

Low-carbon Homes Construction Cooling



Interlocking Blockwork Masonry

May, 2020

Construction Technology

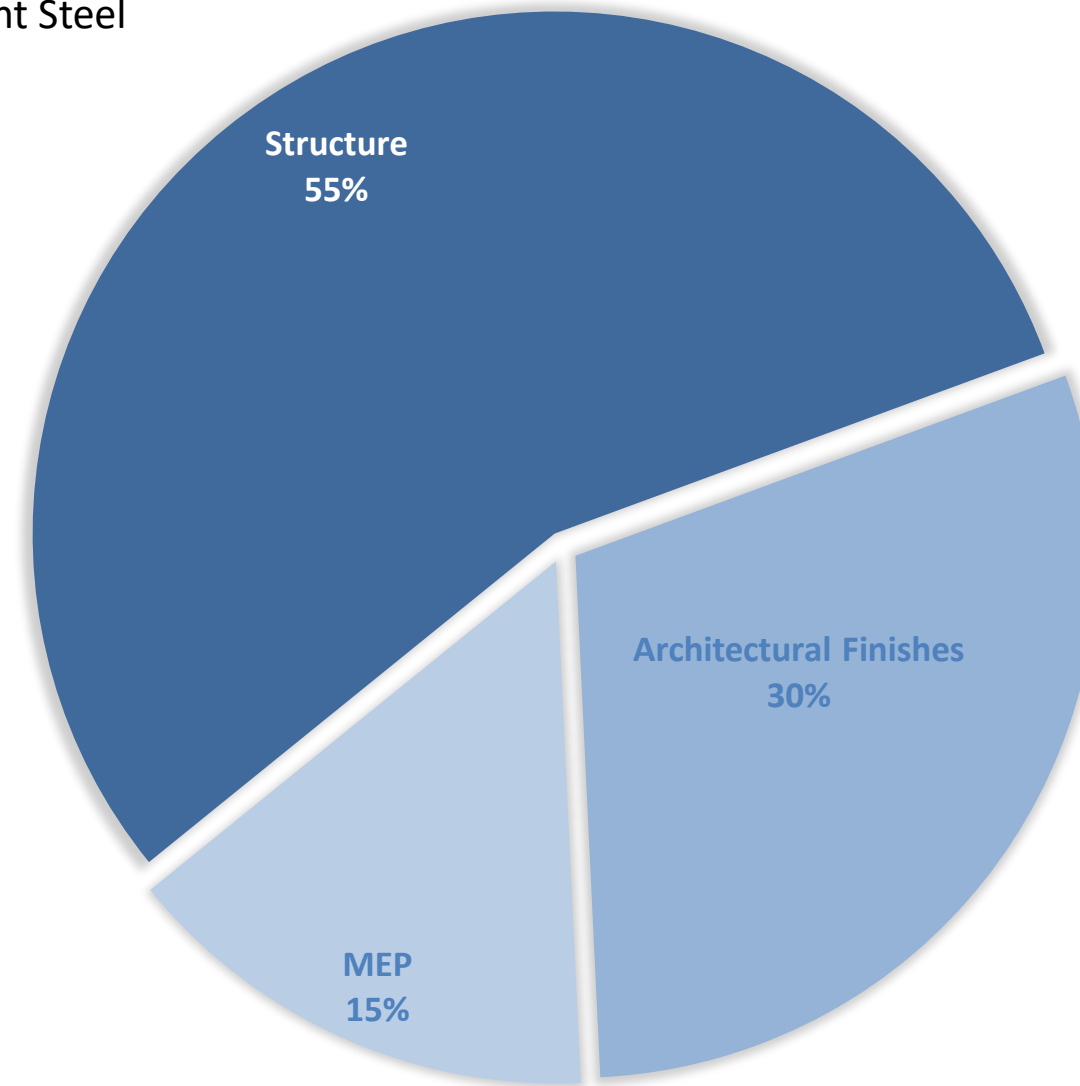


ASHOK B. LALL ARCHITECTS

BUILDING COST DISTRIBUTION

Structure contributes to more than 50% of the construction cost in a building. The Hollow interlocking blockwork masonry is a structural system that helps bring down this cost substantially.

