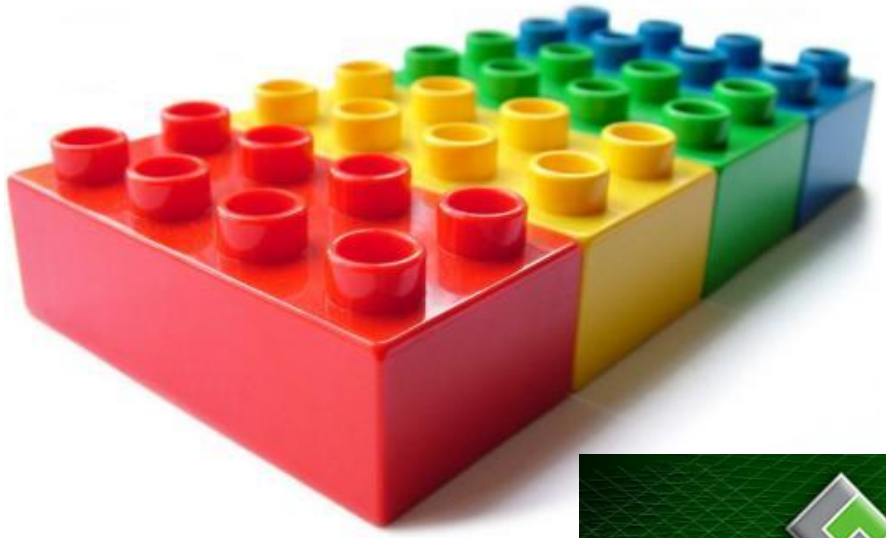
start searching for

sustainability

IMAGINE
a building system

that makes building

as simple as LEGO



GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Green Precast Systems

Stack complete “wall and ceiling” precast components one at a time

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Green Precast Systems

Up to **2 times faster** than other precast systems with modular room sized units stacked 5 stories high in a day

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

factory fit out

factory fit out

Windows & door frames cast in


factory fit out
GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC


factory fit out
First fit electrical & MEP
GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

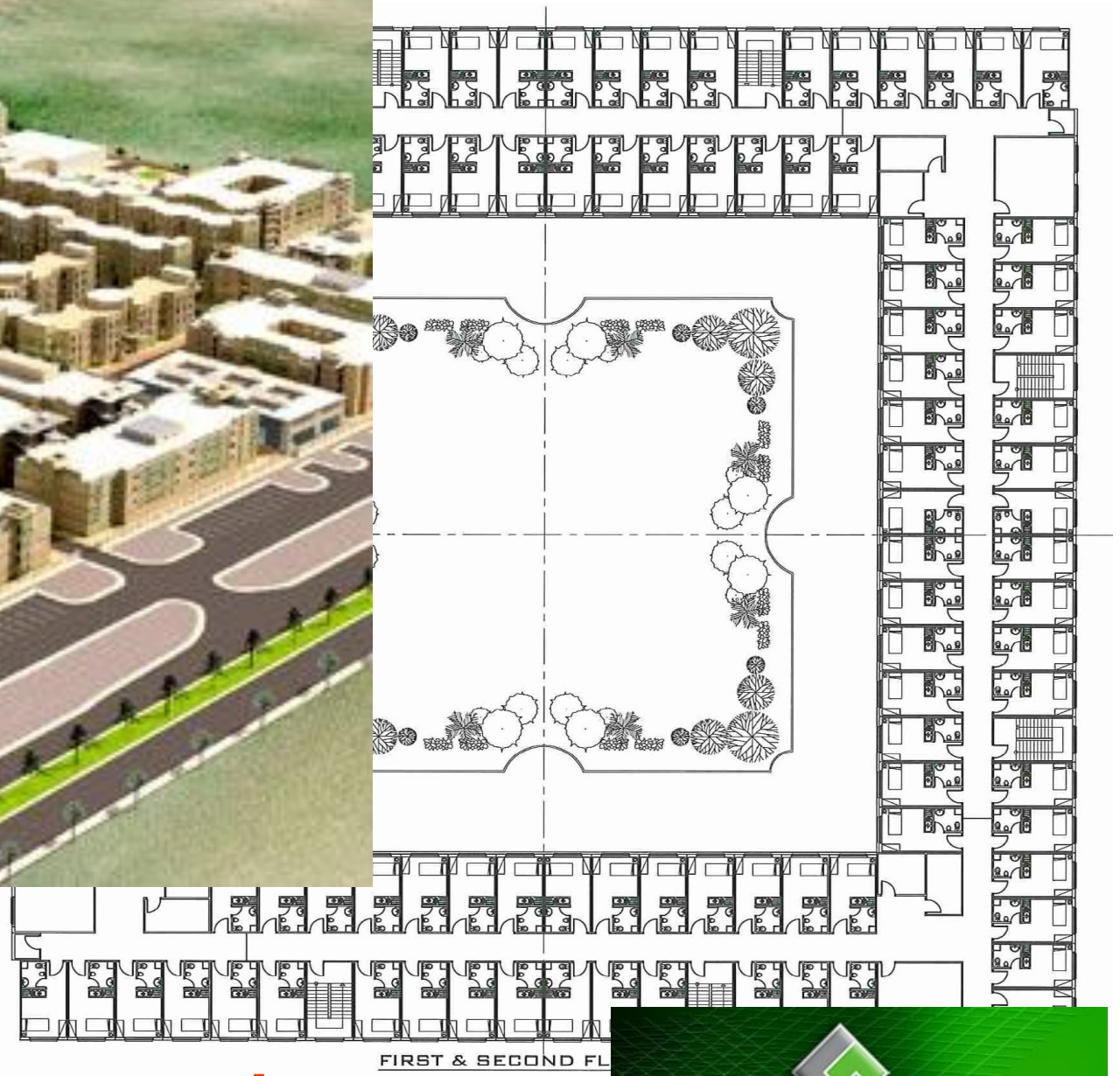
factory fit out

- Painting
- Balustrades
- Floor polishing
- Kitchens & Bathrooms

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

factory fit out

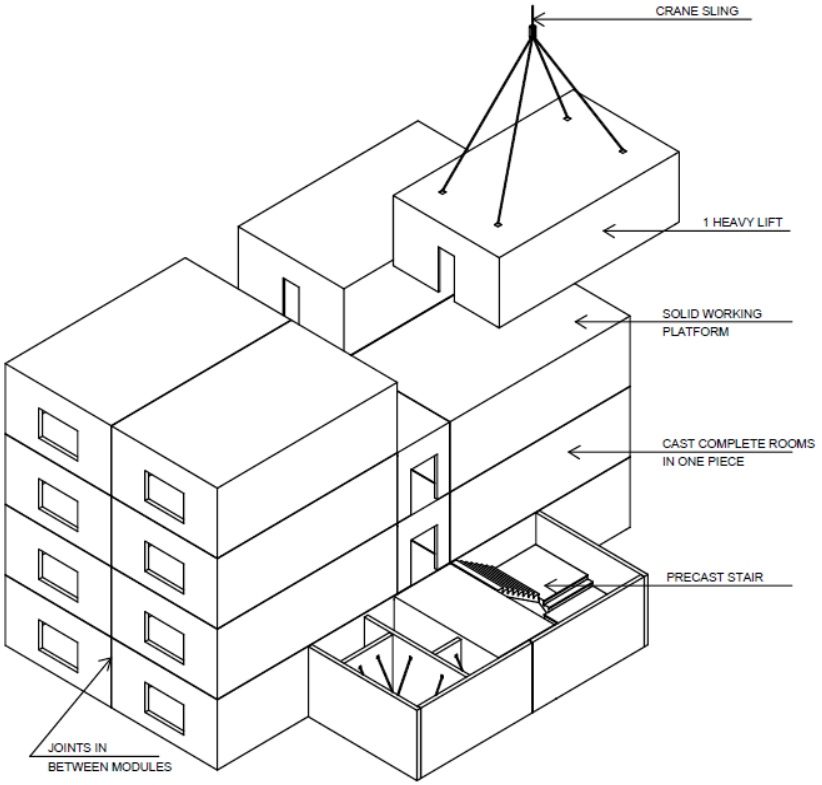
- Painting
- Balustrades
- Floor polishing
- Kitchens & Bathrooms

