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ENGINEERING CALCULATIONS OF A SHEAR BUILDING CONSTRUCTIONS FOR WHILE FORCING USING COMPUTER TECHNOLOGIES

A connection of a beamless monolithic slab's with a reinforced concrete column for the shear during forcing through research results and calculations computerization using up-to-date technology are given in the article.

Keywords: *computer technology, beamless monolithic slab, shear.*

The problem statement. Using computer technology while during performing engineering calculations gives an opportunity to increase the structures' durability and reduce a designing period. It is necessary to develop a calculation algorithm and it's automation to perform beamless monolithic slabs' calculations.

Publications analysis. Development and application issues of calculations performing of building constructions of monolithic slabs nodal connection using up-to-date computer technologies were investigated by Horodetskyi D.O. [1], Horodetskyi O.S. [2], Shymkovych D.H. [3] and others.

Outstanding aspects of the commonly encountered problem definition. It is necessary to develop an algorithm of monolithic slab calculation under forcing through and automation of the process to provide engineering calculations accuracy.

The article's objects formulation. The object of the article is to suggest mathematic model of building constructions nodal connection, to develop an algorithm of calculation of a monolithic slab for shear during forcing through and to implement the algorithm as a computer program.

Main Material Statement. Punching shear may occur at a column and ceiling junction under load at failure [4, 5].

A space form of a shear during forcing through is a concrete truncated pyramid rive from a slab body. The pyramid sides are inclined to horizontal line on-the-mitre about 45°, truncated pyramid side is equal to a crushed punch intersection (i.e. a column).

Flawing in compressed zones of a concrete happens under loads close to the boundary [6]. Therefore an assumption about elastic behavior of concrete at forcing through zone under loads close to the boundary shows real work of a junction.

The work has been carried out at Poltava National Technical Yuri Kondratyuk University within state budget research project "Security and risks of the bearing and filler building structures estimation" (state registration number is 0111U000839).

According to the analysis of a junction between a beamless monolithic slab and a composite column problem the structural and logical research scheme was developed (Fig. 1).

To develop the algorithm of a monolithic slab calculation experimental research of the introduced constructions of the nodal junctions was carried out and a rapture and load-carrying capacity behavior were discovered. A mathematical model of the nodal junctions' deflected mode was also developed using final elements procedure.

A useful model patent No.51630, registered in the Ukrainian State patents register on 26.07.2010 was issued for the introduced construction [9].

An introduced procedure of a beamless monolithic slab and a composite column connection' node includes two stages:

- To check a work of the connection node of a beamless monolithic slab and a composite column during forcing through an improvement of the calculation algorithm according to operative rules using the formula was developed [7, 8];

- A nodal connection between beamless monolithic slab and a composite column calculation for a shear along the column body according to the introduced procedure.