- Plain Cement Concrete
- Reinforced Cement Concrete
- Reinforcement Steel
- Shuttering
- Blockwork



- Plumbing (Piping & Fixtures)
- Electrical
- Lifts

LOWER EMBODDED ENERGY BY:

MINIMISING STEEL INTENSITY

USING LOW EMBODDED ENERGY WALLING

MINIMISING WALLING MATERIAL

MINIMISING FINISHES

- Door windows and Ventilators
- Flooring
- Internal Paint
- External Plaster/ Paint
- Balconies & window shades
- Stair and passage railings

Interlocking Blockwork Masonry

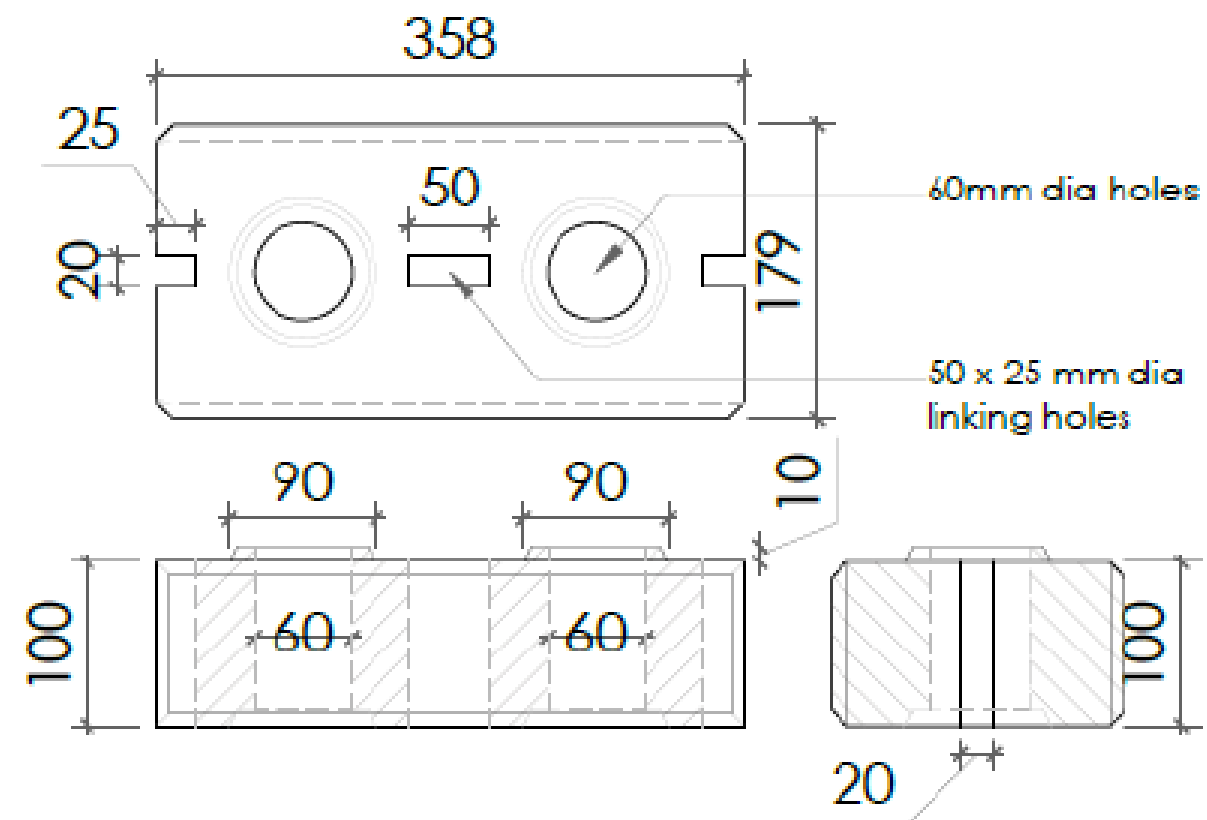
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Construction details



The hollow interlocking blocks comprises of a regular block and a U shaped block for the lintel band. Each block has 2 x 60mm dia holes for running reinforcements and electrical lines while 1 x 50 x 25 mm and 2 x 25x25 mm rectangular holes for linking blocks with concrete slurry.



Regular hollow interlocking concrete block



U shaped hollow interlocking concrete block

THE BLOCK

This construction system is based on a concrete block module.

- The geometry of the block has grooves and depressions which allow the blocks to interlock and stay in place without mortar between courses. Thereby reducing construction time.
- The slits at the edges allow for cement slurry to be poured in to connect the blocks vertically
- The hollows in the middle reduce the block volume while allowing periodic reinforcement to be integrated into the blockwork for tensile strength.