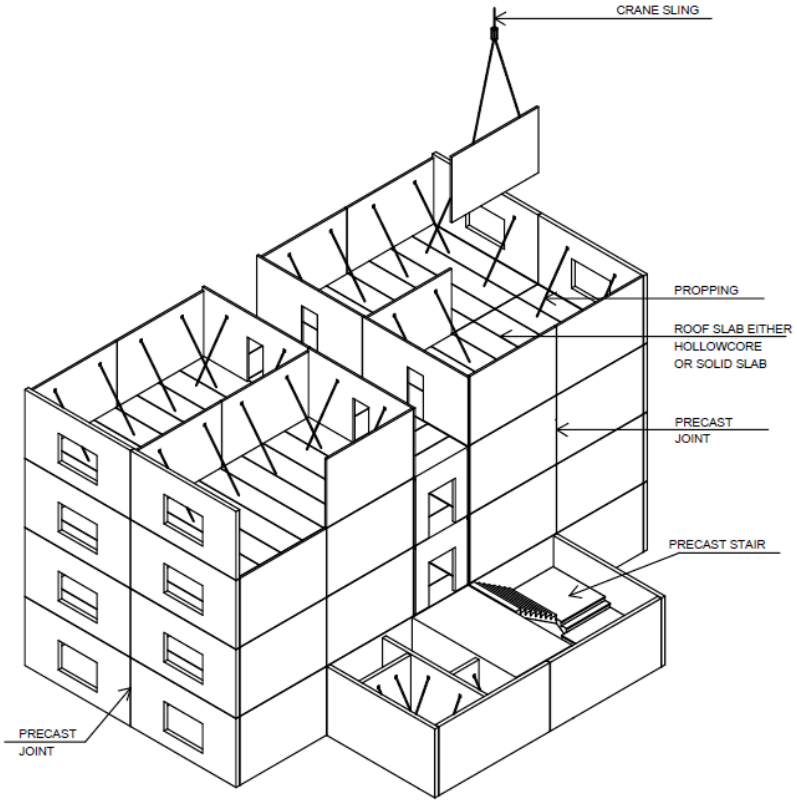


Large multi story projects

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Multi story comparison





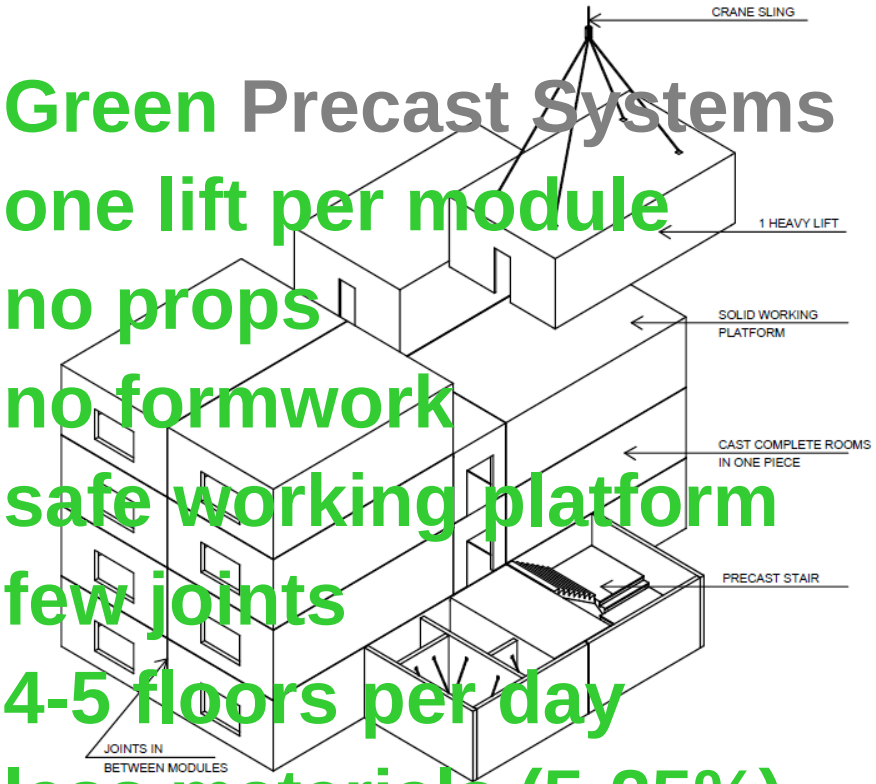
GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Multi storey comparison

Green Precast Systems	Tilt Slab
one lift per module	many lifts
no props	many props
no formwork	formwork required
safe working platform	no working platform
few joints	many joints
4-5 floors per day	1-2 floors per day
less materials (5-25%)	inflexible material qty

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Multi storey comparison



Green Precast Systems

one lift per module

no props

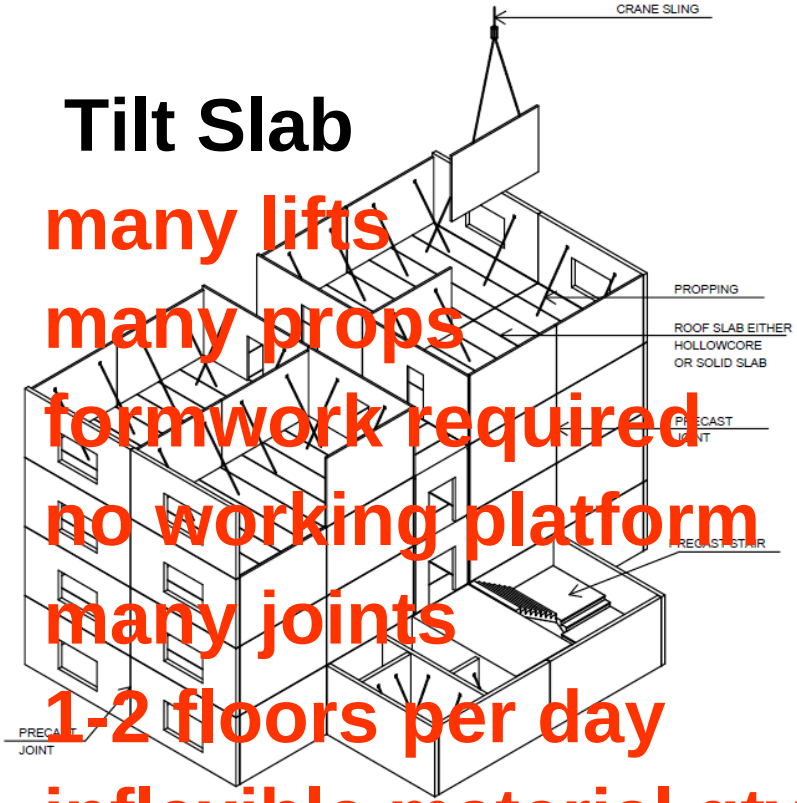
no formwork

safe working platform

few joints

4-5 floors per day

less materials (5-25%)



Tilt Slab

many lifts

many props

formwork required

no working platform

many joints

1-2 floors per day

inflexible material qty

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

. . . contemporary townhouses

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

. . . and villas

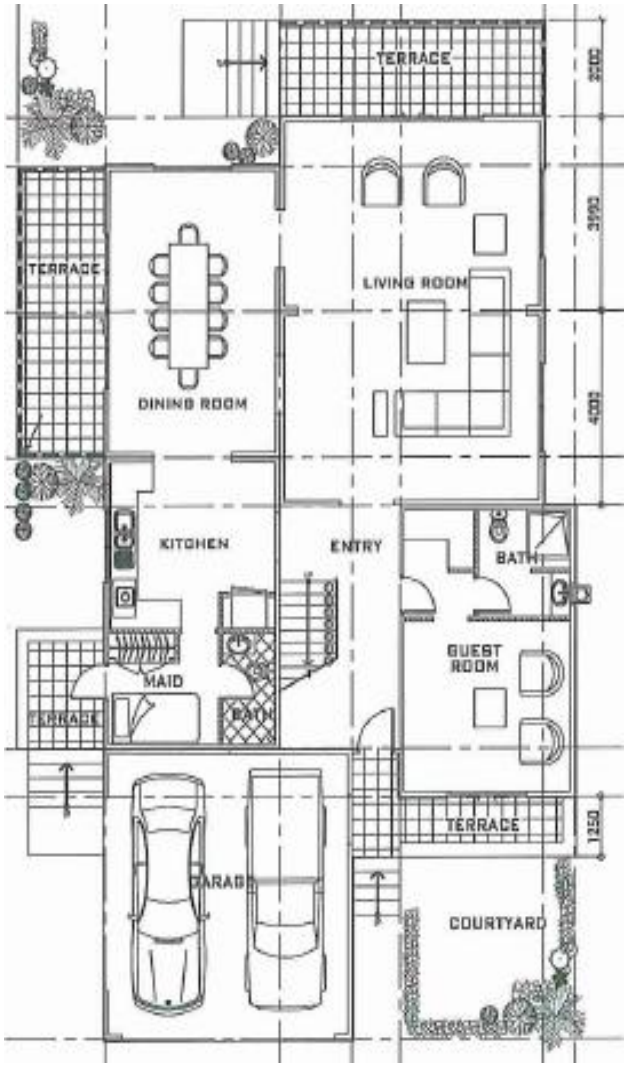
GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

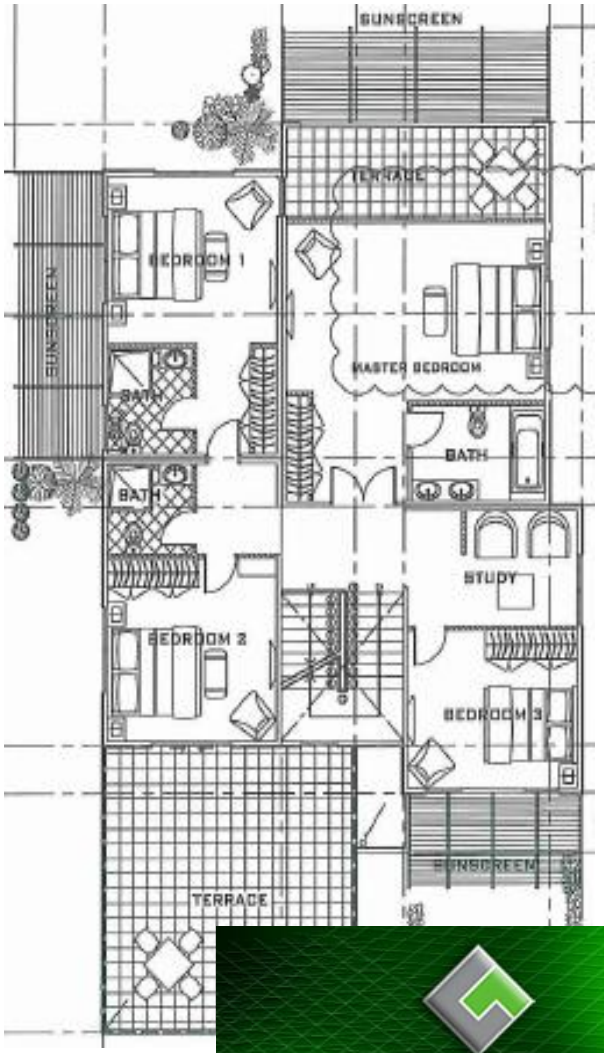
Al Ghadeer prototype villa

Construction January 2009

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

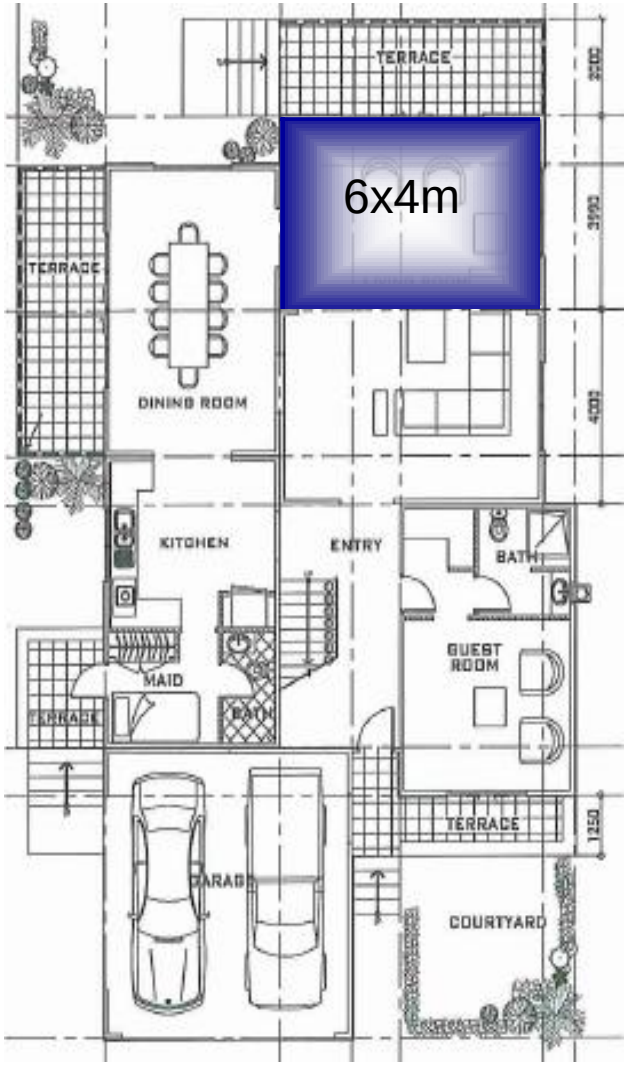
Al Ghadeer (ground & 1st floor)

