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The PLPAK in Concrete international

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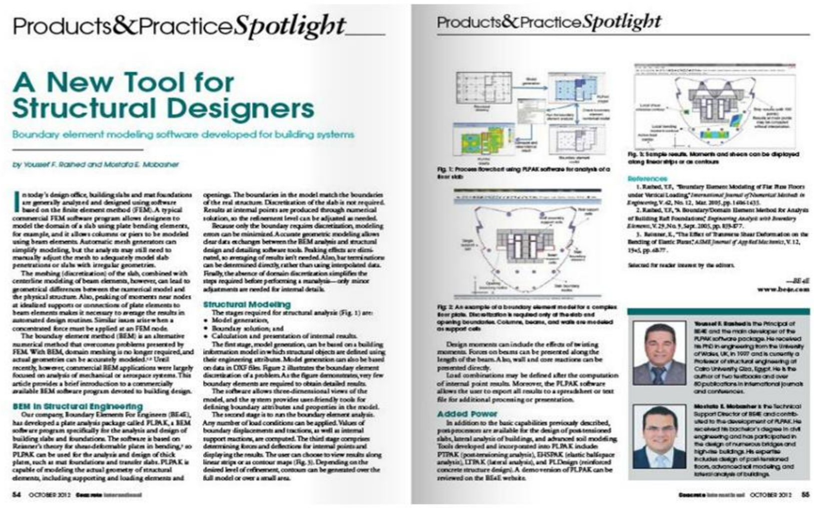
Products&PracticeSpotlight

A New Tool for Structural Designers

Boundary element modeling software developed for building systems

by Youssef F. Rashed and Mostafa E. Mobasher

Abstract

in today's design office, building slabs and mat foundations are generally analyzed and designed using software based on finite element method (FEM). A typical commerical FEM software program allows designers to model the domain of a slab using plate bending elements,for example, and it allows columns and piers to be modeled using beam elements. Automatic mesh generators can be simplify modeling, but the analysts may still need to manually adjust the mesh to adequately model slab penetrations or slab with irregular geometries.

The meshing (discretization) of the slab, combined with centerline modeling of beam elements, however,can lead to geometrical differences between the numerical model and the physical structure. Also, peaking of moments near nodes at idealized supports or connections of plate elements to beam elements makes it necessary to average the results in automated design routines. Similar issues arise when a concentrated force must be applied at an FEM node.

The boundary element method (BEM) is an alternative numerical method that overcomes problems presented by FEM. With BEM, domain meshing is no longer required, and actual geometries can be accurately modeled. Until recently, however, commerical BEM applications were largely focused on analysis of mechanical or aerospace systems. This article provides a brief introduction to a commerically available BEM software program devoted to building design.

Sinopsis

Una nueva herramlenta para diseñadores de estructuras
Rashed, Youssef F., y Mobasher, Mostafa E., Concrete International, V.34, No. 10, octubre de 2012, págs. 54-55
El método de elementos de frontera (boundary element method, BEM) es una alternative al método de los elementos finitos para el análisis numeric. Con el BEM ya no se require la definición de las mallas, de manera que se pueden modelar con exactitude las geometrías reales. Este artículo facilita una breve introducción a PLPAK, un programa informático de BEM disponible a la venta, que se utilize para el análisis y diseño de bloques y cimientos de edificios. El programa incluye módulos para hormigón postensionado y análisis lateral.

New coming: Boundary elements tutorials by Prof. Dr. Youssef F. Rashed

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DEVELOPMENT

The PLPAK software is in constant development to meet the needs of industrial and research purposes. Updates to the software will be posted monthly.

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Using PLPAK in multi-thickness slab

The BE4E consulting services team (services@be4e.com) performed structural analysis and design of a multi-thickness slab (Slab area of 485.0 m2) using the PLPAK & PLDesign. The PLPAK has unique capability of modeling of multi-thickness slabs without the need to use multi-regions. The figures demonstrate the step-by-step analysis and design of the slab. The procedure is initiated by slab model generation on the PLPAK (Figure 1) and completed by the illustration of straining actions (Figure 5). The PLDesign was used as presented in Figures 6 and 7 to perform structural design of the slab.

