FLEXURAL BEHAVIOR OF FERRO-CEMENT SLABS SUPPORTED ON COLD FORMED STEEL JOISTS

By

Yassien Salah El Dien Mouhammed Sief El Dien Yassien

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Structural Engineering

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Under the Supervision of

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Title of Thesis:

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Key Words:

Ferro-cement slabs, Cold formed steel, Flexure

Summary:

This study focusing on flooring systems that comprise Ferro-cement panels rested over cold-formed steel joists. An experimental work and analytical parametric study was held up to determine the load carrying capacity of these systems and monitoring its loading steps or limits, like cracking, yielding, and ultimate limit, in addition to studying the effect of different parameters of the cold formed steel joist and the Ferro-cement panel on the structural behavior of this system. Finite element nonlinear models were established using general purpose finite element software ANSYS and finite element results have been verified with experimental and analytical results discussed in literature review. All models had a simply supported cold-formed steel joists and loaded by a uniform pressure load over the upper face of the Ferro-cement panel.

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Abstract

Safety, economy, and following the work time schedule are the three most important factors controlling the success of any construction project. About safety, it is the natural target of any construction project and would be considered in any design. The two remaining factors are always the factors that distinguish any project from the other. So, there have been a general trend towards the pre-fabricated structural elements like the structural elements covered in this study; cold formed steel beams and ferro-cement slabs. Later, appeared a new structural system depends on these two types of structural elements because of its light weight, high stiffness, and having a lower cost. One of these systems was the flooring system comprising ferro-cement slabs rested over cold formed steel joists.

An experimental work was conducted for three specimens consists of ferro-cement slabs rested on cold formed steel joists to determine the load carrying capacity of these systems, in addition a detailed parametric study was performed to investigate the effect of different parameters of the cold formed steel joist and the ferro-cement slab on the structural behavior of this system and its loading limits like cracking, yielding, and ultimate limit. Finite element nonlinear models were established using general purpose finite element software ANSYS and finite element results have been verified against the experimental work and the analytical results discussed in literature review. All models had a simply supported cold formed steel joists and loaded by a uniform pressure load over the upper face of the ferro-cement slab.

The studied parameters that affected the system were cold formed steel joist's depth, the cold formed steel joist's thickness, the cold formed steel joist's material, the ferro-cement slab's thickness, and the ferro-cement slab's reinforcement thickness. Some regression analysis were performed to determine the effect of each parameter. Accordingly, it was found that the parameters concerning the cold formed steel joist have affected the behavior and loading limits clearly, and it was found also that changing the fero-cement' reinforcement thickness wasn't effective on the cracking limit , but it affected yielding and ultimate limit, in addition to controlling the crack width and slab deformations.