



March 24, 2012

**Press Release from INSWAREB:**

**Sub: Joint Research with GVP College of Engineering on No-Aggregate Concrete**  
-----

The aggregates (sand and stone) in concrete are indispensable inputs for three reasons:

- Without aggregates cement is liable to get shrinkage, leading to cracks.
- Strength of neat cement is around 70-90 MPa against popularly used concrete with strength of 20-25 MPa. Thus aggregates help to moderate strength of concrete to required grade.
- Cost of aggregates is certainly lesser than that of cement, thus bringing down the cost of concrete.

If there is a cementitious paste which can overcome shrinkage and cost-issues, despite avoiding aggregate, why not accept such concrete? Moreover, if such concrete is lighter in weight and higher in strength, increasing the factors of safety, is it not more desirable? Over and above, if such concrete is made of industrial byproducts using lesser cement is it not all the more a welcome development!

This is exactly what the founder directors of this institute, Dr N Bhanumathidas and N Kalidas have invented and patented in 2010. This wonder product is called No-Aggregate Concrete (NAC), which means **a concrete without sand and stone**. Basic engineering data has been developed at INSWAREB labs as recorded in the table below:

| Age of testing :                       | Strength in MPa |      |                 |            |                 |      |
|--|-----------------|------|-----------------|------------|-----------------|------|
|  | 3-day           |      | 7-day           |            | 28-day          |      |
| Engineering data:                      | Cement Concrete | NAC  | Cement Concrete | NAC        | Cement Concrete | NAC  |
| Compressive strength                   | 15.6            | 10.6 | 25.0            | 20.2       | 39.3            | 56.2 |
| Split tensile strength                 | --              | --   | --              | --         | 3.47            | 3.69 |
| Flexural Strength-MOR                  | --              | --   | --              | --         | 4.40            | 5.20 |
| Bond Strength                          | --              | --   | --              | --         | 14.6            | 12.7 |
| <b>Chloride Permeability: Coulombs</b> | <b>Control</b>  |      |                 | <b>NAC</b> |                 |      |
| At accelerate curing-24 hrs.           | 5701            |      |                 | 27         |                 |      |
| At 90-day-Normal curing.               | 4346            |      |                 | 405        |                 |      |

To prove the efficacy of the invention, they have executed a dome using NAC, in addition to other applications such as cantilever beam and shear wall, on 2<sup>nd</sup> floor of FaL-G Mansion at Venkateswara Colony, Sheelanagar, as a live demonstration.



**Institute for Solid Waste Research & Ecological Balance (INSWAREB)**  
(The Unique Techno-Scientific Organisation in NGO Segment)



The table below gives mix ratios and cost comparison of NAC with cement (OPC) concrete:

| Input                      | Rate/kg<br>Rs. | M-50<br>OPC Concrete |             | M-25<br>OPC Concrete |             | M-50<br>NAC |             |
|----------------------------|----------------|----------------------|-------------|----------------------|-------------|-------------|-------------|
|                            |                | Qty - kg             | Cost Rs.    | Qty - kg             | Cost Rs.    | Qty - kg    | Cost Rs.    |
| OPC                        | 6.00           | 480                  | 2880        | 360                  | 2160        | 306         | 1836        |
| Fly ash                    | 0.60           | -                    | -           | -                    | -           | 1147        | 688         |
| Sand                       | 0.60           | 585                  | 351         | 725                  | 435         | -           | -           |
| Aggregate: 10mm            | 0.60           | 498                  | 299         | 484                  | 290         | -           | -           |
| 20 mm                      | 0.75           | 680                  | 510         | 660                  | 495         | -           | -           |
| Water                      | 0.05           | 173                  | 9           | 170                  | 8           | 270         | 30          |
| water/cem.material         | -              | 0.36                 | -           | 0.47                 | -           | 0.18        | -           |
| Chem.admixture             | 60             | 3                    | 180         | -                    | -           | 9.7         | 584         |
| Mineral admixture          | 3              | -                    | -           | -                    | -           | 77          | 231         |
| Concrete prep. Cost<br>Rs. | -              | -                    | 400         | -                    | 400         | -           | 300         |
| <b>Grand total Rs.</b>     |                |                      | <b>4629</b> |                      | <b>3788</b> |             | <b>3652</b> |

But, in order to authenticate the invention for structural applications, considerable structural engineering research is necessary for which GVP College of Engineering has come forward. In addition to the advanced research, students of the college would be exposed to various facets of the research studies through dissertation, project works and doctoral studies.



**Institute for Solid Waste Research &  
Ecological Balance (INSWAREB)**  
(The Unique Techno-Scientific Organisation in NGO Segment)

To take advantage of the structural research studies, it is envisaged to execute various live structures such as water bodies, public and private buildings and other critical structures.

Because of its light weight, NAC is expected revolutionise the precast component industry, that facilitate massive housing program with quickness and qualitative accuracy. Hence NAC would be studied as various precast components.

Eco Carbon Pvt. Ltd., the associate of INSWAREB, has committed to invest for the research and deliver the fruits to the welfare of mankind and mother Earth.

In the background of this agenda, Eco Carbon Pvt. Ltd., and GVP College of Engineering have signed a collaborative research program on NAC at GVP College of Engineering at 12:00 noon on Saturday, 24<sup>th</sup> March 2012.

**Some engineering studies conducted at the labs of INSWAREB, Visakhapatnam:**



Testing on NAC beam-specimen



Phase of concrete after breaking the beams



Split cylinder strength test on NAC cylinder



Study of bond strength on NAC specimen