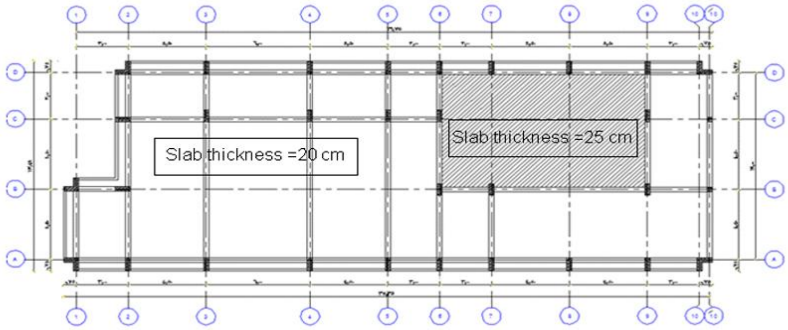


Figure 1: Multi-thickness slab in AutoCAD

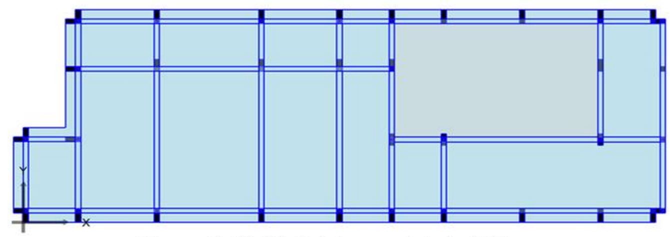


Figure 2: Multi-thickness slab in PLGen

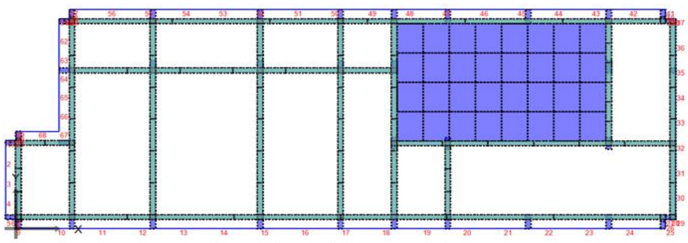


Figure 3 :boundary element nodes in PLView

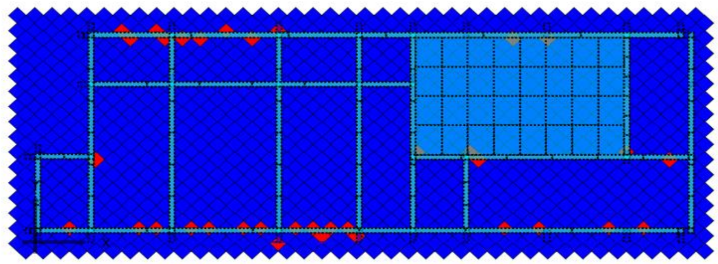
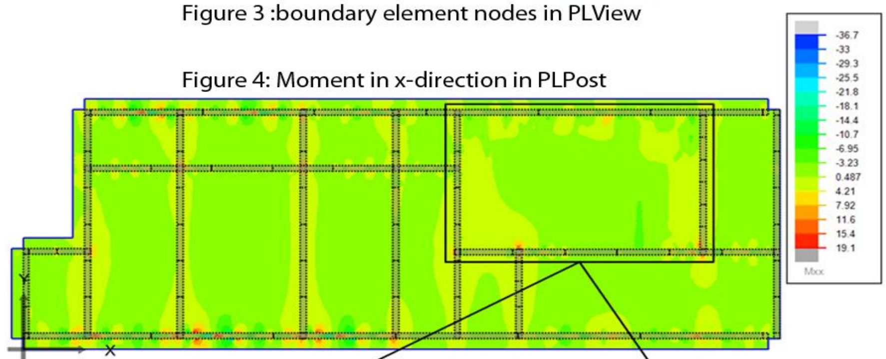


Figure 6: Basic and additional reinforcement in the PLDesign.

Figure 4: Moment in x-direction in PLPost



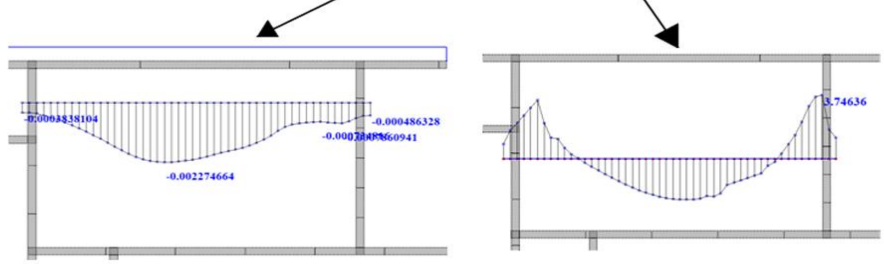


Figure 5: two strips showing the deformation & Moment in x-direction

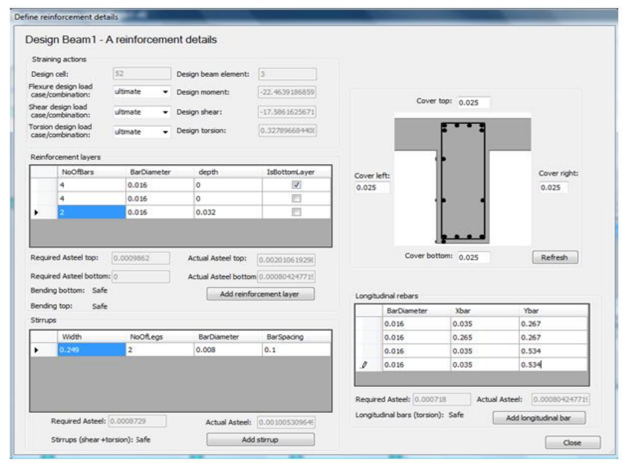


Figure 7: Designing beams in the PLDesign

In need of more questions answered?

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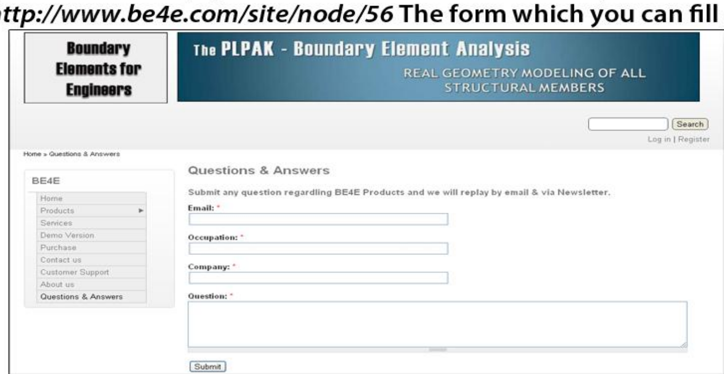

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