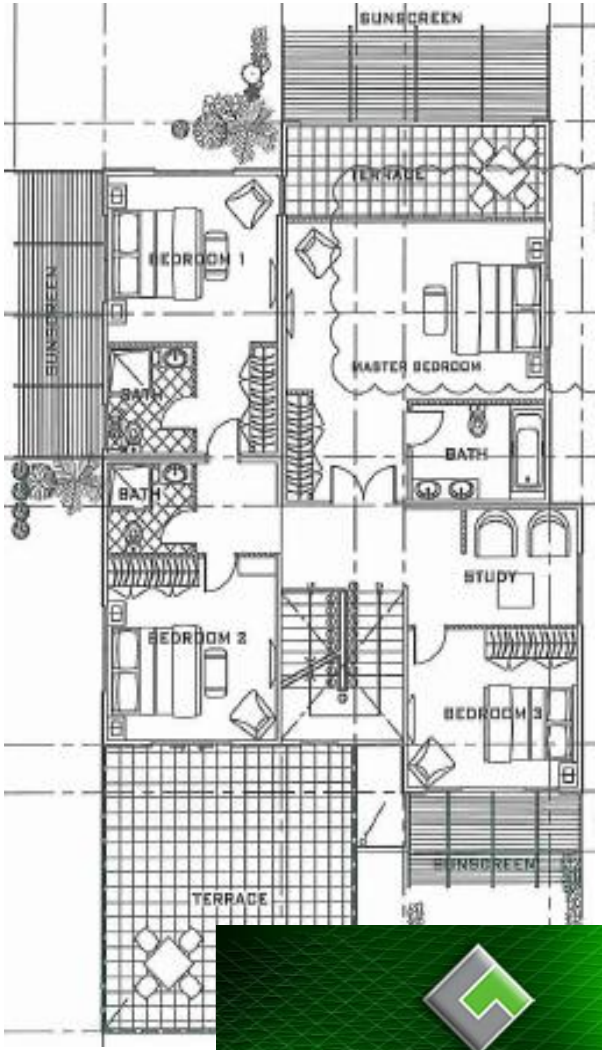




GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

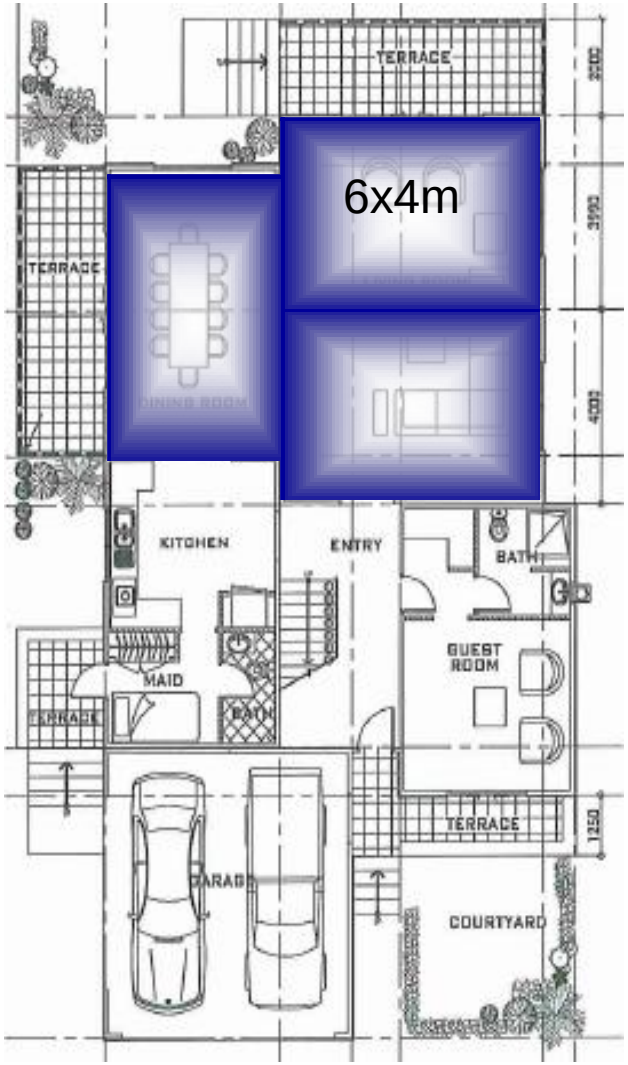
Al Ghadeer (module placement)

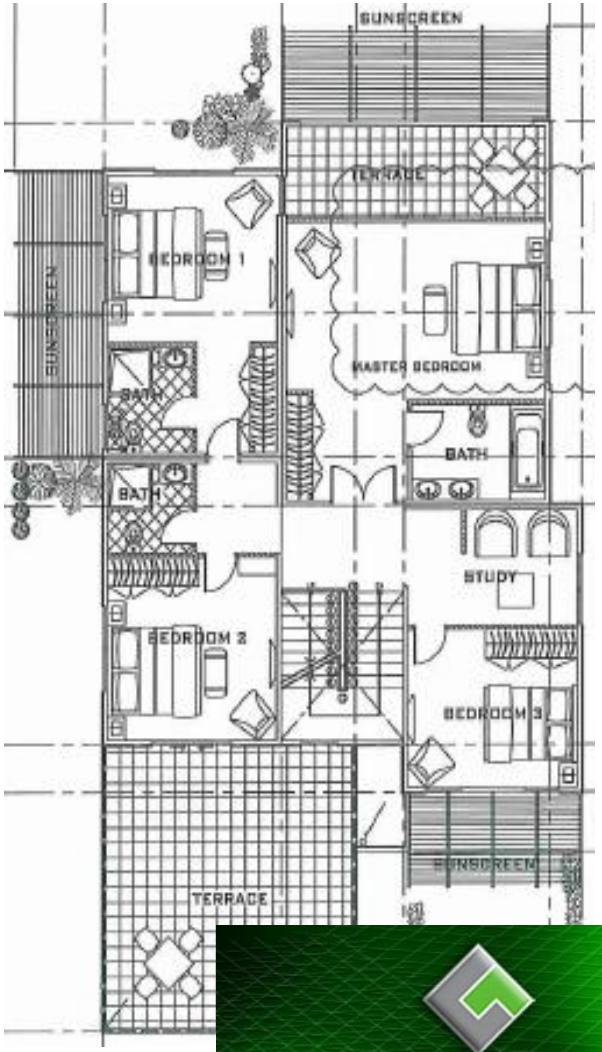




GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

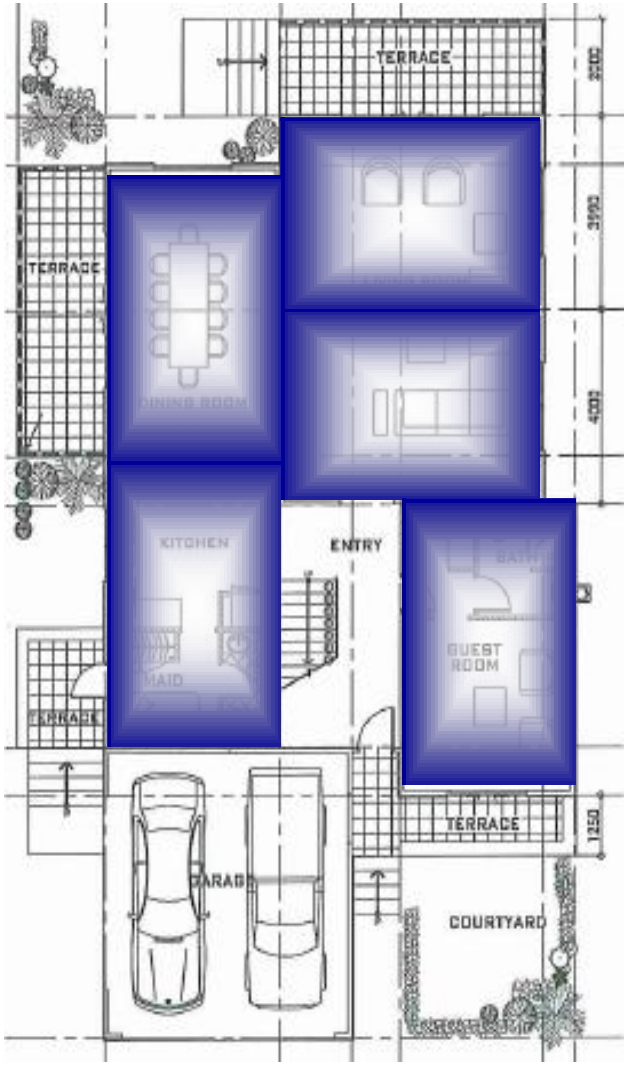
Al Ghadeer (module placement)

