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Flexural strength of span steel-reinforced concrete truss composite structures

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The scientific article proposes a method for calculating the bending strength of steel-reinforced concrete (SRC) composite span truss structures. This method allows calculating the flexural strength of the calculated sections of steel-reinforced concrete truss structures, taking into account their stress-strain state at the time of maximum load-bearing capacity or failure. The analysis of experimental and theoretical values of flexural SRC truss beam strength showed their adequate convergence, which allows the application of the calculation method in practice design SRC span truss structures and members.

Keywords: steel-reinforced concrete, span, composite, truss structures, flexural strength

Міцність на згин прогінних сталезалізобетонних фермових композитних конструкцій

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Наведено загальну методику розрахунку міцності на згин прогінних сталезалізобетонних фермових конструкцій. Дана методика дозволяє на основі екстремального критерія досягнення деформацій зони стискання бетону величини ε_u у крайній верхній грані полиці перерізу фермових композитних конструкцій, при якому міцність на згин (M_{Rd}) буде максимальною, виконати розподіл випадків напружено-деформованого стану в розрахункових їх перерізах залежно від міцностних властивостей компонентів та їх об'єму (площі бетонної полиці та проценту її армування, площі еквівалентного стального елемента). В момент досягнення величини граничної деформації ε_u відбуватися пластична стадія руйнування бетону полиці (Composite-PSD), при якій міцносні характеристики компонентів сталезалізобетонних фермових конструкцій будуть використовуватися в повному обсязі (випадок a). В той же час, при непропорційному конструктивному вирішенні перерізу сталезалізобетонної фермової конструкції, коли переріз чи міцносні характеристики одного із компонентів прийняті чи запроектовані з визначеним запасом, руйнування в розрахункових перерізах конструкції може відбуватися на пружно-пластичній стадії (Composite-SC) (випадок c). Межею між пружно-пластичною і пластичною стадіями є випадок b, коли деформації в крайніх гранях розтягненої і стисненої ділянок перерізу досягають одночасно граничних значень. В роботі викладені аналітичні залежності для послідовного розрахунку міцності на згин перерізів сталезалізобетонних фермових конструкціях з урахуванням їх напружено-деформованого стану в момент максимальної несучої здатності або руйнування. Проведений порівнянний аналіз експериментальних та теоретичних значень міцності на згин 21-ої композитної фермової балкової конструкції, які мали жорсткий зв'язок між своїми компонентами. Зіставлення експериментальних і теоретичних значень міцності на згин сталезалізобетонних фермових балок показало їх адекватну збіжність, що дозволяє застосовувати метод розрахунку на практиці при проектуванні сталезалізобетонних прогінних композитних фермових конструкцій і елементів.

Ключові слова: сталтзалізозобетон, прогін, складений, фермові конструкції, міцність на згин

Introduction

Span steel-reinforced concrete (SRC) truss structures of various combined cross-sections are widely used today in the construction of bridges and buildings and structures coverings. Structural solutions of SRC truss structures allow arranging airs transport and pedestrian crossings with runs up to L=15…40 m and more to L=60 m.

The analysis of constructive decisions of modern truss bridges is carried out in the works of such scientists as: Nussbauera A., Schumachera A. and Hirta Manfreda A. [1, 2]; Daunera H.-G., Oribasi A. and Wery D. [3, 4].

In the work [5], the authors Zhijuan Tian, Yongjian Liu, Lei Jiang, Weiqing Zhu, and Yinping Ma collected 32 typical design cases of composite truss bridges and also summed up the historical results of developments.

The structural solutions analysis of span bridges, are carried out by scientists Mohammad Hossein Taghizadeha and Alaeddin Behravesh in the work [6], showed the economic and structural efficiency of truss structures in comparison with traditional beam structures of bridges.

As a result of many years of monitoring the technical condition of bridges in Ukraine, the article authors Bodnar L., Koval P., Stepanov S., Panibratets L. [7] found that in 2019, 35% of bridges had got technical condition 5 (inoperable) and 48% - technical condition 4 (limited serviceability) and required repairing or replacement. Therefore, the main task at the moment is developing and implementing in the construction practice new effective structural solutions of girder truss structures, which are also used in bridge construction.

