Low-carbon Homes

Construction

Cooling
Interlocking Blockwork Masonry

May, 2020

Construction Technology
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

LOWER EMBODYED ENERGY BY:

- Minimising Steel Intensity
- Using Low Embodied Energy Walling
- Minimising Walling Material
- Minimising Finishes

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

- Plumbing (Piping & Fixtures)
- Electrical
- Lifts
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
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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Hollow interlocking blockwork with reinforcement

WALLING SYSTEM – HOLLOW INTERLOCKING REINFORCED MASONRY
### ADVANTAGES OF INTERLOCKING BLOCK MASONRY

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameter</th>
<th>Advantage</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Blocks</td>
<td>Engineered to any performance requirement, easy to handle and place, low water absorption.</td>
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<td>2.</td>
<td>Masonry</td>
<td>Quick construction, less mortar, embedded modularity, higher masonry efficiency, thickness of wall is optimal</td>
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<td>3.</td>
<td>Introduction of reinforcement</td>
<td>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</td>
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<td>4.</td>
<td>Structural performance</td>
<td>Strength and stiffness is higher, enhanced shear strength, flexural strength and axial load capacity.</td>
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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)
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
Carrier invented the first electrical air conditioning unit in 1902.

Sackett-Wilhelms Lithographing & Publishing Company of Brooklyn
Richard de Dear


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
HIGH DENSITY INTENSIVE DEVELOPMENT = POLLUTION AND URBAN HEAT ISLAND EFFECT WITH RISING TEMPERATURES
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’
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.
ECONOMICS

AIR CONDITIONED COMFORT

NECESSITY DESIRE

PHYSIOLOGY

ACCLIMATIZATION

15 DEG C – 37 DEG C

LIFESTYLE

PRODUCTIVITY PERFORMANCE COST OF COOLING TECHNOLOGY

NECESSITY PHYSICAL ADAPTATION

DEMAND BEHAVIORAL ADAPTATION

ACCLIMATIZATION

15 DEG C – 37 DEG C

SYMBOLISM OF WEALTH & STATUS

! SUPER COOLISM !

SYMBOLISM OF DRESS

MODESTY

DRESS CODES

ACTIVITY