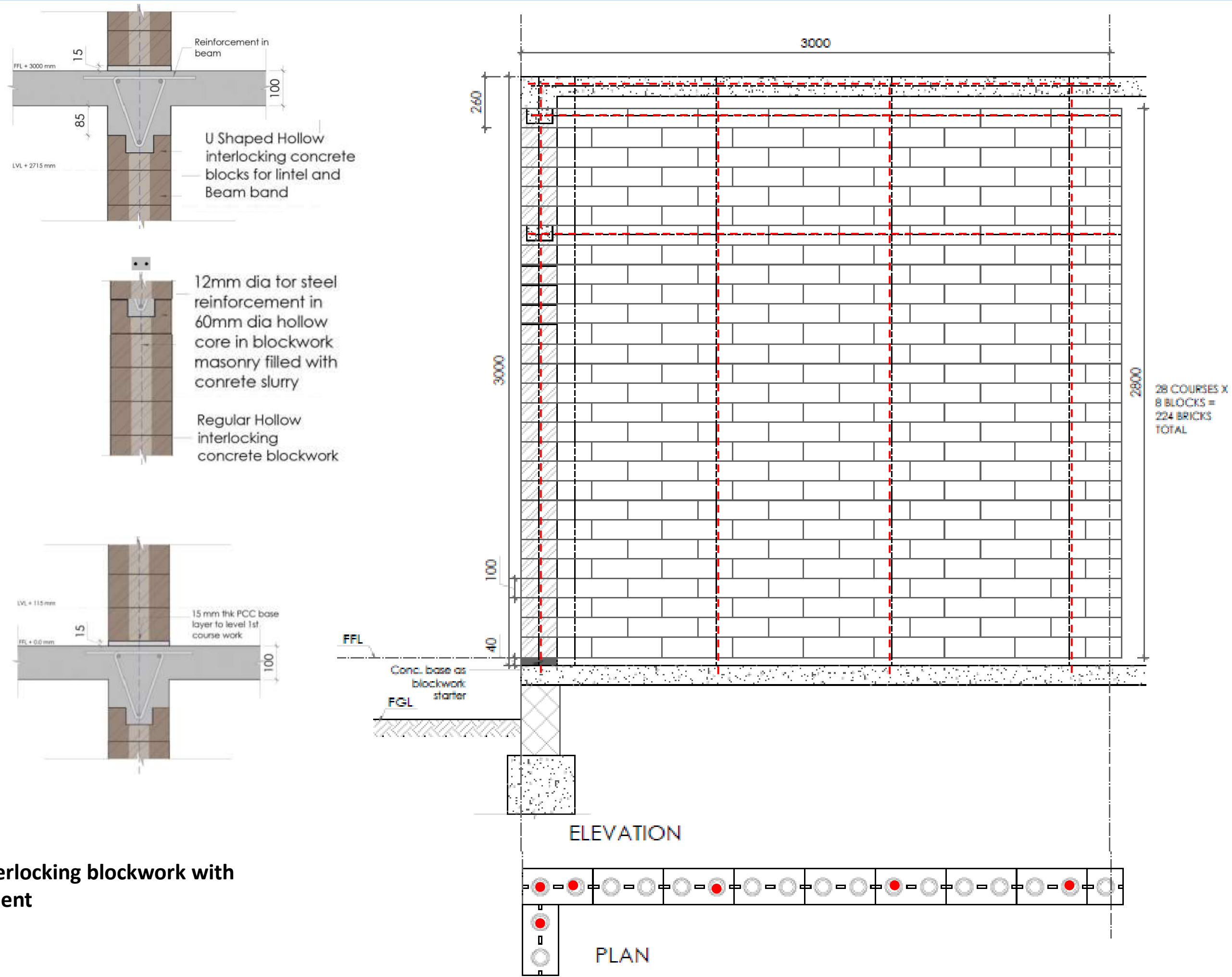
THE SYSTEM

This construction system is a constrained masonry system which is primarily loadbearing with some vertical and horizontal steel reinforcement to tie the structure together and provide strength against lateral forces.



