

Zeitschrift: IABSE reports = Rapports AIPC = IVBH Berichte
Band: 60 (1990)

Artikel: Serviceability criteria for composite floors
Autor: Leon, Roberto T. / Alsamsam, lyad
DOI: <https://doi.org/10.5169/seals-46489>

Nutzungsbedingungen

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. [Mehr erfahren](#)

Conditions d'utilisation

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. [En savoir plus](#)

Terms of use

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. [Find out more](#)

Download PDF: 04.04.2026

ETH-Bibliothek Zürich, E-Periodica, <https://www.e-periodica.ch>

Serviceability Criteria for Composite Floors

Critères d'aptitude au service de planchers

Gebrauchsfähigkeitskriterien für Verbundträger

Roberto T. LEON

Assoc. Prof.
Univ. of Minnesota
Minneapolis, MN, USA

Iyad ALSAMSAM

Graduate Res. Assist.
Univ. of Minnesota
Minneapolis, MN, USA

SUMMARY

This paper addresses the serviceability criteria for composite beam floors designed to American specifications [LRFD]. It offers recommendations on how to calculate short and long term deflections for composite beams. It also describes the results of tests conducted to determine the effects of (1) cambering vs. shoring, (2) creep and shrinkage, and (3) end restraint on deflections of slender composite girders.

RESUME

Les critères de tenue en service de poutres mixtes de plancher conçues selon la norme américaine LRFD sont examinés. Des recommandations sur les méthodes à suivre pour les calculs des flèches à court et à long terme sont fournies. Des résultats de tests visant à évaluer les effets de l'étaçonnement, du fluage, du retrait, et de la rigidité partielle des supports sur les flèches de poutres mixtes élancées sont aussi rapportés.

ZUSAMMENFASSUNG

Die Durchbiegungsrechnungen fuer Verbundtraeger, die nach den neuen Amerikanischen Normen (LRFD) bemessen sind, werden hier vorgestellt. Vorschlaege werden gemacht ueber die Rechnung kurzzeitiger und langzeitiger Durchbiegungen von Verbundtraegern. Ergebnisse die gemacht wurden um die Wirkung von (1) Unterstuetzung gegenueber Vorbeugung, (2) Kriechen und Schwinden, und (3) Endrotationsbeschraenkung auf die Durchbiegungen von schlanken Verbundtraegern.

1. INTRODUCTION

The traditional deflection limit of $L/360$ used by most engineers in the U.S. has served well for many years. When serviceability problems arise it is because deflections were not computed correctly. Four key areas where current models are inadequate are (1) the calculation of stresses after construction loads are applied, (2) the calculation procedures to find the moment of inertia to be used, (3) the long term effects of creep and shrinkage, and (4) the effect of continuity and end restraint.

As part of a large analytical and experimental program currently underway, four composite beams are being tested to investigate the problem areas mentioned above. The specimens were 9750 mm long, and consisted of W18x35 (UB 457 x 191 x 52) beams nominally 250 Mpa, with a 2440 mm wide concrete slab on 75 mm metal deck. The



unshored beam specimen (Beam III) was mechanically cambered approximately 20 mm to offset dead load deflections. Beam IV was shored at three locations 2440 mm apart during casting. The beams were attached to steel column by means of double clip angles.

2. SUMMARY OF EXPERIMENTAL RESULTS

Fig. (1) shows the entire load histories (events) for two beams starting with camber, erection, casting, allowing for 80 days of shrinkage deformations and ending with test loads. The creep and shrinkage deformations were measured for a period of eighty days after casting. In Beam III deflected by a total of about 6.1 mm, while Beam IV deflected by 5.6 mm. While the changes in deflection with time were becoming smaller, they had by no means reached their ultimate values. The total deflection for examples shown in [LRFD] taking long term effects into account were almost twice the predicted in the shored case and 30% higher in unshored. For Beam III, the centerline moment accounted for 76% of the load carrying capacity, while the ends accounted for 24%. For Beam IV the proportions were 84% and 16%. The system stiffness was very similar for both specimens. When deflection of $L/360$ (27.2 mm) was reached the beams were performing non-elastically. Fig. (2) shows the full live load deflection curves obtained during test to failure for two beams. The ultimate strength of the beams was governed by the shear studs. Since the steel was 20% stronger than nominal the studs prematurely failed ending the load carrying capacity of the shored beam.

CONCLUSIONS

- (1) Long-term deflections, particularly shrinkage, can have a significant effect on composite beam deformations.
- (2) The use of LRFD lower bound moment of inertia is suggested for live load deflections.
- (3) Limited yielding will occur before the full live load is achieved for most LRFD-designed beams.
- (4) The end restraint provided by most simple connection can have a significant impact on the deflections.

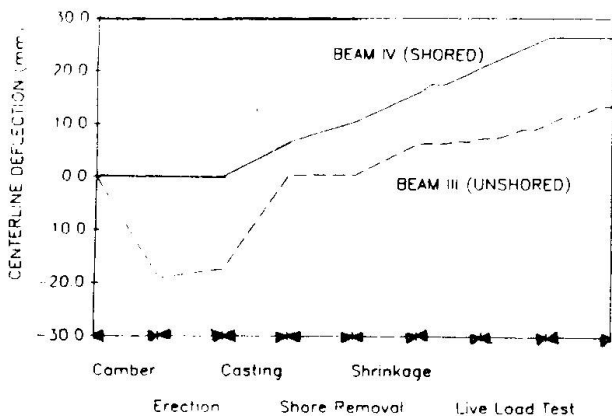


Figure 1 - entire deflection history

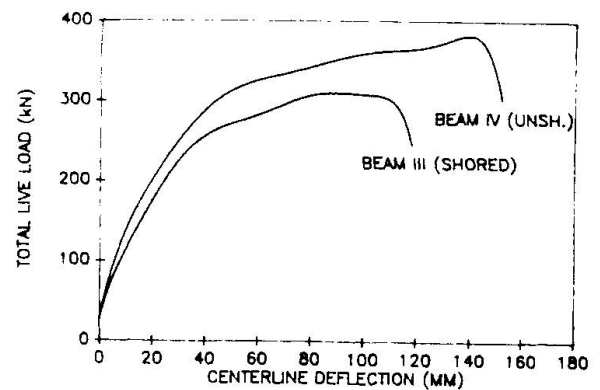


Figure 2 - Test load deflection behavior