Review of the research sources and publications

Scientists Martinez-Munoz D., Marti J. V. and Yepes V., as a result of studying more than 150 scientific works, conducted in work [8] the analysis of a condition and directions of the researches devoted to design and operation structures of steel-reinforced concrete bridges. The distribution of publications by research areas were [8]: design and behaviour - 66%; optimization - 13%; life cycle assessment - 8%; maintenance and repair - 6%; construction process - 5%; multi-criteria decision-making - 2%.

Experimental-theoretical study of the strength and deformability of span steel-reinforced concrete truss structures are devoted to the work of scientists: Reis A. and Pedro J. J. O. [9]; Bujnak J., Michalek P., Baran W. [10]; Luiz Alberto Araujo de Seixas Lea and Eduardo de Miranda Batista [11]; Luo L., Zhang X. [12]; Kuch T.P. [13]; Shkoliar F.S. [14]; Braz J. [15]; Videira O. [16]; Azmi M.H. [17]; Yiyan Chen, Jucan Dong, Zhaojie Tong, Ruijuan Jiang, Ying Yue [18]; Zhijuan Tian, Yongjian Liu, Lei Jiang, Weiqing Zhu, Yinping Ma [5]; Zhang D., Zhao Q., Li F. & Huang Y. [19, 20].

Definition of unsolved aspects of the problem

Nowadays, an important issue is the development of methods for calculating the flexural strength of span reinforced concrete truss structures depending on the stress-strain state of their calculated cross-sections at the time of failure.

Problem statement

The work aims to develop a method for calculating the flexural strength of span steel-reinforced concrete truss structures.

Basic material and results

Basic prerequisites for the calculation of the span SRC truss structure.

To develop a general method for calculating the flexural strength of a span steel-reinforced concrete (SRC) composite truss structure the following prerequisites were adopted:

- in the cross-section of the SRC truss structures, the steel profile has rigid vertical and inclined connections with the concrete slab;
- at the moment of failure, the cross-section of the SRC truss structure can have three cases of the limiting stress-strain state, at which:

case a M_{plRb} (ε_{cu}, $\varepsilon_a>\varepsilon_{au}$) = max – is the plastic stage;

case b: M_{Rb} (ε_{cu}, $\varepsilon_a=\varepsilon_{au}$) = max – the border between plastic stage and elastic-plastic stage;

case c: M_{Rb} (ε_{cu}, $\varepsilon_a<\varepsilon_{au}$) = max – elastic-plastic stage;

- the compressive force in the concrete N_c of the upper flange in the section of the SRC truss structures is determined as for reinforced concrete, taking into account the percentage of its reinforcement, according to the scientific proposals of D. Kochkarev [21] for the dependencies of Eurocode 4 [22];
- analysis of cross-sections SRC truss structures showed that most of their cross-sections can be generalized about the vertical axis to an equivalent I-section, see Fig.1 and Fig.2;
- depending on the position of the neutral line and the nature of fracture determining the bending strength, the main boundary cases of the stress-strain state of the cross-section of truss structures are distinguished, see Fig. 3.

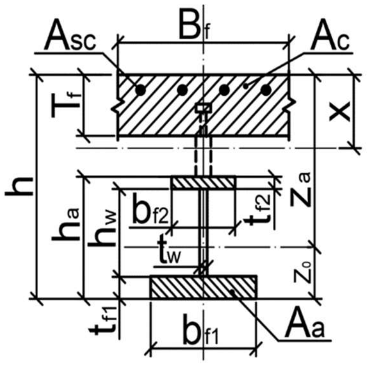

Figure 1 – Equivalent design cross-section of an SRC truss structure along the vertical axis