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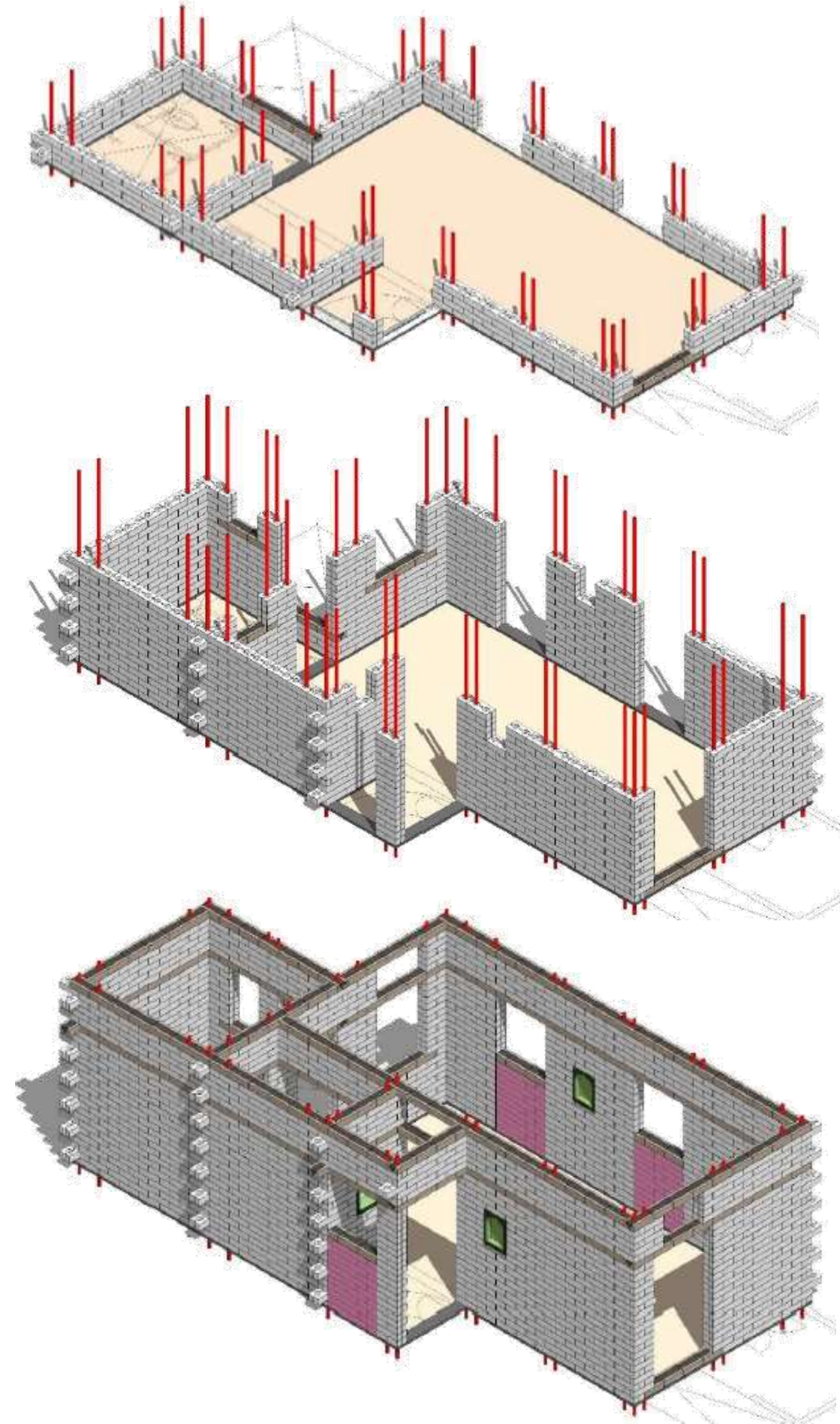
WALLING SYSTEM – HOLLOW INTERLOCKING REINFORCED MASONRY



Hollow interlocking blockwork with reinforcement

ADVANTAGES OF INTERLOCKING BLOCK MASONRY

Sl. No.	Parameter	Advantage
1.	Blocks	Engineered to any performance requirement, easy to handle and place, low water absorption,
2.	Masonry	Quick construction, less mortar, embedded modularity, higher masonry efficiency, thickness of wall is optimal
3.	Introduction of reinforcement	Can be easily reinforced, the reinforcement can be introduced in stages after construction of 1.0m height of wall. The lap length of the reinforcement need not be tied, an overlap is sufficient to enhance the performance. If a construction sequence is developed which ensures tying of reinforcement over the lap length, the performance can only be expected to become even better
4.	Structural performance	Strength and stiffness is higher, enhanced shear strength, flexural strength and axial load capacity.



STRENGTH & DESIGN TESTING

The construction system has been tested for structural strength & stability by Structural Masonry Resource Center at B.M.S. College of Engineering, Bangaluru, India



NO CURING OF WALLS
PUTTY OVER MASONRY JOINTS --- PAINT !





The need for cooling the body
when one is feeling uncomfortably warm is self evident

The hand fan is such a natural invention
Fan your face when you need it

At times of rest or leisure !

ADAPTATION
(behavioural)