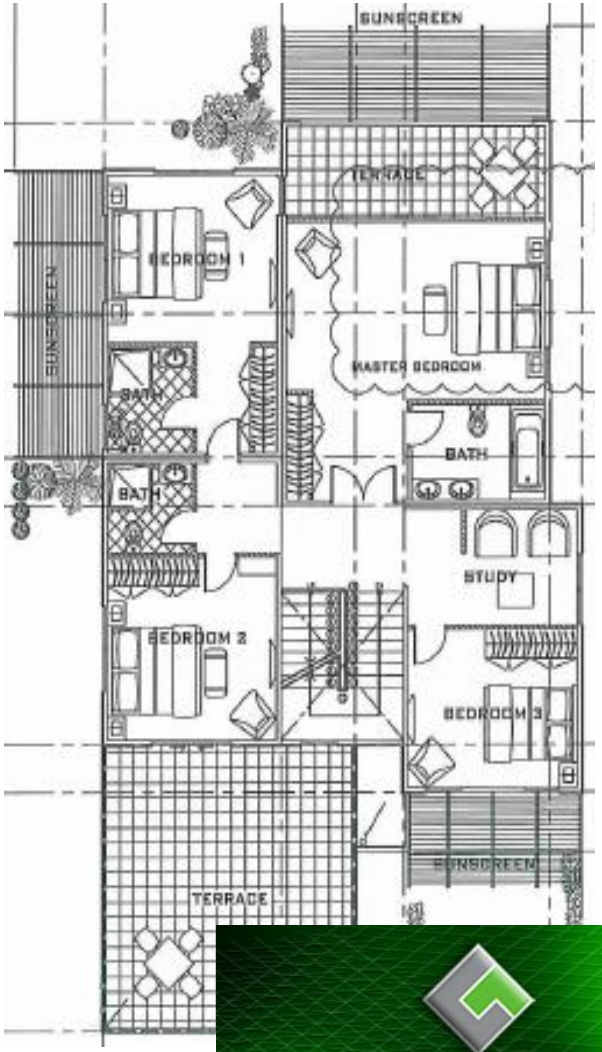




GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

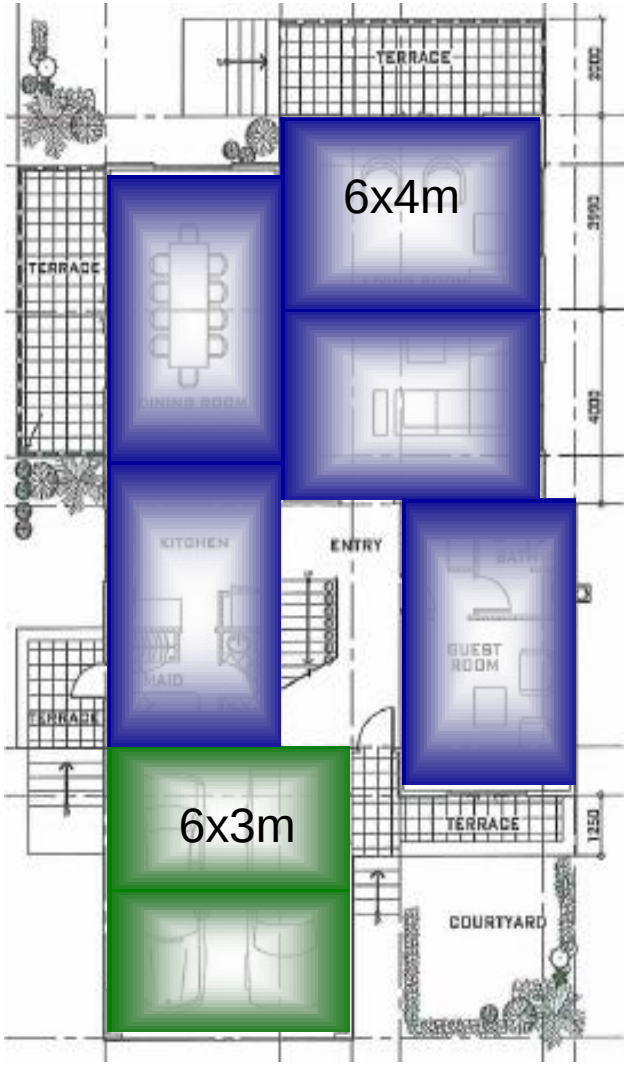
Al Ghadeer (module placement)

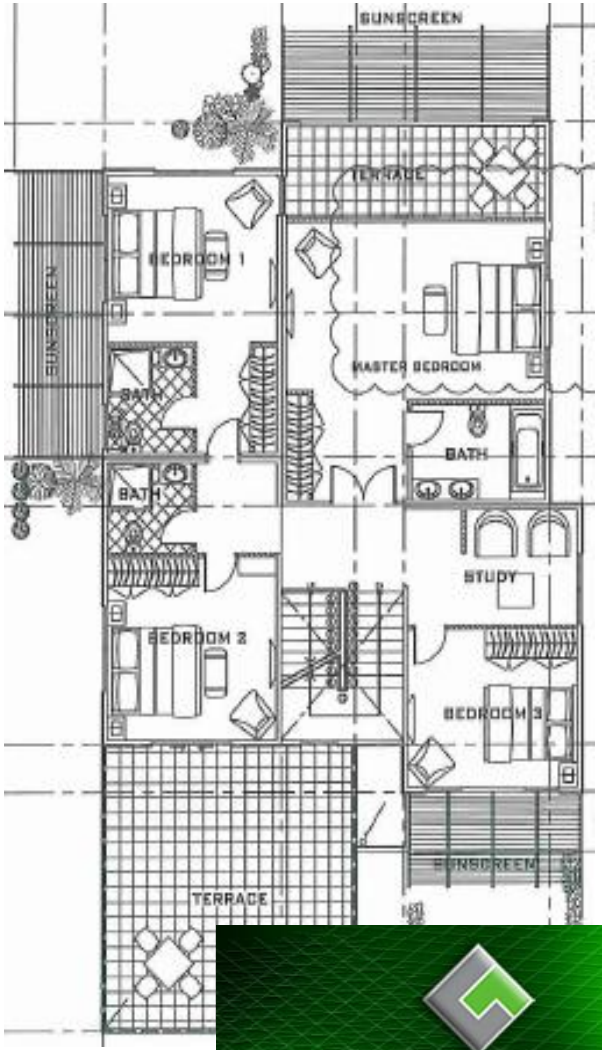




GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

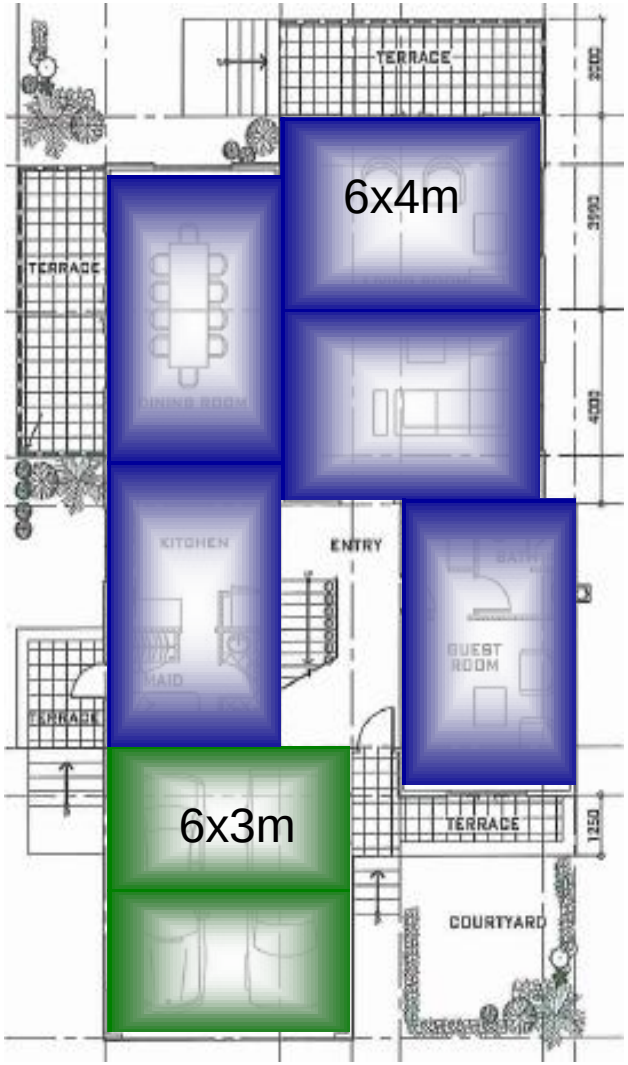
Al Ghadeer (module placement)

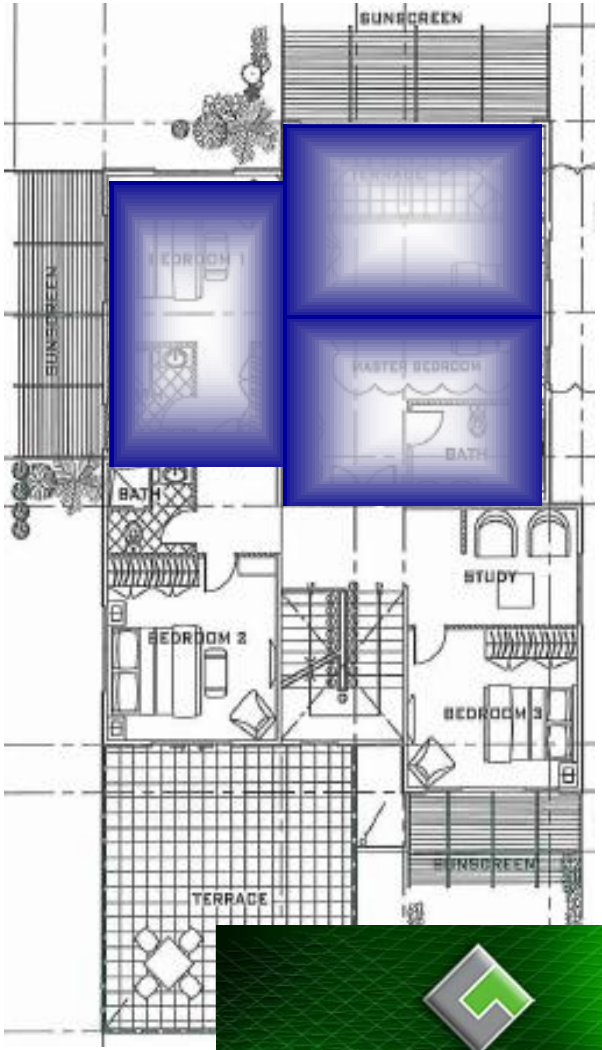




GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

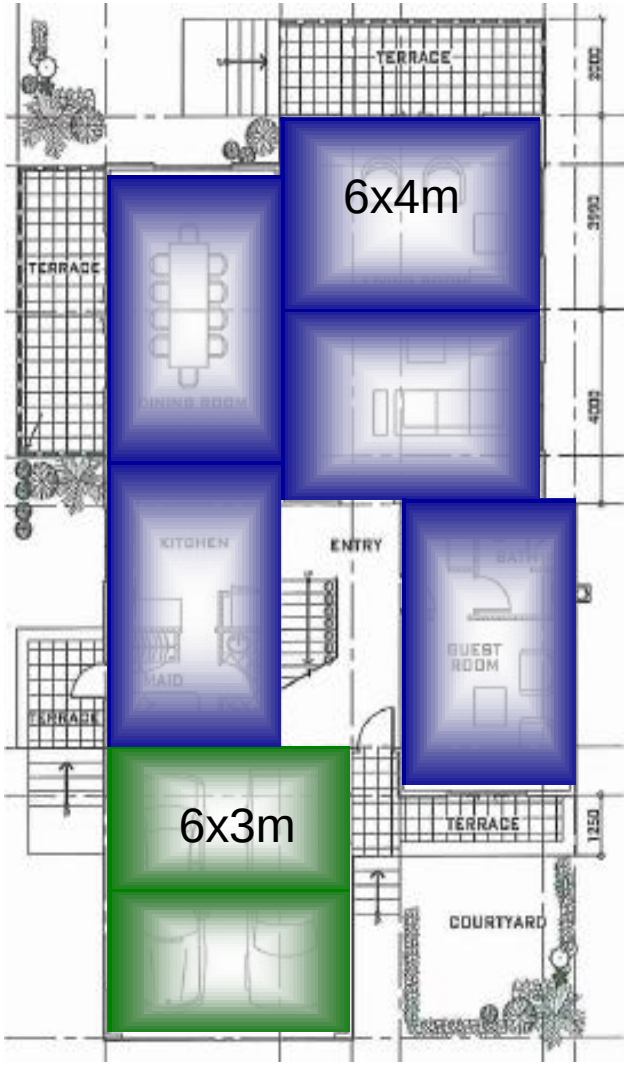
Al Ghadeer (module placement)