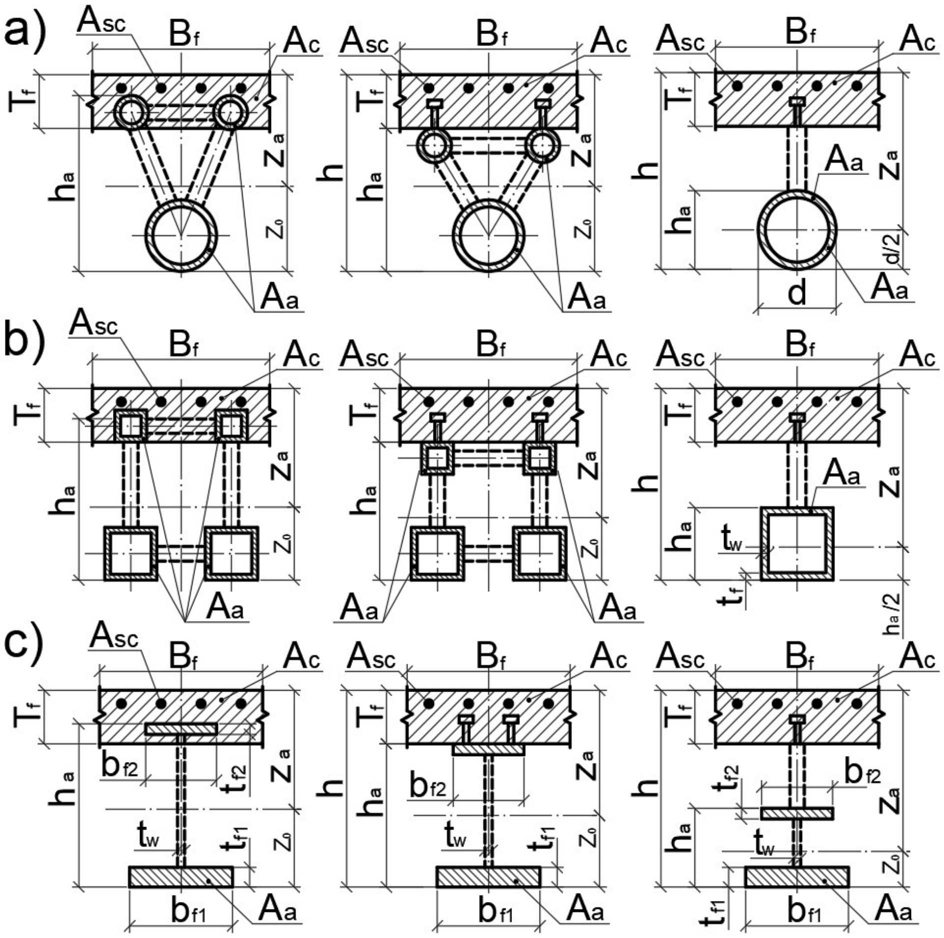

Figure 2 – Cross-sections of SRC truss structures:
a) V- a similar shape of the section;
b) П- a similar shape of the section;
c) Equivalent a shape of the cross-section

The method foundations of calculating steel-reinforced concrete structures were previously laid in the works of the authors [23, 24].

The sequence of calculation of the bending strength of the span SRC truss structures.

According to the proposed method of calculating the bending strength, SRC truss structures determine the value of the limiting moment M_{Rb} and compare it with the external moment M from the action of the load: $M_{Rb} \varepsilon M$.

First, we accept the parameters and cross-sectional dimensions of truss structures and technical characteristics of their components: (ε_{cu}, ε_{au}, E_C, E_a, f_{cd}, f_y, $A_C = B_f T_f$, $A_a = t_{f1} b_{f1} + h_w t_w + t_{f2} b_{f2}$, $h_w = h_a - t_{f1} - t_{f2}$).

Determining the dependence ($\alpha_a \mu$) by the formula (1):

$$\alpha_a \mu = E_a A_a / (E_c A_c) \, ; \qquad (1)$$

Determining values of the internal forces N_{cf} and N_{pla}, respectively, by formulas (2) and (3):

$$N_{cf} = 0.85 f_{cd} B_f T_f \, ; \qquad (2)$$

$$N_{pl,a} = A_a f_y \, ; \qquad (3)$$

Checking the inequality condition (4):

$$\alpha_a \mu \geq \alpha_a \mu_{opt} \, ; \qquad (4)$$

where $\alpha_a \mu_{opt}$ – coefficient, which is determined by the method given in the works [23, 24], and by the formulas (5), (6), (7), (8):

$$\alpha_a = E_a / E_c \, ; \qquad (5)$$

$$\mu_{opt} = \frac{\left[2\Delta_z \Delta_\varepsilon (1+\Delta_h) - \Delta_\varepsilon - 1\right]}{\alpha_a \left[2\Delta_z (1+\Delta_h) - \Delta_h (1+\Delta_\varepsilon)\right]} \, ; \qquad (6)$$

$$\Delta_z = Z_a / (T_f + h_a / 2); \qquad (7)$$

$$\Delta_\varepsilon = \varepsilon_{cu} / \varepsilon_{au} \, , \quad \Delta_h = h_a / T_f \, ; \qquad (8)$$

Next, determine the position of the neutral horizontal axis at the height (T_f), when $N_{cf} > N_{pl,a}$.