COOLING WITHOUT AIR CONDITIONING – BEYOND COVID-19





And a beautiful and rich culture of artefacts evolves over centuries

ORGANIC ADAPTIVE DESIGN : Mind-Body-Tool continuum









SYMBOLISM OVERRIDES





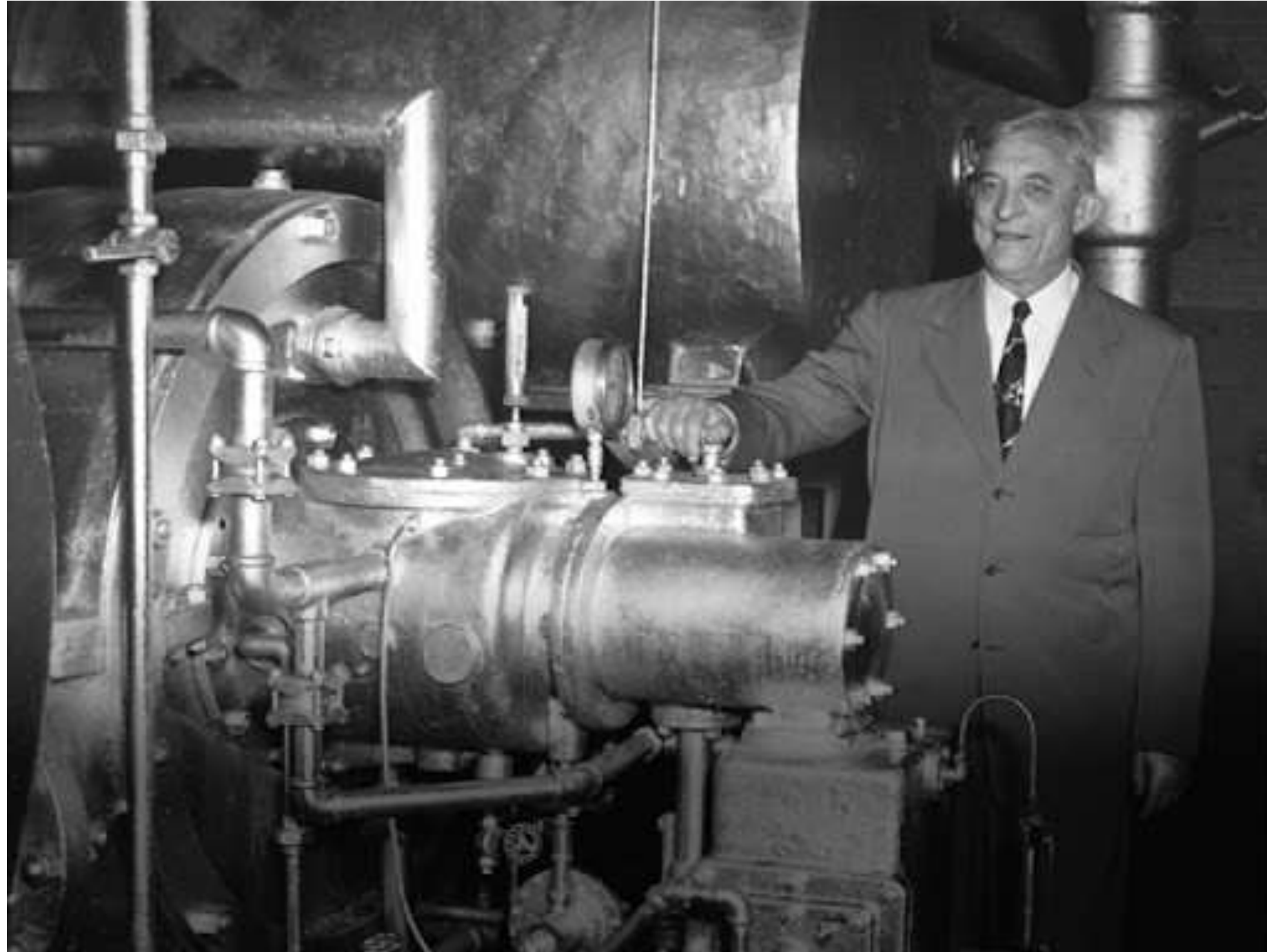
DRY BULB TEMPERATURE – 29 ° Celsius

WET BULB TEMPERATURE – 24 ° Celsius



1902

Controlled Indoor air quality



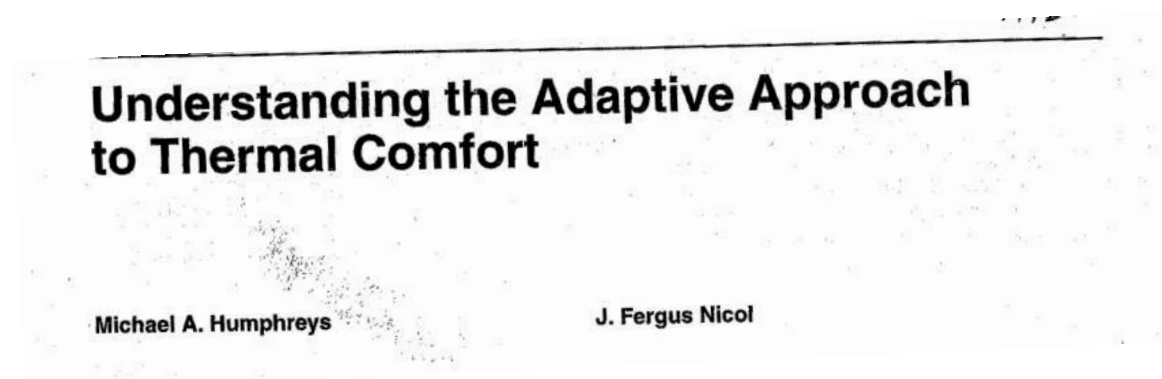
Carrier invented the first electrical air conditioning unit in 1902.