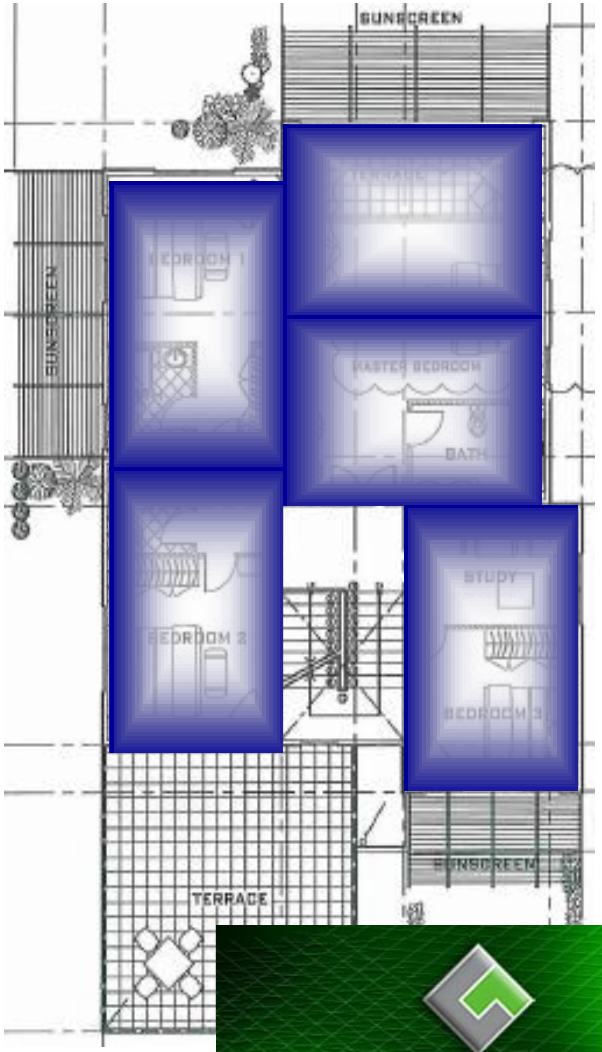




GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

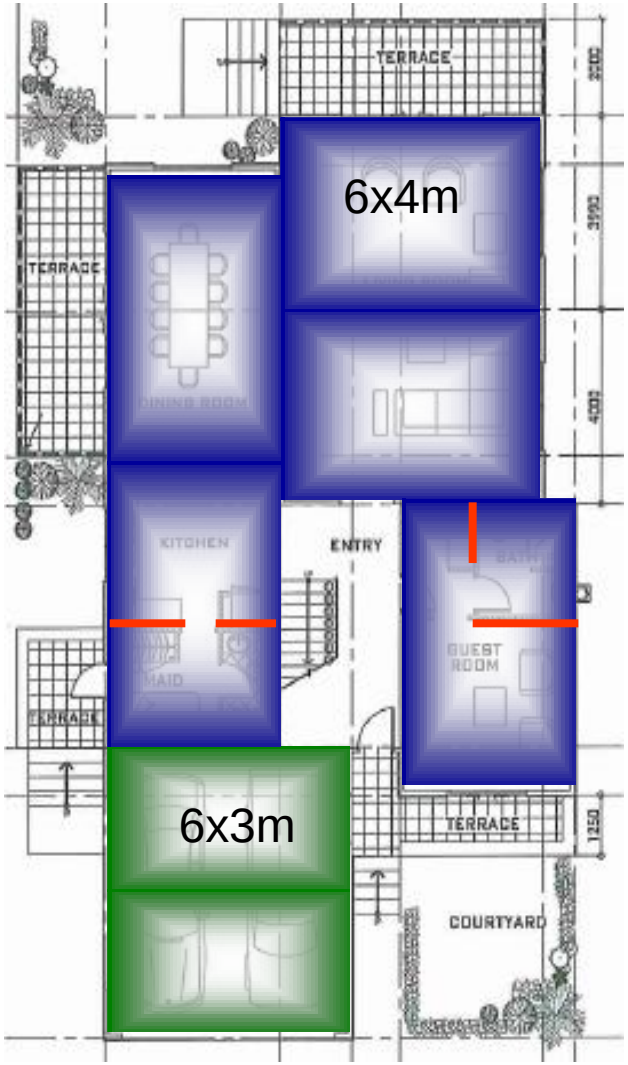
Al Ghadeer (module plans)

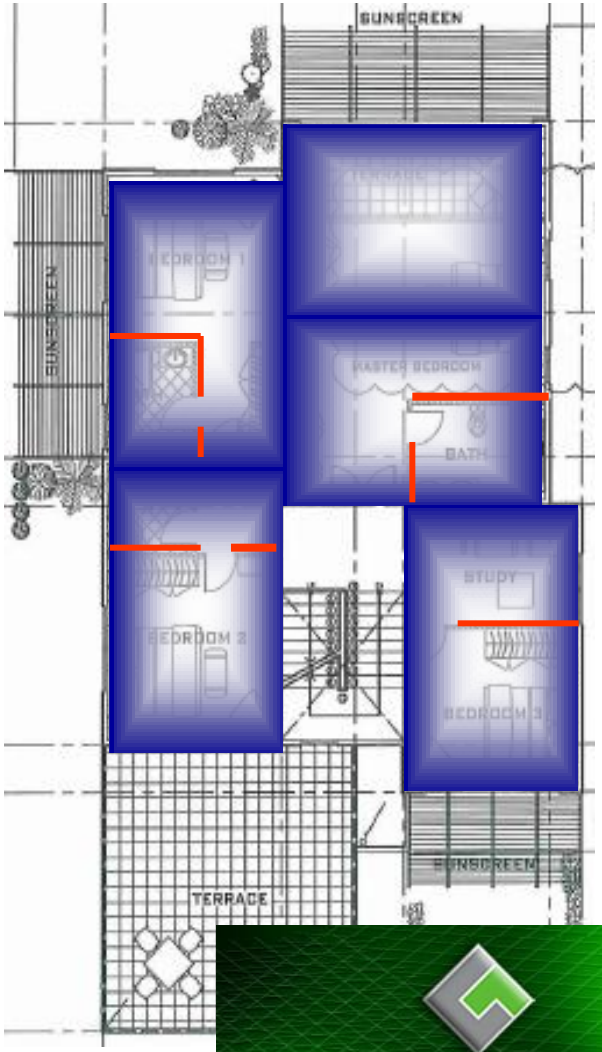




GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

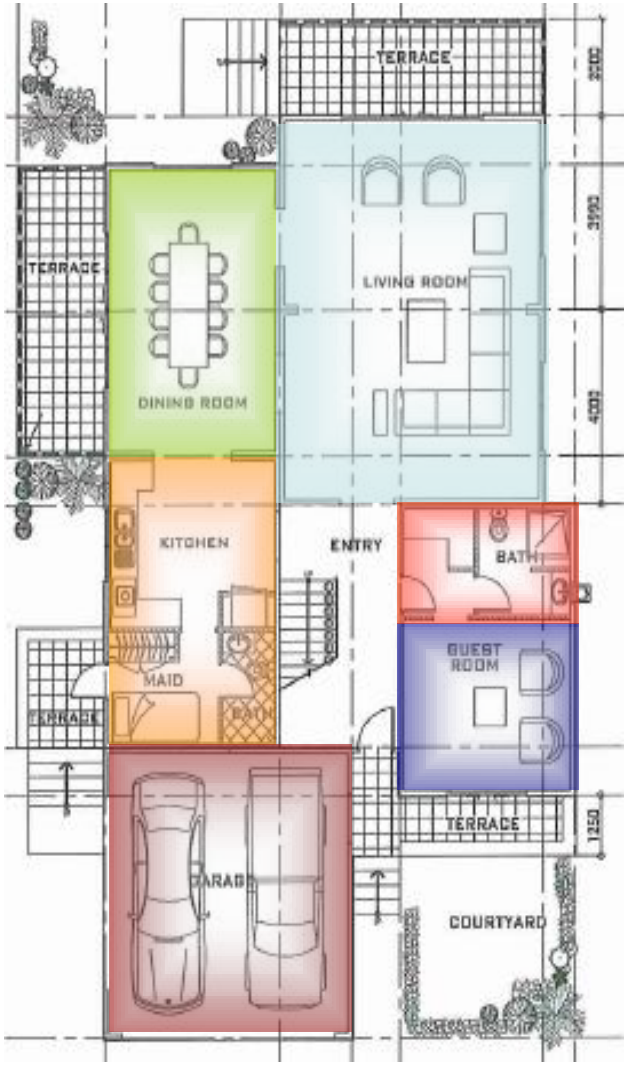
Al Ghadeer (additional internal walls)