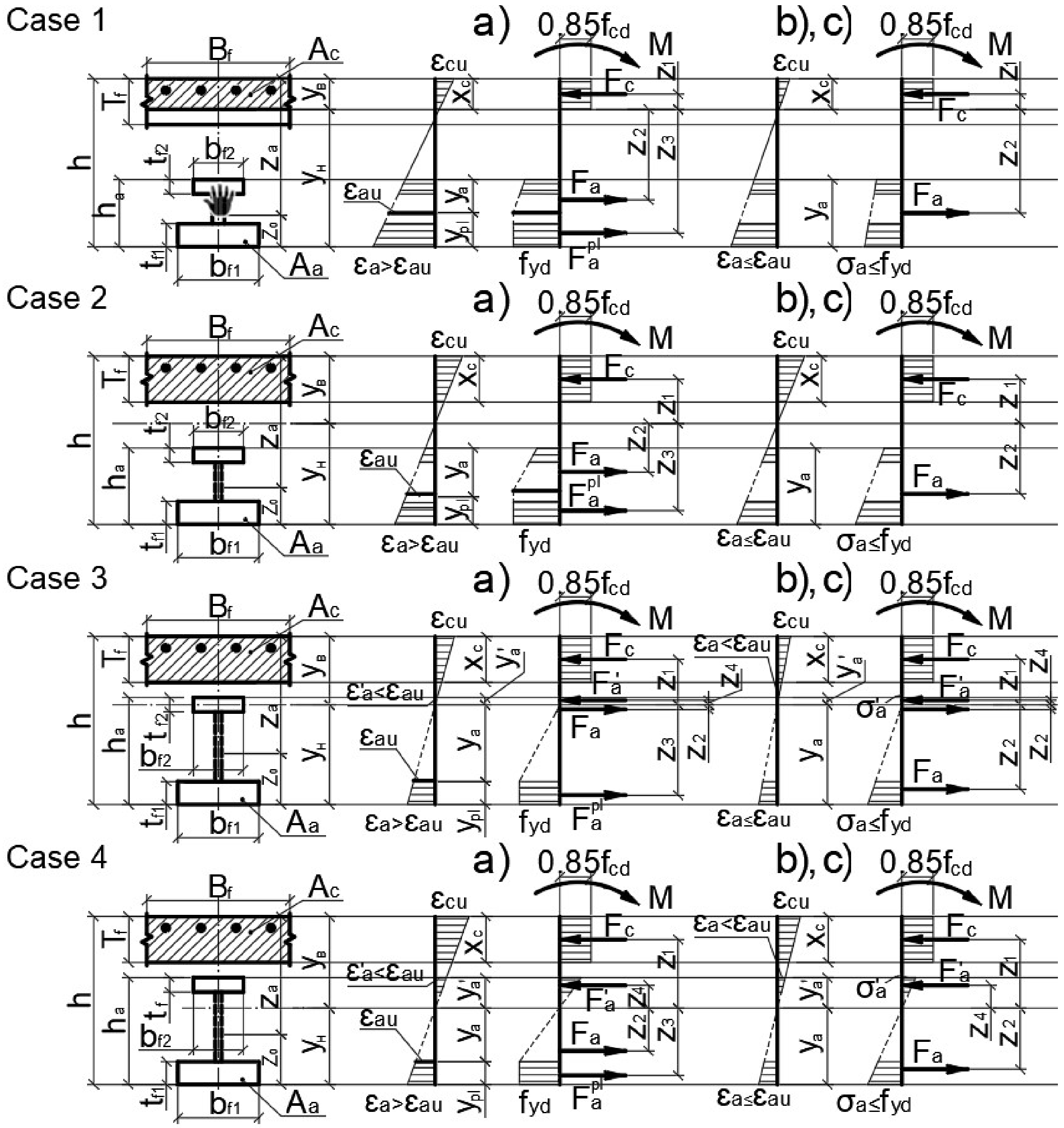

Figure 3– Limiting states of the equivalent section of a steel-reinforced concrete truss structure when determining the bending strength

When $N_{cf} > N_{pl,a}$, the neutral horizontal axis of the element is located within the height of the upper concrete shelf T_f, determining the compressed concrete zone (x_c) height and bending moment (M_{Rd}) for cross-section SRC truss structures at stress-strain state in cases 1a or 1b, c (Fig. 3).