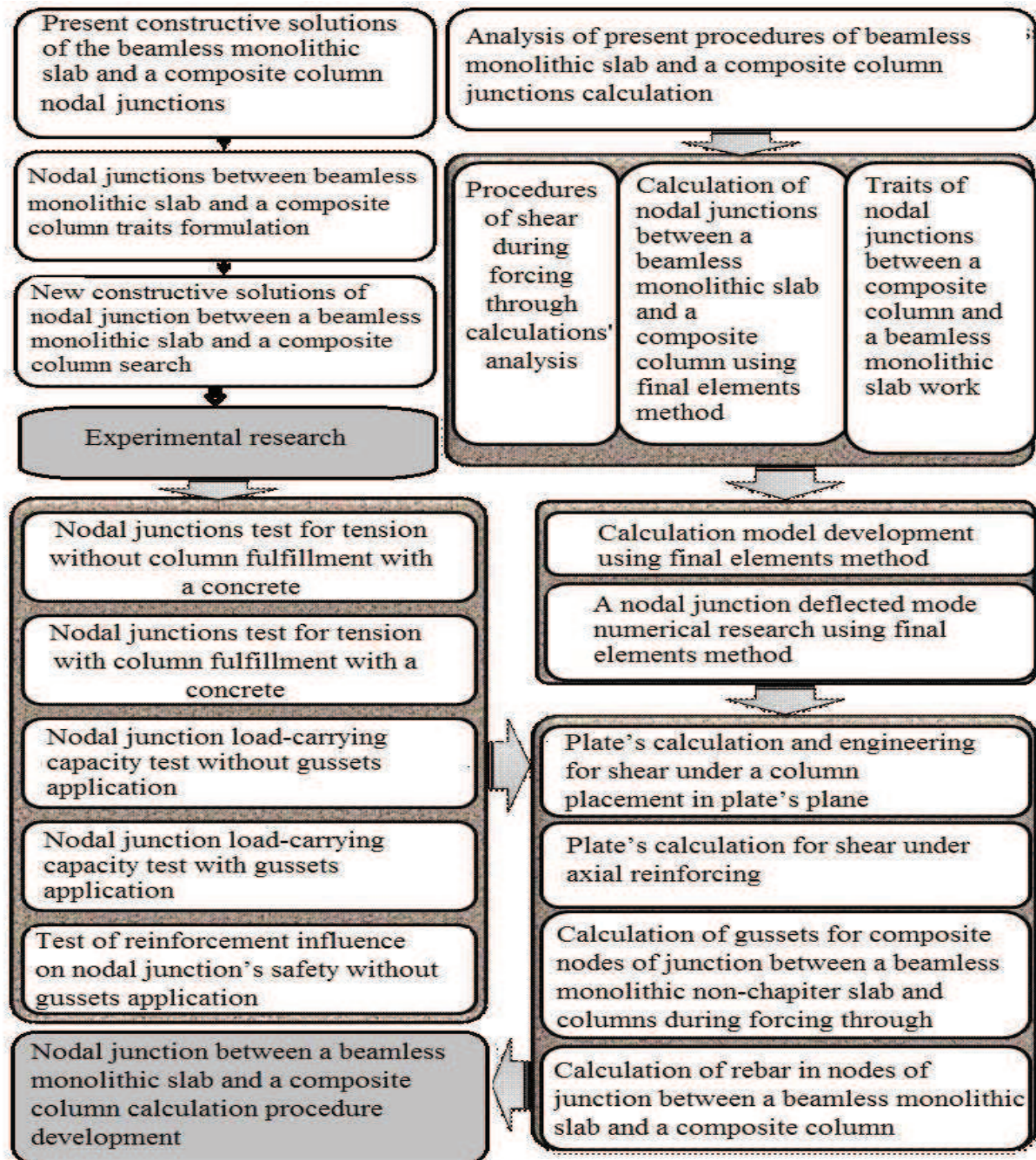


Figure 1 – The structural and logical scheme of the calculation algorithm of a junction between a beamless monolithic slab and a composite column development

Computer software programming language Visual Basic for Applications (VBA) was developed following the procedure (Fig. 2).

A testing algorithm is showed figure 3.