Sackett-Wilhelms Lithographing & Publishing Company of [Brooklyn](#)



Humphreys & Nicol

1998

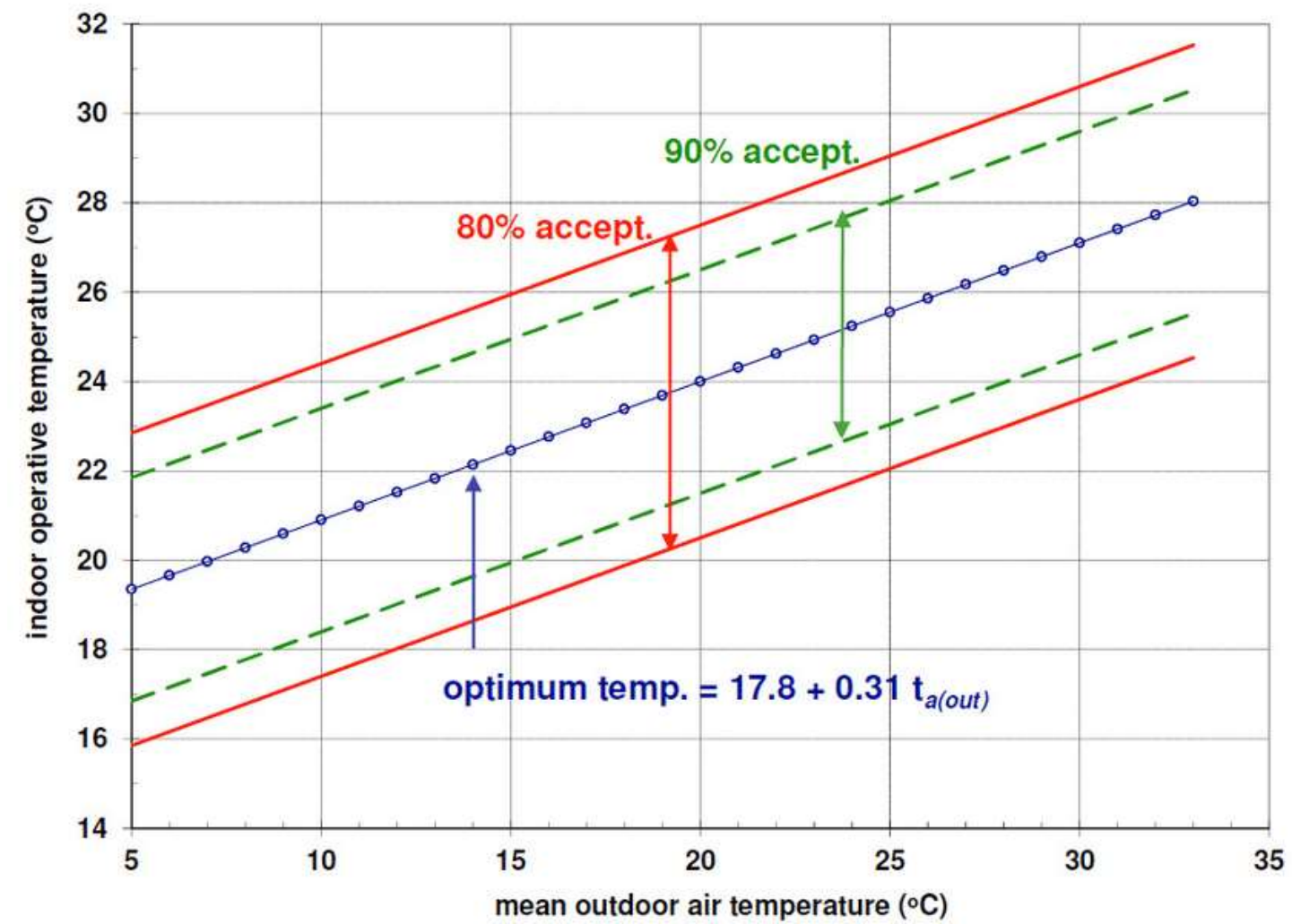


Humphreys and Nicol 1998





Richard de Dear



The ASHRAE 2004 (2010) adaptive comfort standard in
naturally ventilated spaces



Gail Brager



ADAPTIVE RESPONSE TO DISCOMFORT

Physiological and Behavioral

17 deg C – 36 deg C

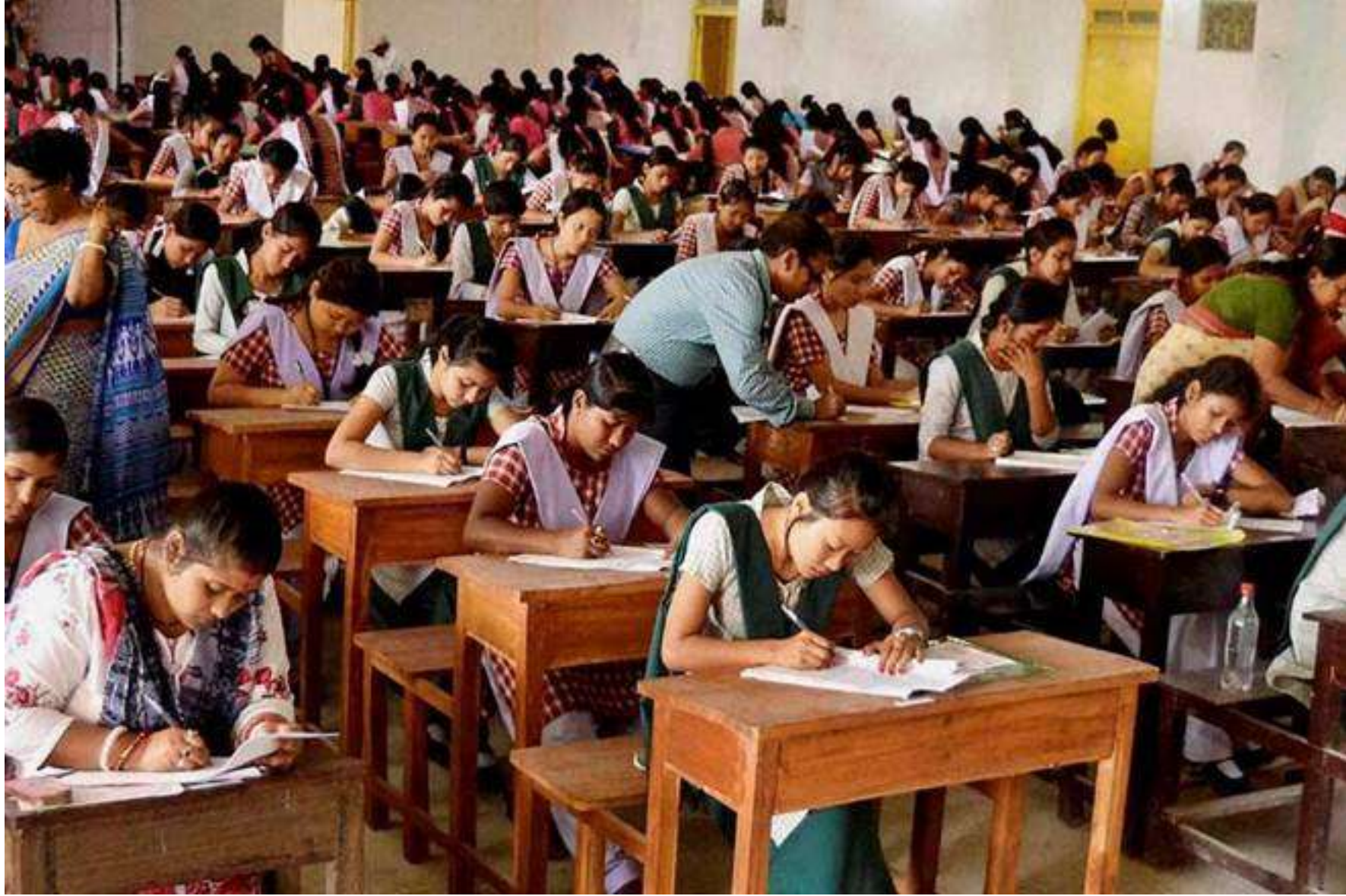


AT THE SAME TIME, SYMBOLISM
OVERRIDES THE ADAPTIVE RESPONSIVE











FOR THE MIDDLE CLASSES, AIR CONDITIONED PUBLIC SPACE BECOMES THE NORM







AIR CONDITIONING FOLLOWS COMMERCE FOR THE WEALTHY







DB
80

PM 2.5

600

PM 2.5

600

DB
80

PM 2.5

600



PM 2.5

600

PM 2.5

600

PM 2.5

600

DB
80

DB
80





**HIGH DENSITY INTENSIVE DEVELOPMENT = POLLUTION AND
URBAN HEAT ISLAND EFFECT WITH RISING TEMPERATURES**



D.G. SHED
Built Up Area : 2200 sq.m

WORKSHOP
Built Up Area : 6340 sq.m

OFFICE
Built Up Area : 4945 sq.m

CLASS A



CLASS B



CLASS C

Richard de Dear – “ PMV is around 80% for all three classes of comfort design!