Checking the conditions (9, 10). If conditions (9, 10) are satisfied, then the limit stress-strain state in the section span SRC truss structures corresponds to case 1a, see Fig.3.

Then, using dependence (11), the height x_c of the concrete compression zone is determined.

Using dependence (12) is determined the flexural strength M_{plRb} SRC truss structures.

$$\alpha_a\mu < \alpha_a \mu_{opt}\ ; \qquad (9)$$

$$N_{cf} \geq N_{pl\,a}\ ; \qquad (10)$$

$$x_c = A_a f_y\ /\ (0.85\, f_c\, B_f)\ ; \qquad (11)$$

$$M_{plRb} = 0.5\ A_a f_y\ (z_a - x_c\ /2)\ ; \qquad (12)$$

where: z_a – distance between the center of mass of the steel equivalent section and the middle of the compression zone section of the reinforced concrete slab.

If condition (9) is met and condition (10) is not met, need to calculate distance from the top edge of the compressive zone of the concrete to the neutral section line Y_B using the equation (13). If condition (14) is satisfied the SRC truss structure's limit state corresponds to case 2a (Fig. 3). Using dependence (15) is determined the flexural strength M_{plRb} SRC truss structures.

$$Y_B = A_a f_y / (0.85 f_c B_f) ; \tag{13}$$

$$Y_B \leq h_a - h_a ; \tag{14}$$

$$M_{plRb} = A_a f_y z_a + 0.85 f_c B_f T_f z_c ; \tag{15}$$

where:

$$z_c = Y_B - T_f / 2 . \tag{16}$$

If condition (9) is fulfilled and condition (10) is not fulfilled, then it is necessary to check condition (17). If condition (17) is satisfied, then we have case 3a of the limit state SRC truss structures (see Fig. 3).

The distance from the upper face of the compression zone of concrete to the section neutral line in the second approximation is calculated by the equation (18). The bending strength M_{plRb} of a section, the truss structures are determined according to equations (19) and (22).

$$h - h_a < Y_B \leq h - h_a + T_f ; \tag{17}$$

where: Y_B – the distance from the upper face of the compression zone of the concrete shelf to the section neutral line in the first approximation, which is calculated by the equation (13).

$$Y_B = (A_a f_y - 0.85 f_c B_f T_f) / (2 f_y b_f) + h - h_a ; \tag{18}$$

$$M_{plRb1} = A_a f_y z_{a1} - 2 f_a B_f (Y_B + h - h_a) z_{a2} ; \tag{19}$$

where:

$$z_{a1} = 0.5 (2 h - h_a - T_f) ; \tag{20}$$

$$z_{a2} = 0.5 (Y_B - h_a + h - T_f) ; \tag{21}$$

$$M_{plRb2} = 0.85 f_c B_f T_f z_c + 2 f_a B_f (Y_B + h_a) z_{a3} ; \tag{22}$$

where: z_c – the same as equation (20);

$$z_{a3} = 0.5 (h - Y_B) ; \tag{23}$$

If condition (9) is satisfied and conditions (10, 17) are not fulfilled, then there is a case 4a of the limit state of the SRC truss structures at the time of their failure (see Fig. 3).