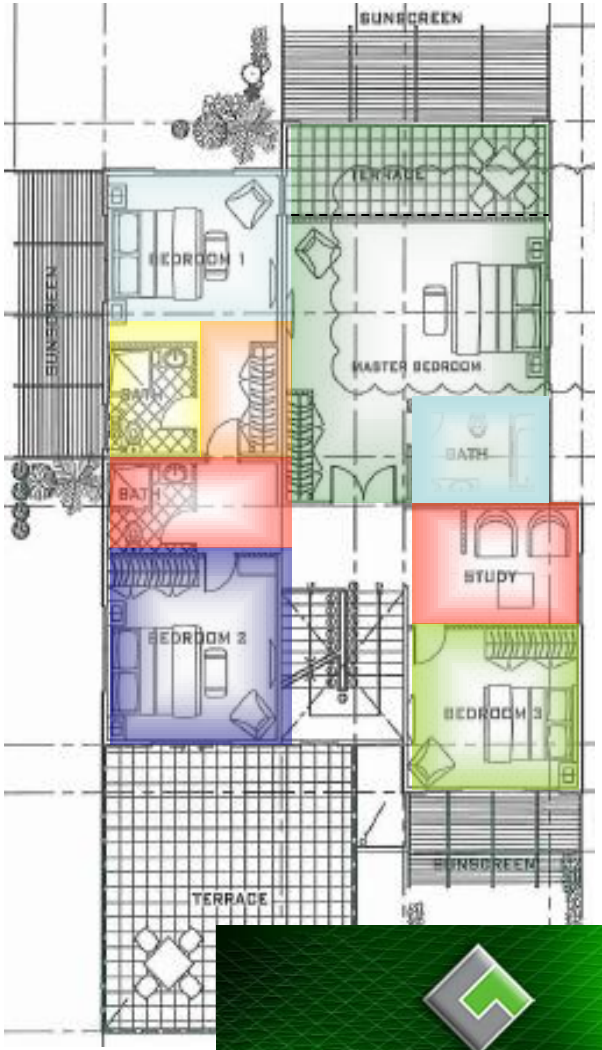




GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Al Ghadeer





GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

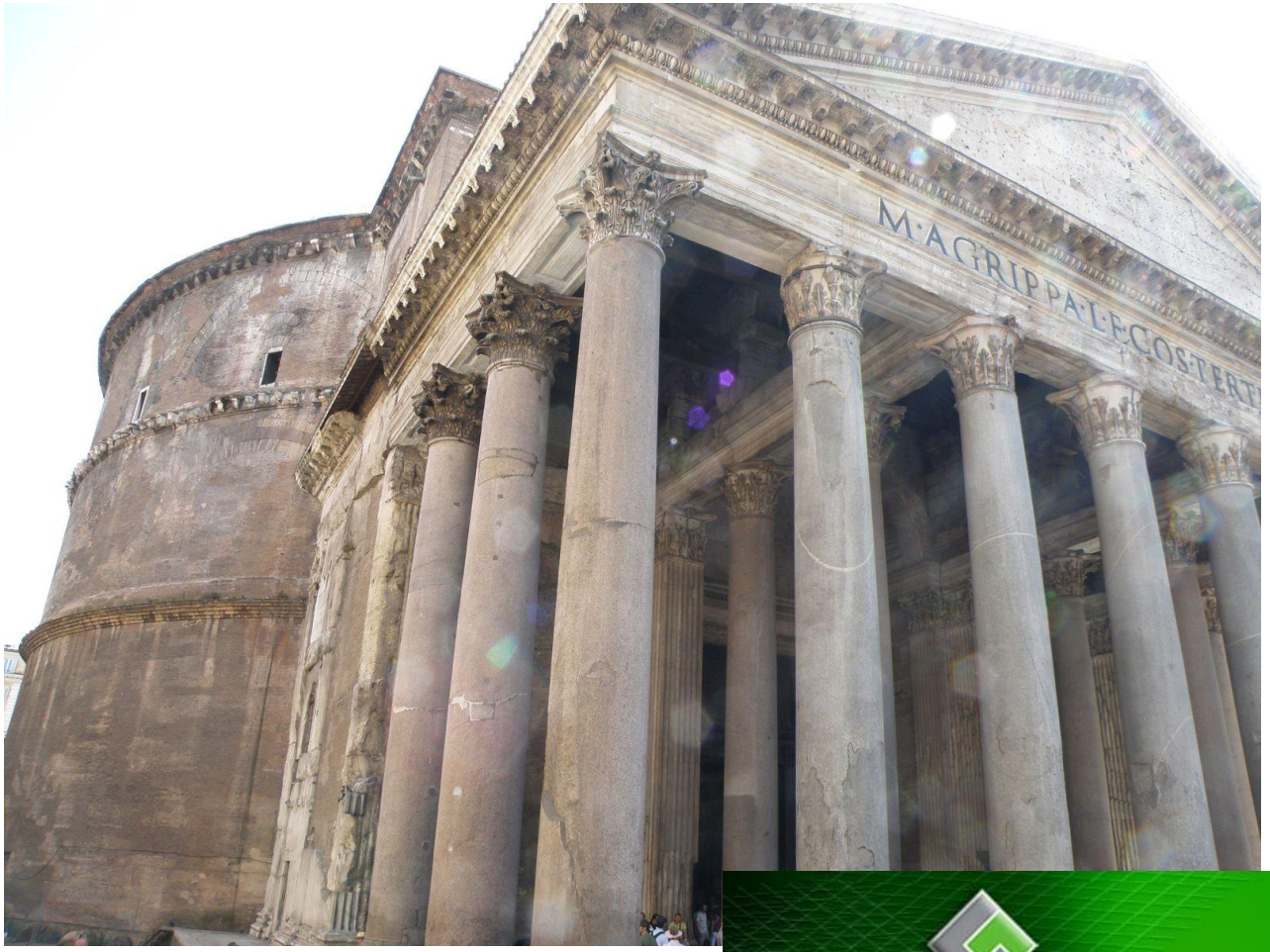
Green Precast Systems can be specified and designed into a project to the benefit of the environment and the project's bottom line

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Concrete lasts thousands of years

The earth's resources are best conserved if the service life of a building is prolonged, so the durability and longevity of concrete makes it an ideal choice.

Photo: the Pantheon the largest Roman concrete structure



GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Life Cycle of **Green** Precast Systems

The embodied energy of concrete is high yet it has a very long life and is low maintenance

When the embodied energy resources used to maintain it over this time are divided in to its operational life it is highly sustainable compared with other materials

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC


No formwork
GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC


Reduced
site
WASTE
GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Waste onsite is not lost . . .

…it often never even appears

…up to 90% reduction from Green Precast Systems

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

relocatable

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

recyclable

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

•High tech mould 12-24 hour cycle

•Cast in doors, window frames and MEP

Re-usable forms

Forms have a long life span

Re-use of forms reduces waste and debris at the job site.

Construction sites are cleaner, neater and quieter

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

up to 70% labour savings on installation

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

up to 50% faster construction times

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Speed > velocity of capital invested

- **Significant advantage of speed is that capital invested is returned in up to half the time**
- **Less risk of liquidated damages on late delivery of projects**
- **Income stream much sooner**

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Less materials

Monolithic construction **uses 5-25% materials** to achieve the same strength

- for sustainability initiatives
- at no extra cost to the project

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Sustainability Design Considerations

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Efficient Building Modules

An efficient building is one that integrates and optimises insulation levels, glazing, shading, thermal mass, air leakage control, and UV reflective exterior surfaces to minimise heat gains.

Green Precast Systems achieve this.

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Sustainability & Green Precast Systems

- A sustainable building lies in long-life, adaptable, low-energy design
- All features of Green Precast Systems

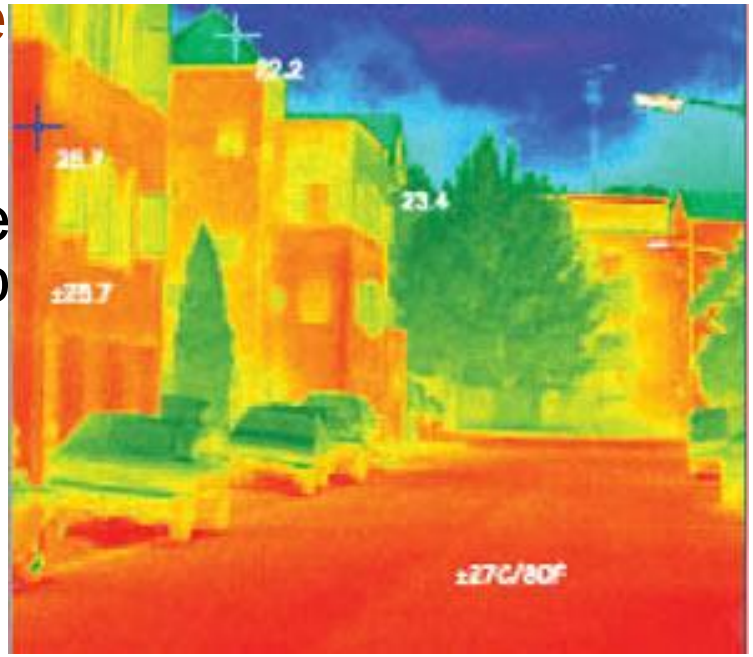
Reducing operational energy

- High reflectivity
- Thermal mass
- Insulation
- Shading
- Interior air quality
- Durability

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Cooler communities

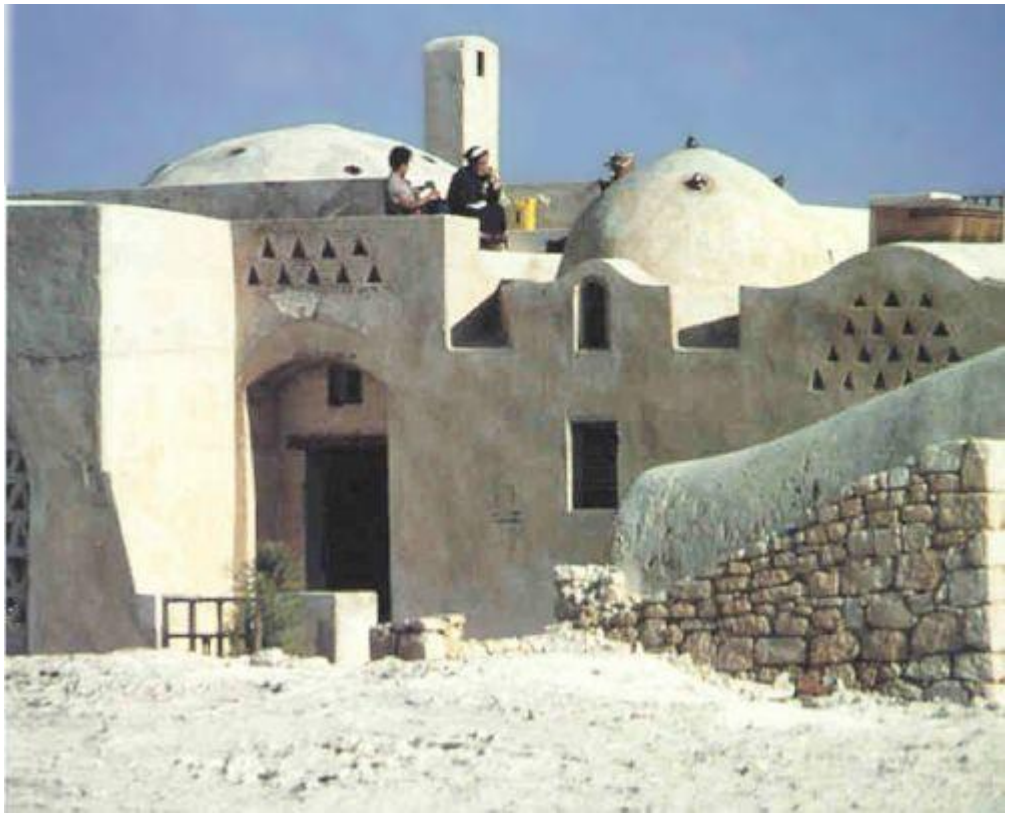
- Reflective precast concrete can moderate the heat island urban effect
- “Cool” roofs and walls have proven to lower the need fo a/c up to 50%
- Solar reflective paints can increase this efficiency. Green Precast Systems paints have the highest reflectivity in world. Available to wider market.



GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Thermal Mass

- Use thermal mass in combination with insulation
- Thermal mass with insulation provides energy benefits that exceed the benefits of mass or insulation alone



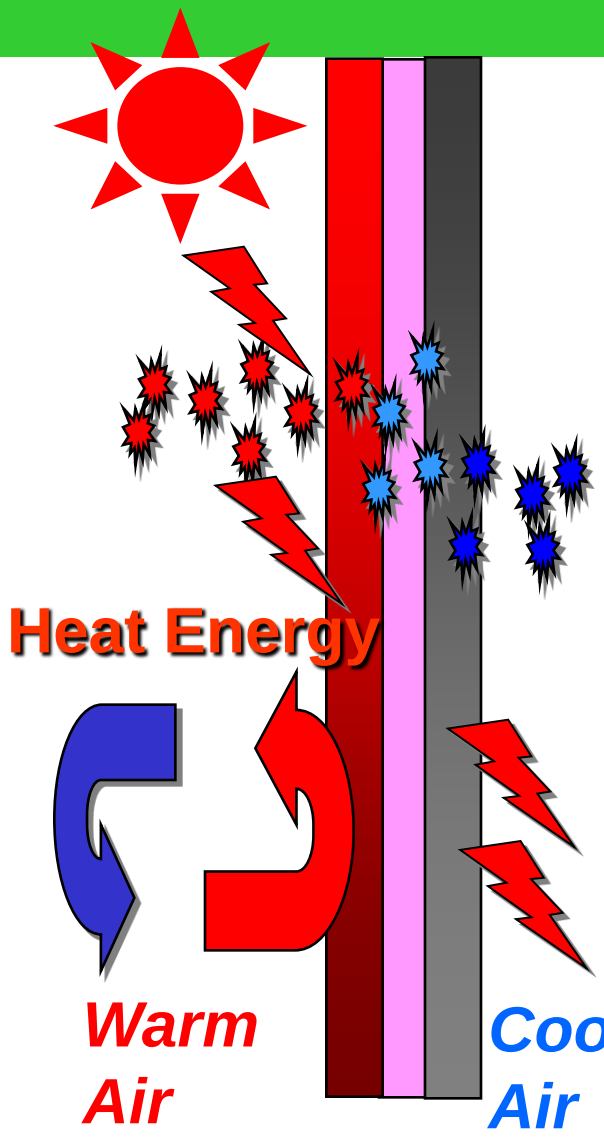
GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Thermal mass

- By storing and releasing the energy needed for cooling, concrete's thermal mass delivers year-round energy benefits by reducing temperature swings in buildings.
- Thermal mass impacts the size of HVAC systems.
- Thermal mass can reduce energy for cooling by up to 50%.

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Insulation



Improving wall and roof assembly performance

Energy transfer is minimized by wall design:

- Add insulation
- Add mass
- Minimize thermal bridging
- Minimize infiltration & exfiltration
- Control moisture

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

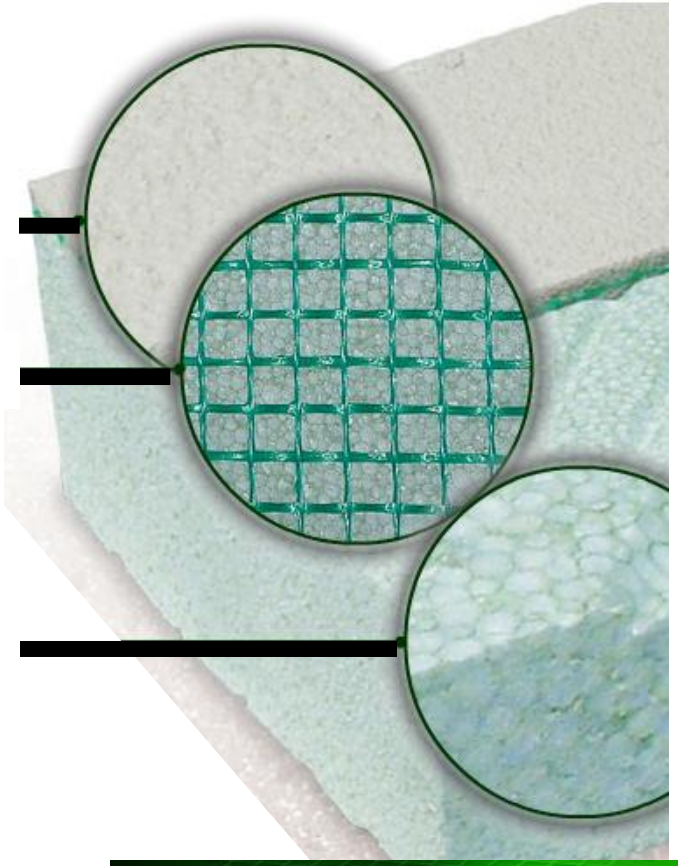
Insulation

Sandwich core insulation

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Insulation

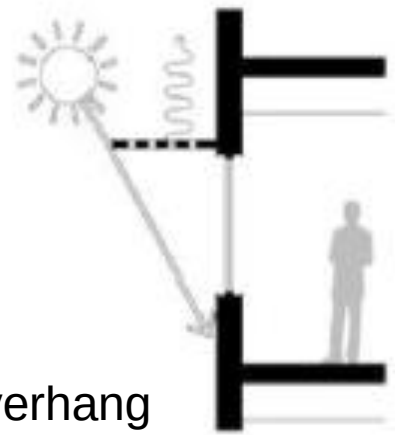
Save Energy Costs up to 40%!



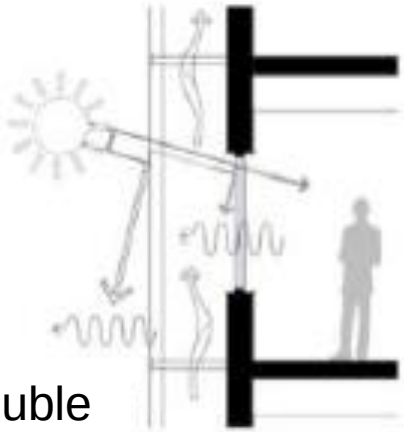
- External Insulation System
- Abu Dhabi municipality approved
- Applied externally to modules for thermal mass benefit and rendered

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

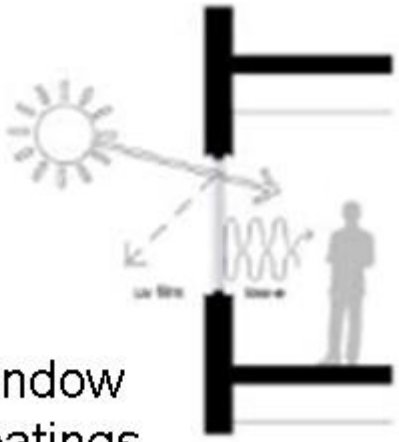
Window treatments



overhang



double skin



window coatings

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Shading

- Deep recessed windows allow indoor daylighting without heat buildup
- Double and insulating glazing reduce heat transfer through glass

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Shading

- The inclusion of shading over windows can greatly reduce heat gain and air con use.

Photo: Photovoltaic awnings over windows

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Indoor air quality

Indoor environmental quality

Excellent sound and fire protection and high thermal mass touch on every aspect of sustainable design as well as the important aspect of increased consideration for people's health and safety

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Indoor air quality

People spend up to 90% of their time indoors.

- The simple lines and smart edges of **Green Precast Systems** are easy to keep clean.
- Concrete is an inert substance so it doesn't give off any gasses, toxic compounds or volatile organic compounds.

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Durability

Fire resistance

- Because precast concrete is non-combustible – it does not require additional fire-proofing applications.
- 1-2 hour fire rated.

Durability

Corrosion Resistance

- Quality control in manufacture
- 40+Mpa concrete less porous
- Vibration reduces air content
- Waterproof -painted or rendered with Green Precast products

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Durability

Inedible to Vermin & Insects

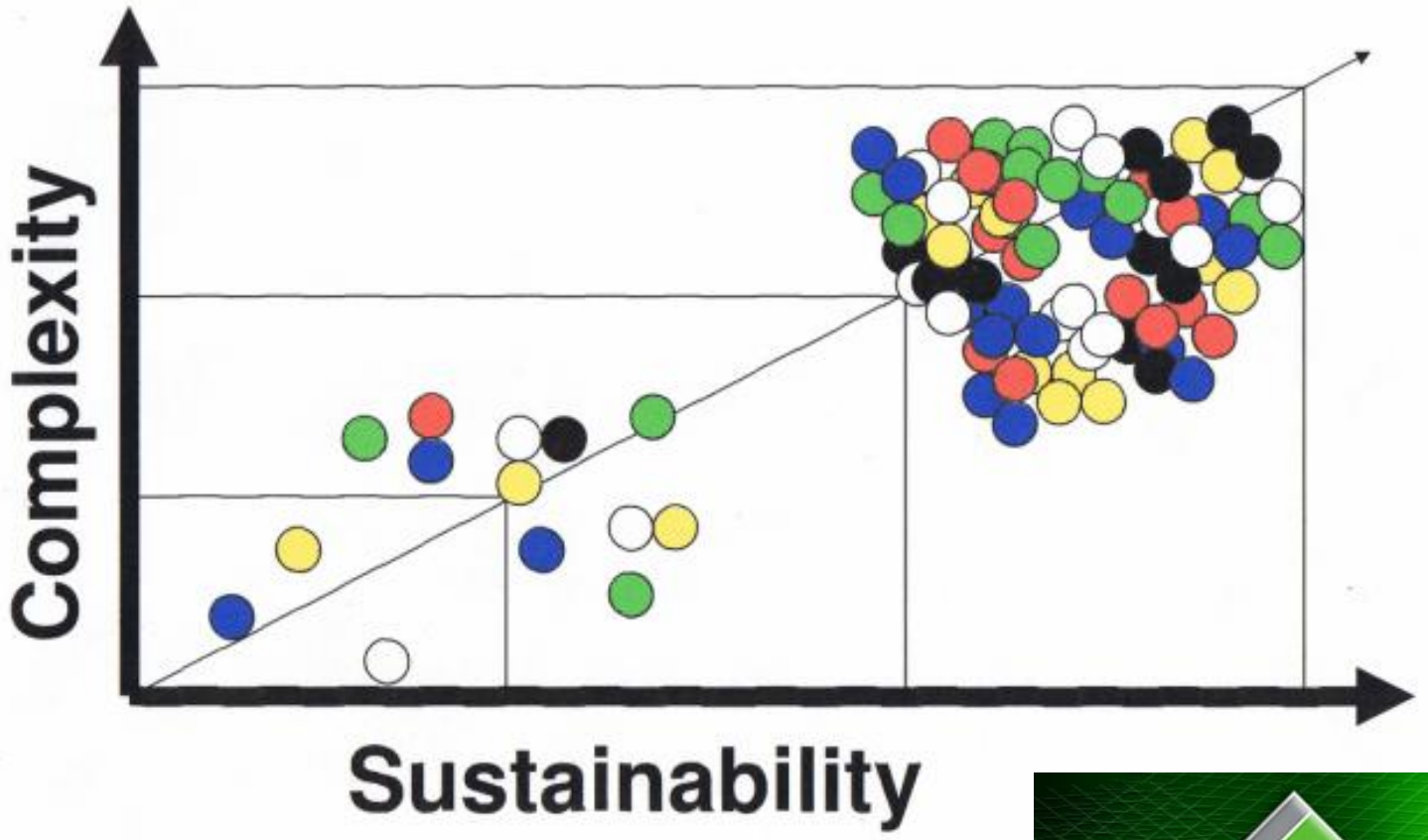
- Vermin and insects cannot destroy concrete because it is inedible.

