ENGLISH SUMMARY

Huovinen, Seppo, THE BEHAVIOUR OF REINFORCED CONCRETE BEAMS UNDER THERMAL GRADIENT AND MECHANICAL LOADING

In the article the behaviour of reinforced concrete beams under thermal gradient and mechanical loading is treated especially in the ultimate state. The calculation methods of the stiffness of the structure and the forces are treated based on the actual behaviour of the materials concrete and steel on the structure. In the end the results of loading tests are presented and are compared to calculated values, such as forces based both on elastic and plasticity theory, rotation capacities and deflections.

Kilpeläinen, Mikko, ELASTICALLY SUPPORTED SLAB SUBJECTED TO POINT LOADS

In this article some methods suitable for structural analysis of elastically supported slabs under point loads are examined. The methods are based on the general slab theory and the linear load-deflection relationship of the foundation. First a slab is examined in polar coordinate system. In this case the differential slab equation is solved in closed form on one hand and using finite element method with ringelements on the other hand. Both these methods are suitable for structural analysis of wide and/or circular and symmetrically loaded slabs. Secondly a slab is examined in rectangular coordinate system. In this case the slab equation can be solved using finite element method or difference method. Those methods are applicable to rectangular slabs of different shapes under different loadings.

At the end of the article some examples are analysed numerically using the methods examined. On the basis of the results the methods are compared with each other. All of them are found to be serviceable for structural analysis of elastically supported slabs, but provide the use of a computer in numerical calculations.

Virtanen, Hannu, Mikkola, Martti, GEOMETRICALLY NONLINEAR ANALYSIS OF PLANE FRAMES

In this article a method for the computer analysis of geometrically nonlinear behaviour of plane frames has been presented. Members are treated with the beam-column theory. The theory takes into account the interaction between axial force and bending. Incremental solution procedures has been used. Loading is added step by step and the tangential stiffness of the structure is calculated at each step. The position of the co-rotational coordinate system is updated after each increment. This updated Langrangian formulation allows for large translations and rotations. The relative deformations of members are assumed to remain small according to the beam-column theory. Modified Newton-Raphson equilibrium iteration has been used at each load step. For overcoming limit points the constant-arc-length-method has been combined with modified Newton-Raphson iteration. Three examples have been analysed with implemented program. The results agree well with comparison results. Constant-arc-length-method is efficient and recommendable solution procedure.