The distance from the upper face of the compressed zone of concrete to the section neutral line in the second approximation is determined by the equation (24).

$$\begin{aligned} Y_B = {} & (A_a f_y - 0.85 f_c B_f T_f - 2 f_y B_f T_f)/(2 f_y f_w) + \\ & + h - h_a + T_f ; \end{aligned} \tag{24}$$

The bending strength M_{plRb} for SRC truss structures are determined by equations (25) and (27).

$$\begin{aligned} M_{plRb1} = {} & A_a f_y z_{a1} - 2 f_a B_f z_{a4} - \\ & - 2 f_a t_w (Y_B + h_a - h - t_f) z_{a5} ; \end{aligned} \tag{25}$$

where: z_{a4} – the same as the equation (20);

$$z_{a5} = 0.5 (Y_B - h_a + h - T_f - t_f) ; \tag{26}$$

$$\begin{aligned} M_{plRb2} = {} & 0.85 f_c B_f T_f z_c + 2 f_a B_f T_f z_{a6} + \\ & + 2 f_a t_w (Y_B + h_a - h - t_f) z_{a7} ; \end{aligned} \tag{27}$$

where: z_c – the same as the equation (20);
z_{a6} – the same as equation (23);

$$z_{a7} = 0.5 (h - Y_B - t_f) ; \tag{28}$$

If condition (9) is not satisfied and condition (29) is fulfilled, then the SRC truss structure's limit state corresponds to case 1b, c (see Fig. 3). The height x_c compression of the concrete zone of the cross-section is calculated by equation (30).

The bending strength M_{Rb} for SRC truss structures are determined by equations (31) and (32)

$$N_{cf} \geq 0.5 N_{pl\,a} ; \tag{29}$$

$$x_c = 0.5 A_a f_y / (0.85 f_c B_f) ; \tag{30}$$

at $\varepsilon_a = \varepsilon_{au}$

$$M_{Rb} = 0.5 A_a f_y (z_{a8} - x_c / 2) ; \tag{31}$$

at $\varepsilon_a < \varepsilon_{au}$

$$M_{Rb} = 0.5 A_a \sigma_a (z_{a8} - x_c / 2) ; \tag{32}$$

where:

$$\varepsilon_a = (\varepsilon_{cu} (h - x_c) / x_c) ; \tag{33}$$

$$\sigma_a = \varepsilon_a E_a . \tag{34}$$

If conditions (9, 29) are not met, it is necessary to calculate the distance from the upper face of the compressed zone of the concrete shelf to section line neutral $\mathrm{Y_B}$, using the equation (35).

If condition (6) is satisfied, then there is a stress-strain state of the cross-section of the SRC truss structures in accordance with cases 2b, c (see Fig. 3).

The bending strength M_{Rb} section the truss structure is determined according to equations (36) and (37).

$$Y_B = 0.5 A_a f_y / (0.85 f_c B_f) ; \tag{35}$$

at $\varepsilon_a = \varepsilon_{au}$

$$M_{Rb} = 0.5 A_a f_y z_{a9} + 0.85 f_c B_f T_f z_c ; \tag{36}$$

at $\varepsilon_a < \varepsilon_{au}$

$$M_{Rb} = 0.5 A_a \sigma_a z_{a9} + 0.85 f_c B_f T_f z_c ; \tag{37}$$

where: z_c – the same as the equation (16);

$$\varepsilon_a = (\varepsilon_{cu}\,(h - Y_B)\,/\,Y_B)\,; \tag{38}$$

σ_a – the same as the equation (34);

If condition (9, 29) is not fulfilled, you need to check condition (18). If condition (18) is satisfied, then there is a limit stress-strain state SRC truss structures according to case 3b (see Fig. 3).

The value of the distance Y_B should be calculated by equation (35)

The distance from the upper face of the compressed zone of the concrete to the neutral line of intersection in the second approximation is calculated by equation (39).

$$Y_B = (0.5\,A_a f_y - 0.85\,f_c\,B_f\,T_f\,)\,/\,(\sigma_{a2}) + h - h_a\,; \tag{39}$$

where:

$$\varepsilon_{a2} = \varepsilon_{cu}\,t_f\,/\,Y_B\,; \qquad (40$$

$$\sigma_{a2} = \varepsilon_{a2}\,E_a \tag{41}$$

Flexural strength M_{Rb} for SRC truss structures are determined according to equations (42, 45) and (47).
at $\varepsilon_{a1} = \varepsilon_{au}$

$$M_{Rb1} = 0.5\,A_a f_y\,z_{a10} - \sigma_{a2}\,b_f\,(Y_B + h_a - h)\,z_{a11}; \tag{42}$$

where:

$$z_{a10} = h - h_a\,/\,3 - T_f\,/\,2\,; \tag{43}$$

$$z_{a11} = Y_B\,/\,3 - T_f\,/\,2 - 2\,(h_a - h)\,/3\,; \tag{44}$$

$$M_{Rb2} = 0.85\,f_c\,B_f\,T_f\,z_c + \sigma_{a2}\,b_f\,(Y_B + h_a - h)\,z_{a12}\,; \tag{45}$$

where: z_c – the same as equation (35);

$$z_{a12} = (h + h_a - Y_B)\,/\,3\,; \tag{46}$$

at $\varepsilon_{a1} < \varepsilon_{au}$

$$M_{Rb1} = 0.5\,A_a\,\sigma_{a1}\,z_{a10} - \sigma_{a2}\,b_f\,(Y_B + h - h_a)\,z_{a11}\,; \tag{47}$$

where: ε_{a1} – the same as equation (38);
σ_{a2} – the same as equation (34).

If conditions (1, 29, 35) are not met, then there is a limit stress-strain state SRC truss structures, which corresponds to case 4 b, c (see Fig. 3).

The distance from the upper face of the compressed zone of concrete to section line neutral in the second approximation is determined according to the equation (48).

$$\begin{gathered} Y_B = (0.5\,A_a f_y - 0.85\,f_c\,B_f\,T_f - \\ - \sigma_{a2}\,b_f\,t_f)\,/\,(\sigma_{a3}\,t_w) + h - h_a + t_f; \end{gathered} \tag{48}$$

where:

$$\varepsilon_{a2} = \varepsilon_{cu}\,(Y_B + h - h_a)\,/\,Y_B\,; \tag{49}$$

$$\sigma_{a2} = \varepsilon_{a2}\,E_a\,; \tag{50}$$

$$\varepsilon_{a3} = \varepsilon_{cu}\,(Y_B + h_a - h - t_f)\,/\,Y_B\,; \tag{51}$$

σ_{a3} – the same as the equation (50);

Flexural strength M_{Rb} for SRC truss structures are determined according to equations (52, 56) and (60).
at $\varepsilon_{a1} = \varepsilon_{au}$

$$\begin{gathered} M_{Rb1} = 0.5\,A_a f_y\,z_{a13} - \sigma_{a2}\,t_f\,b_f\,z_{a14} - \\ - \sigma_{a3}\,t_w\,(Y_B + h_a - h - t_f)\,z_{a15}\,; \end{gathered} \tag{52}$$

where:

$$z_{a13} = (2\,h + Y_B)\,/\,3 - T_f\,/\,2\,; \tag{53}$$

$$z_{a14} = h - h_a + t_f\,/\,3 - T_f\,/\,2\,; \tag{54}$$

$$z_{a15} = (2\,(h - h_a) + Y_B)\,/\,3 + t_f - T_f\,/\,2\,; \tag{55}$$

$$\begin{gathered} M_{Rb2} = 0.85\,f_c\,B_f\,T_f\,z_c + \sigma_{a2}\,b_f\,t_f\,z_{a16} + \\ + \sigma_{a3}\,t_w\,(Y_B + h_a - h - t_f)\,z_{a17}\,; \end{gathered} \tag{56}$$

where: z_c – the same as the equation (53);

$$z_{a16} = h_a - (h + t_f - Y_B)\,/\,3\,; \tag{57}$$

$$z_{a17} = 2\,h_a\,/\,3 - t_f; \tag{58}$$

$$z_{a15} = (2\,(h - h_a) + Y_B)\,/\,3 + t_f - T_f\,/\,2\,; \tag{59}$$

at $\varepsilon_{a1} < \varepsilon_{au}$

$$\begin{gathered} M_{Rb1} = 0.5\,A_a\,\sigma_{a1}\,z_{a13} - \sigma_{a2}\,b_f\,t_f\,z_{a14} - \\ - \sigma_{a3}\,t_w\,(Y_B + h_a - h - t_f)\,z_{a15}\,; \end{gathered} \tag{60}$$

where: ε_{a1} – the same as the equation (38);
σ_{a1} – the same as equation (34).

The calculated flexural strength (M_{Rd}) in the calculated cross-section is compared with the magnitude of the bending moment (M) from external forces acting on the SRC truss structure.

