C 114

Material properties of slip-forward load bearing wall punch for low-cost medium-rise buildings

The special composite material under consideration consists of cement, crusher dust and coir and it is begin used to build walls of structures using a special construction technique called slip-from method. This technique was first introduced by Dr. A.N.S. Kulasinghe in mid 80a as a low cost and rapid method of construction.

Now the slip-formed walls are used as load bearing walls combined with pre-cast pre-stressed columns and composite slabs in multi storeyed buildings with repeated floor plan. However, the application of this technique is limited to 5 storeyed buildings as yet and a thorough investigation is required to explore the possibilities of extending the same technique to 8-12 storeyed buildings.

The results of a comprehensive experimental program, carried out to obtain the essential mechanical properties of the composite material are as follows for mix proportions increasing from 1:12 to 1:8 cement: quarry dust by volume. The Young's modulus increasing from 2.4 GPa to 9.3 GPa and Possion's ratio decreases from 0.17 to 0.11 with the increasing cement content. There is also a progressive increase in compressive strength with age which range from 0.505 MPa (1:12 at 1 days) to 5.193 MPa (1:8 at 28 days).

Using above results, the allowable compressive strengths can be determined at each floor level for different wall thickness at different ages. This was compared with the ultimate vertical load at different floor levels for unit length of the load bearing wall, due to factored dead and imposed loads. As this is only an initial measure off feasibility, the effect of slenderness of the wall was not taken in to account. The results indicate that this material can be used up to 8 storeyes, keeping the wall thickness at 9 inches. It is envisaged that the number of floors can be further increased using a stronger mix proportion such as 1:6 while maintaining a consistent wall thickness at lower floor levels. The characteristic strength of the composite material for different mix proportion and the appropriate factor of safety for material can be introduced to the design guidelines once sufficient test data are available.

From this preliminary investigation it can be concluded that this composite material can be used to construct load bearing walls up to 8-12 storeyes and it is worthwhile extending this experimental program to explore the other material properties such as tensile strength, flexural strength and also the material properties of mix proportion 1:6.