THE ENIGMA OF AIR CONDITIONED COMFORT AND THE IMPERATIVE OF FOR 'STANDARDS'

Richard de Dear –

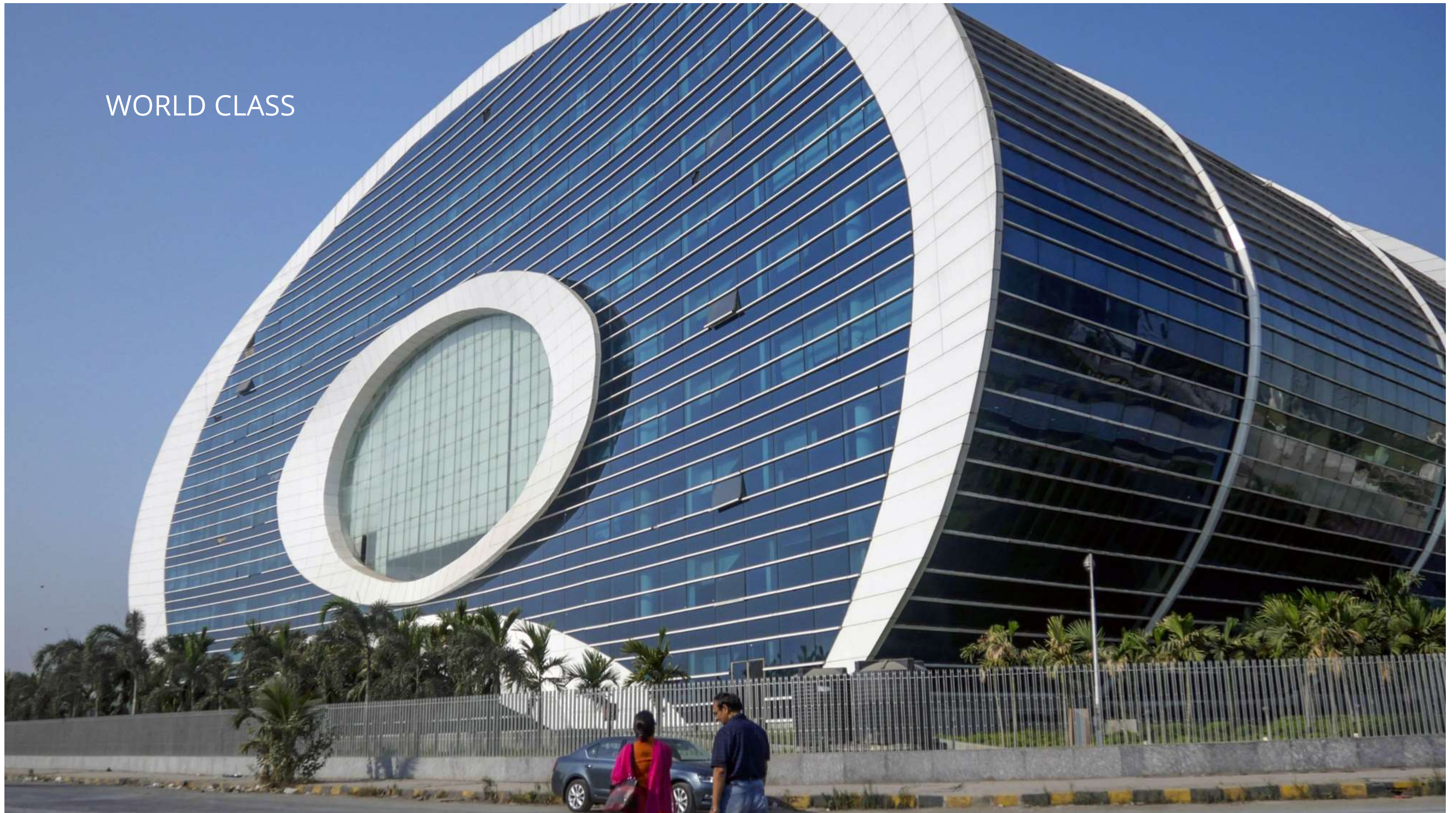
PMV is around 80% for all three classes of comfort design!
It doesn't matter which standard you adopt!

Thermal delight or Alliesthesia must be an integral part of architectural delight. This requires change and variation in sensation or in sensory experience to feel alive and active



Richard de Dear

WORLD CLASS



THE OIL AND NATURAL GAS CORPORATION
Mumbai