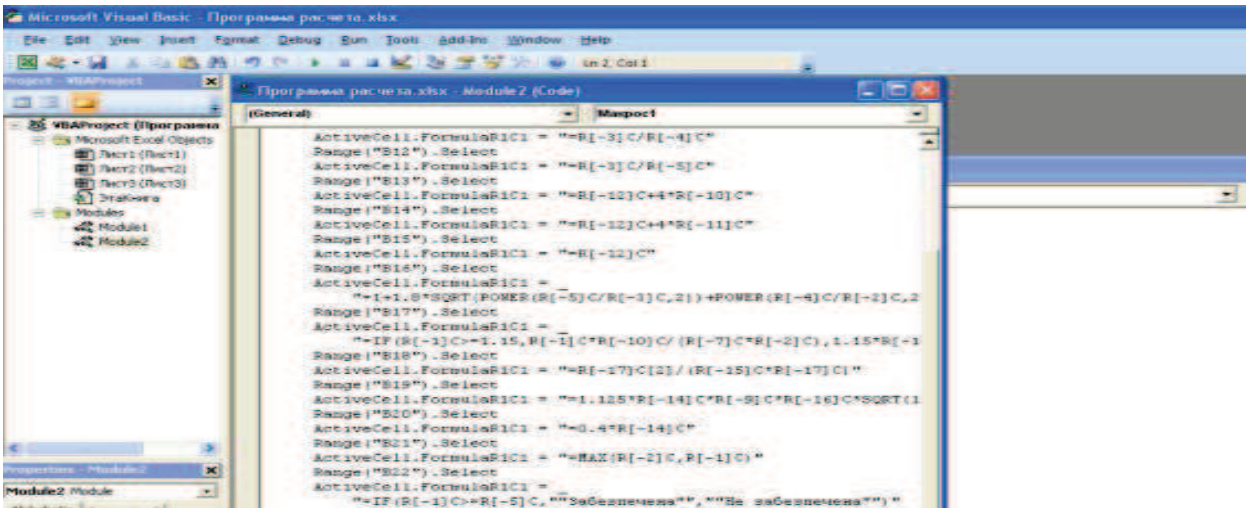


Figure 2 – Visual Basic for Applications software environment

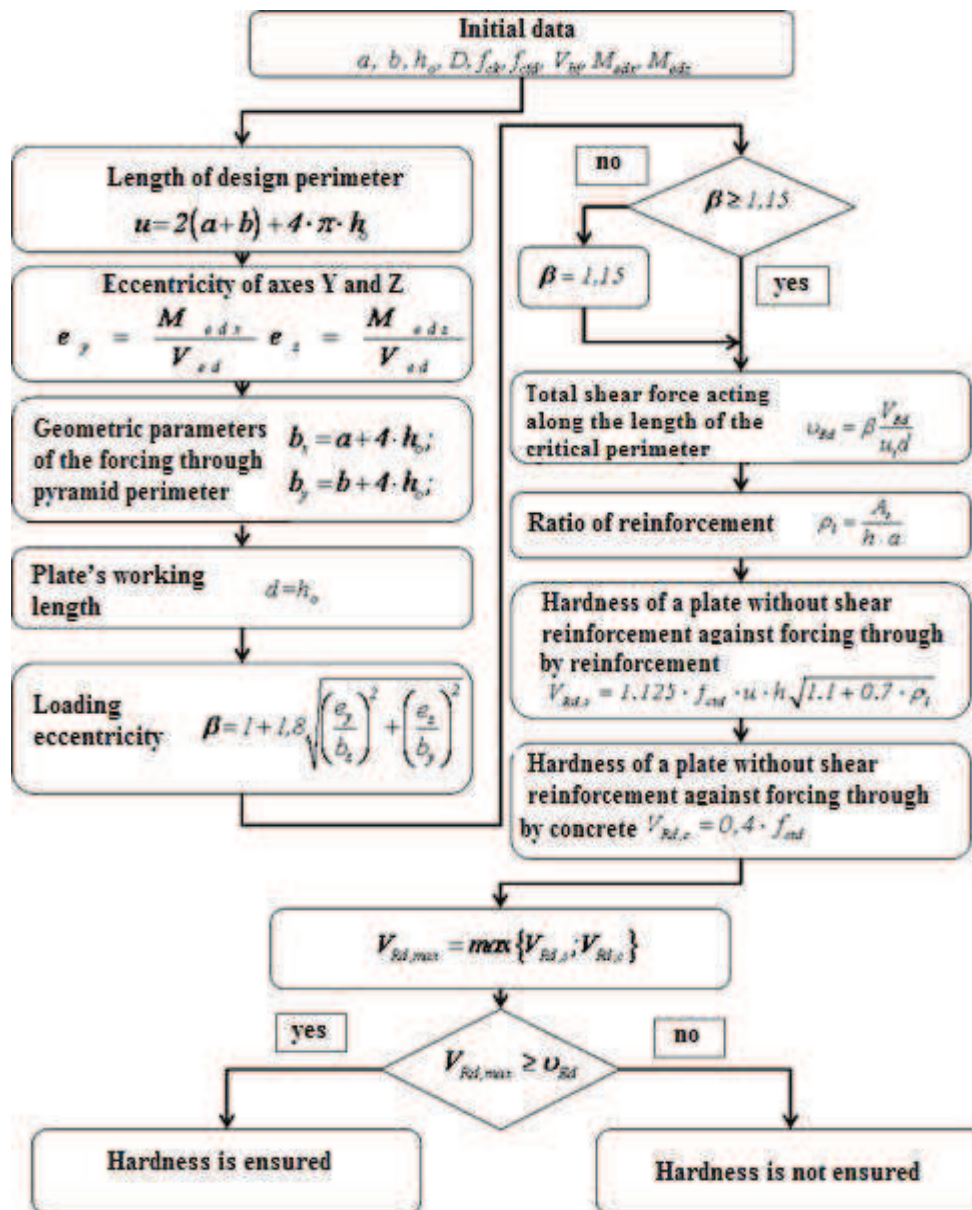


Figure 3 – The algorithm of a junction between a beamless monolithic non-chapter slab and a composite column during forcing through testing (according to the introduced procedure)

A programming module used for junction of beamless monolithic slab and a composite column during forcing through testing is showed below (using introduced procedure):

As stated above, it is necessary to perform a calculation of the junctions along the column body according to the procedure.

To determine optimal field performances of rebar the europium method of bracing calculations was used. The method is known as a Concrete Capacity Method [10].

Conclusions:

A model of junction between a beamless monolithic slab and a composite column deflected mode was developed and calculated by final elements procedure using Femap software environment.

Calculation procedure of the introduced nodal connection is an improved calculation algorithm according to the standards in force using the recovered formula.

The algorithm realized by Visual Basic for Applications language ensures engineering calculations accuracy.

Automation gives more accurate results of the nodal junctions for the shear during forcing through. Deviation between results obtained with and without the computer program is equal to 1 %.

Junctions deflected mode calculation gives 10 % convergence between theoretic and experimental research results.

Procedure of the introduced junctions' calculation includes calculations for the shear during forcing through and calculations for the shear along the column body.

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ВИКОРИСТАННЯ КОМП'ЮТЕРНИХ ТЕХНОЛОГІЙ ПРИ ВИКОНАННІ ІНЖЕНЕРНИХ РОЗРАХУНКІВ БУДІВЕЛЬНИХ КОНСТРУКЦІЙ НА ЗРІЗ ПРИ ПРОДАВЛЮВАННІ

У статті надані результати дослідження з'єднання монолітного залізобетонного перекриття зі сталезалізобетонною колонною на зріз при продавллюванні та проведення автоматизації розрахунків з використанням новітніх комп'ютерних технологій.

Ключові слова: *комп'ютерні технології, монолітне безбалкове перекриття, зріз.*

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В статье предоставлены результаты исследования соединения монолитного железобетонного перекрытия с сталежелезобетонных колонной на срез при продавливании и проведения автоматизации расчетов с использованием новейших компьютерных технологий.

Ключевые слова: *компьютерные технологии, монолитное безбалочное перекрытие, срез.*

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