Bending strength in the SRC sections of the truss structure will be ensured if the requirement (61) is met:

$$M_{Rb1} \geq M_{Rb1}\,. \tag{61}$$

If the bending strength condition (61) of the SRC truss structure sections is not met, then it is necessary to increase the size of their steel equivalent cross-section or take the materials of the components of the composite structure with higher values of strength characteristics and recalculate.

Comparative analysis of experimental data of tests and theoretical calculations of flexural strength of SRC of truss structures.

To compare the theoretical developments of the authors with the data of experimental studies of the bending strength of rafter structures, the results of experimental studies of the following scientists were used: Buinak J. et al. [10]; Leal L. et al. [11]; Luo L. et al. [12]; Kuch T.P. [13]; Scientist F.S. [14]; Braz J. [15]; Videira O.P. [16] and Azmi M.H. [17].

To analyze and summarize the results of comparing the theoretical and experimental values of bending strength of truss structures, statistical indicators were determined: arithmetic mean ($\overline{X}$), standard deviation (σ_{n-1}) and coefficient of variation (ν).

The results of the comparison of experimental tests (M^{test}) and analytical calculations of the bending strength of SRC truss structures (M^{calc}) are shown in table 1.

The following statistics were obtained by comparing the experimental and theoretical strength values of the 21 SRC truss beams, which had a rigid connection between the components.

With coefficients $\gamma_c > 1.0$ and $\gamma_M > 1.0$ that take into account the properties of components with parameters of the indeterminate model and size variations: $\overline{X} = 1.229$; $\sigma_{n-1} = 0.020$; $\nu = 1.65\%$.

With coefficients $\gamma_c = 1.0$ and $\gamma_M = 1.0$ that take into account the properties of components with parameters of the indeterminate model and size variations: $\overline{X} = 1.085$; $\sigma_{n-1} = 0.010$; $\nu = 0.88\%$.

Table 1 – Comparison of experimental results with theoretical values of bending moments

Specimen	Author	Year of publication	M^{test}, kNm	$M^{calk}_{\gamma>1,0}$, kNm	$\dfrac{M^{test}}{M^{calk}_{\gamma>1,0}}$	$M^{calk}_{\gamma=1,0}$, kNm	$\dfrac{M^{test}}{M^{calk}_{\gamma=1,0}}$
-	Leal L.A.A.S.	2020	91,2	95,1	0,96	99,7	0,91
B-1	Luo L.	2019	385,6	300,6	1,28	364,6	1,06
B-2			405,9	300,6	1,35	364,6	1,11
B-3			408,7	300,6	1,36	364,6	1,12
-	Bujnak J.	2018	357,8	243,4	1,47	281,9	1,27
B-1.1	Shkoliar F.	2015	33,0	26,2	1,26	31,8	1,04
B-1.2			32,0	26,2	1,22	31,8	1,01
B-2.1			21,0	15,1	1,39	17,5	1,20
B-2.2			20,0	15,1	1,32	17,5	1,14
B-3.1			30,5	21,2	1,43	25,5	1,19
B-1	Kuch T.	2012	38,5	33,7	1,14	37,0	1,04
B-2-1			27,8	25,5	1,09	27,3	1,02
B-2-2-1			28,3	26,1	1,08	27,8	1,02
B-2-3			29,8	26,5	1,12	28,1	1,06
B-3-1			46,5	38,8	1,20	45,0	1,03
B-3-2-1			50,3	40,6	1,23	46,5	1,09
B-3-3			52,0	41,9	1,24	47,4	1,10
-	Braz J.	2009	352,5	314,7	1,12	338,2	1,04
-	Videira O.P.	2009	517,5	363,6	1,42	388,1	1,33
I	Azmi M.H.	1972	703,9	667,8	1,05	712,9	0,99
VI			526,5	485	1,08	516,0	1,02

Conclusions

The scientific article proposes a method for calculating the bending strength of steel-reinforced concrete composite span truss structures. This method allows calculating the flexural strength of the calculated sections of steel-reinforced concrete truss structures, taking into account their stress-strain state at the time of maximum load-bearing capacity or failure. The analysis of experimental and theoretical values of flexural strength of SRC truss beams showed their adequate convergence, which allows the application of the calculation method in practice to design SRC span truss structures.

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