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

How to achieve Sustainable Design

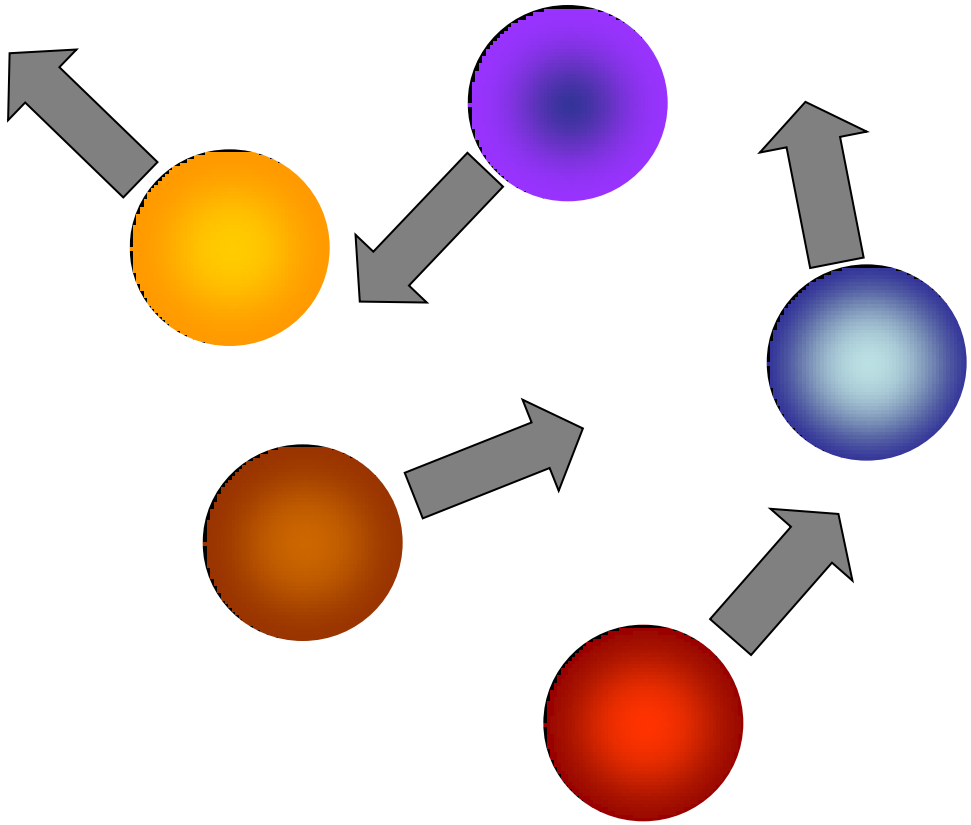
GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

The complexity of sustainability



GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

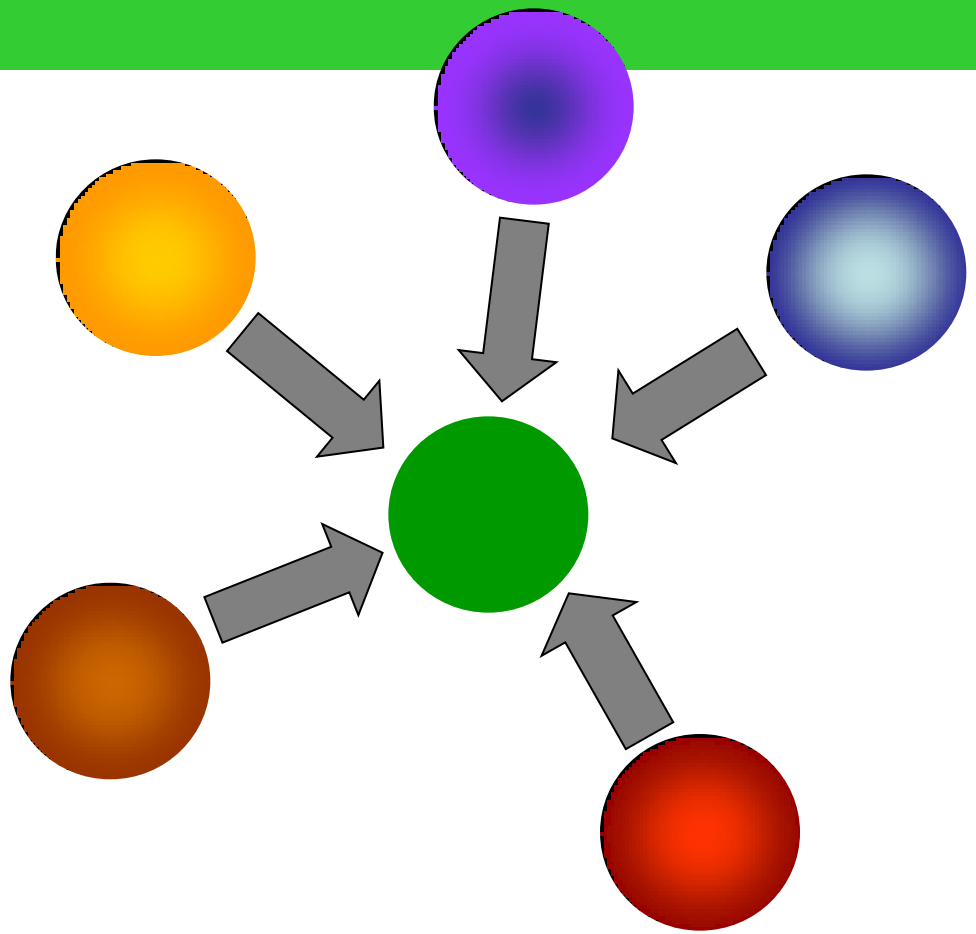
Evolution of holistic design



No focus on sustainability outcomes

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

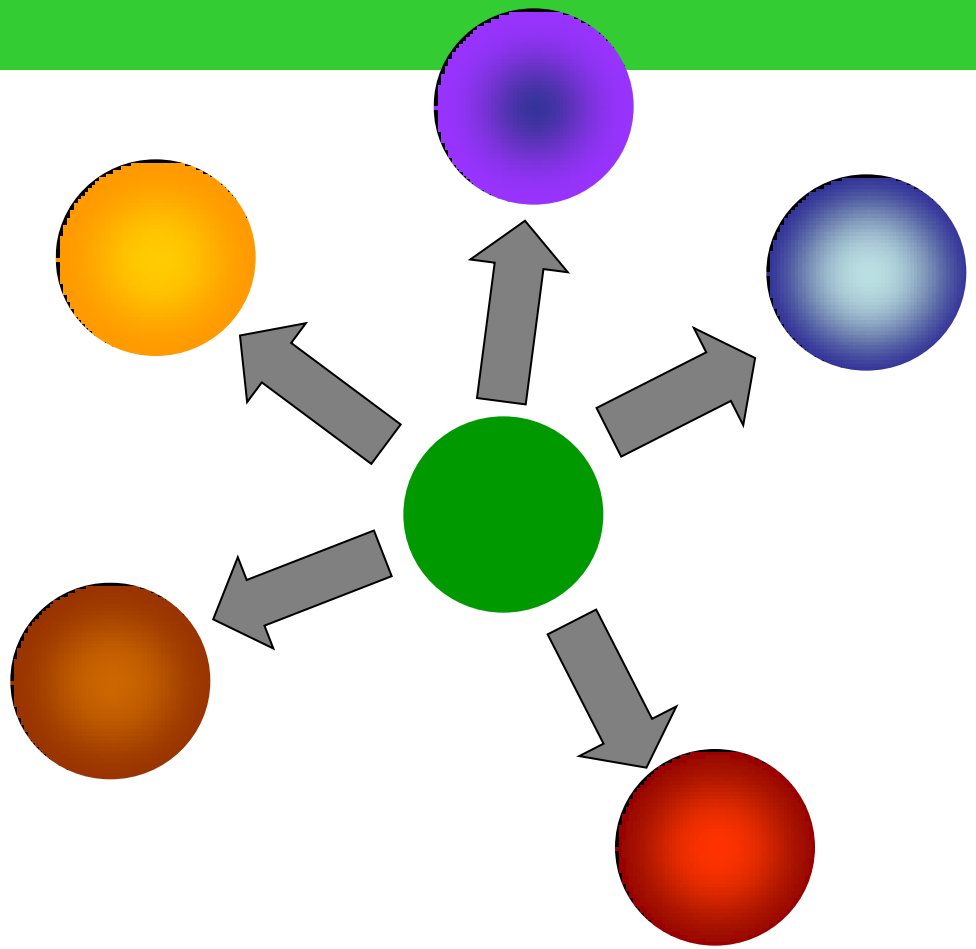
Evolution of holistic design



Focus on sustainability from their perspective

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Evolution of holistic design

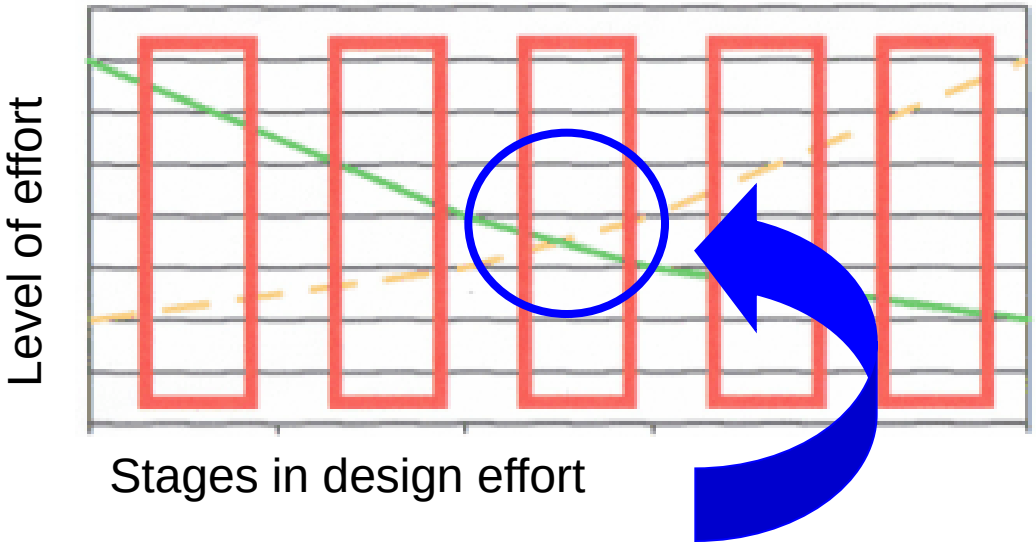


Group defines sustainability outcomes they wish to achieve, defines links and opportunities. Require high degree of ongoing communication.

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

Sustainability cost-effectiveness

- Good design produces cost neutral outcomes
- Holistic design must be undertaken at outset of project to achieve this



Level of effort

Opportunities to implement cost effective integration

GREEN PRECAST
SYSTEMS AND TECHNOLOGIES LLC

شكرا لك

Thank you