Investigation on Bridge Deck with different slab thickness and steel bar diameter to determine stress and deformation

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Abstract

In present investigation analysis is performed on experimental method to identify the strength ability during load of 87.5 KN with stress evaluation by performing Experimental evaluation of non linear load for determination of stress and deformation using experimentation technique in bridge deck slab with different diameter of steel bars i.e. 8, 10, 12, 16, 20 and 25 mm the parameters and results were validated from present previous research work present in literature, these different bar profiles in bridge deck slab are investigated for stress, deformation and strain. Thus minimum stress is found steel bar of diameter 16 mm profile in bridge deck slab, the bridge deck slab pre – cast model is casted considering M25 with Indian standard code of IRC: 112 - 2011.

Key Words – Stress, Deformation, Strain, TAGUCHI'S optimization, Bridge deck slab.

1.1 INTRODUCTION

Concrete slab, a very common and important structural element, is constructed to provide flat, useful surfaces. It is a horizontal structural component, with top and bottom surfaces parallel or near so.

1.2 Concrete Slab Construction

Concrete floor slabs may also be of situ then prefabricated. The into situ embodied tablet flooring are made the use of form-work, as is many times done regarding timber planks & boards, plastic yet steel. Usually ground slabs functionate no longer require some form-work.

1.3 Concrete cracks caused by overloading the slab

Although embodied is an intensive constructing material, it does have its limits. Placing excessive quantities on weight on top on a figured blade execute cause cracking. When you hear a embodied composition has a strength over 2000, 3000, 4000, then 5000+ PSI, it is referring in imitation of the kilos per square inch it would smoke in accordance with crush up to expectation concrete slab.

1.4 Experimental Conditions

- **Load**
  - (i) Load 87.5 KN is applied at center of slab at 600 mm × 250 mm area.
  - (ii) Fixed support is applied at beneath of slab.
  - (iii) Displacement in slab is defined at direction of force.

1.5 Material Properties

- **Material used – Steel**
  - (i) Density : 7750 kg/m^3
  - (ii) Young's Modulus: 200,000 MPa
  - (iii) Poisson's ratio : 0.30
- **Material used –**
  - (iv) Density : 2398 kg/m^3
  - (v) Young's Modulus: 15000 MPa
  - (vi) Poisson's ratio : 0.25

Figure – Mixing of materials

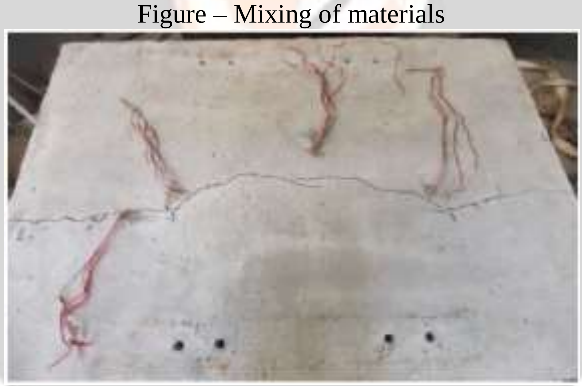

Figure – Positioning of strain gauges/sensors in bridge deck slab

1.6 RESULTS

Overall comparison of output parameters for bridge deck slab with different diameter of steel bar are shown below:

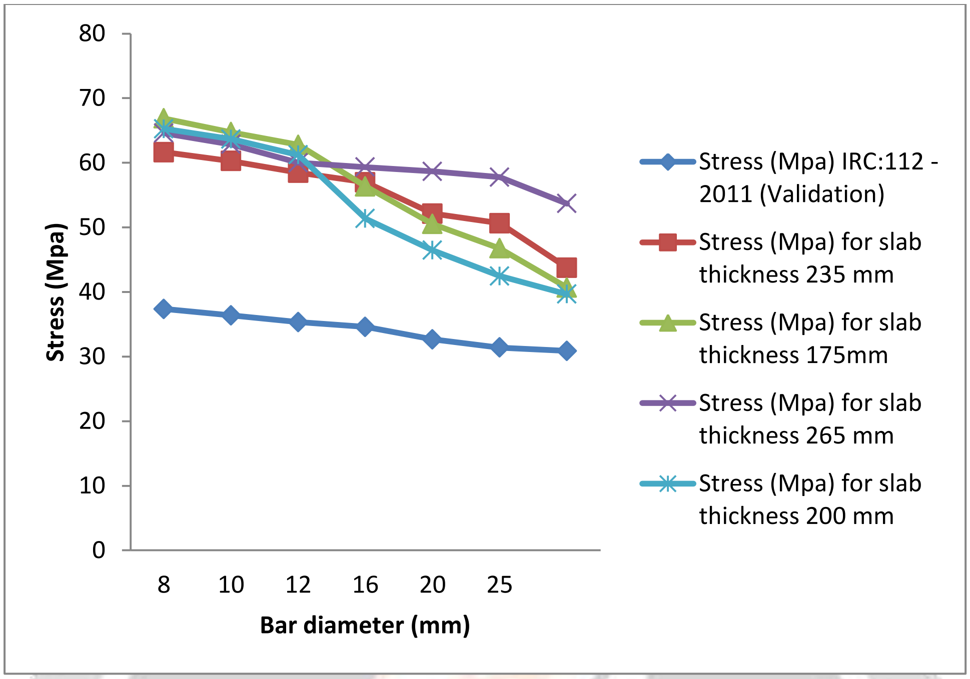

Figure – Overall comparison of stress (MPa) with respect to bar diameter

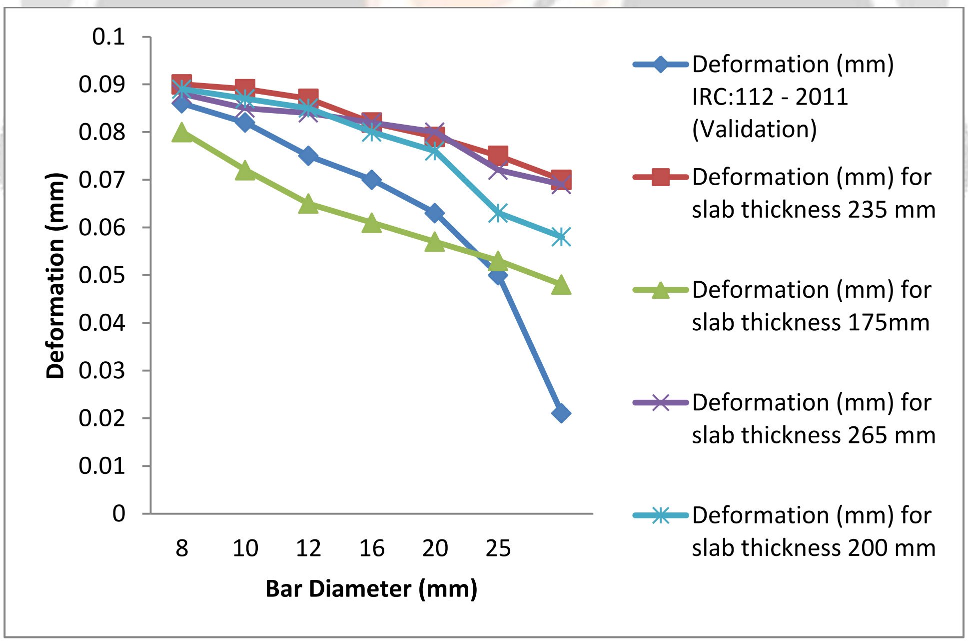

Figure – Overall comparison of deformation (mm) with respect to bar diameter.

Conclusion

1. The prediction of experimental model shows good relation with IRC: 112 - 2011 Indian code described in references.
2. The internal consistency of the results confirms the validity of the experimental model.

3. The stresses are found to be minimum as increase in bar diameter in bridge deck slab profile at certain limit.
4. The deformation is found decreased after 10 mm of bar diameter, thus bar diameter should persist between 14 mm to 16 mm diameter for optimum resistance against stress and deformation.

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