ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 6, Issue 11 , November 2019

New Type of Road Bridge Riding Cloth Construction Using Self-Tensioning Concrete

S.S.Salixanov

Associate Professor, Tashkent Institute of Railway Engineers, Tashkent, Uzbekistan

ABSTRACT. The work itself is a method of calculating the intensity of the new design of the bridge floor with the use of stressing concrete. Magnitude of stresses in the concrete fields of unreinforced concrete and reinforced stripes design of the " frame contour - straining concrete" is determined.

KEYWORDS: reinforcement, waterproofing, metal, consumption, constructions, circuit, poisson, Stress

I. INTRODUCTION

In [1], [2] and [3], a bridge web design was considered, consisting of a ten-centimeter layer reinforced with a grid of ten-millimeter rods along the entire length and width of the bridge. The reinforcement coefficient in both directions is 0,4%. Compared to the traditional (i.e., consisting of a leveling layer, coating or gluing waterproofing and reinforced protective layers) construction of the bridge web, tangible savings were achieved, mainly due to the reduction of the complexity when installing a new type of bridge web.

However, the metal consumption of the spans increased slightly. True, taking into account the joint work of the main beams with a layer of bridge fabric creates the possibility of reducing the metal consumption within 12-15%.In order to further reduce the metal consumption of superstructures, a new design of the bridge canvas "frame contour - stressing concrete" was proposed and the copyright certificate was obtained [4]. This design has a significantly lower metal consumption.

II. SIGNIFICANCE OF THE SYSTEM

The work itself is a method of calculating the intensity of the new design of the bridge floor with the use of stressing concrete. The study of literature survey is presented in section III, methodology is explained in section IV, section V covers the experimental results of the study, and section VI discusses the future study and conclusion.

III. METHODOLOGY

The idea of the new design is that the concrete layer on the tensile cement is not reinforced over the entire width and length, but only along the span contour with strips with a width of c = 1 m with a device with spans of more than 12 m and an intermediate strip with a width of also 1 m (Fig. one). The saving of reinforcement per span of 18 m in length with a dimension of 12 m is 432 kg, i.e. metal consumption compared with the method of reinforcing throughout the field is reduced by 33%.

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 6, Issue 11 , November 2019

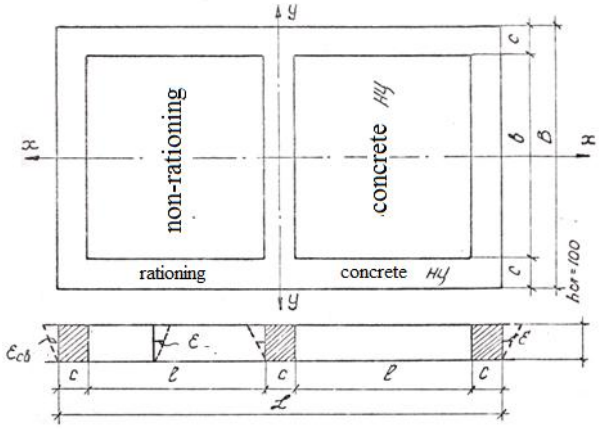

Fig. 1. The calculation of the self-tension of the bridge canvas type "frame contour-stressing concrete"

IV. EXPERIMENTAL RESULTS

We consider the construction of the bridge canvas "frame contour-stressing concrete" as a free-lying concrete slab bordered by reinforced strips. According to the experimental data, the associated expansion of the reinforced bands ε and the free expansion of the unreinforced plate $\varepsilon 0$ are taken as the corresponding average height of the deformation layer of reinforced and unreinforced prisms that adhere to the underlying layer. The adoption of precisely these deformations for calculation takes into account the influence of the underlying layer and allows us to consider the plate as freely lying.

With this design, the expansion of the unreinforced field of the concrete layer on the tensile cement is much larger than the expansion of the reinforced bordering contour. Due to the expansion difference in the unreinforced field, compressive stresses are created, and the strips themselves receive tensile stresses.

The strain compatibility equations have the form:

$$\varepsilon_{0cp} l - \frac{x_x l}{E_{\text{бн}} h_{\text{сл}}} + \frac{x_y l}{E_{\text{бн}} h_{\text{сл}}} \nu = \varepsilon_{\text{свcp}} \frac{L}{2} + \frac{y_x L}{2E_{\text{бн}} A_{\text{бп}}} \quad (1)$$

$$\varepsilon_{0cp} \frac{b}{2} - \frac{x_y b}{E_{\text{бн}} h_{\text{сл}}} + \frac{x_x b}{2E_{\text{бн}} h_{\text{сл}}} \nu = \varepsilon_{\text{свcp}} \frac{B}{2} + \frac{y_y B}{2E_{\text{бн}} A_{\text{бп}}} \quad (2)$$

Here (Fig. 1) ε_0 is the average value of the free expansion of unreinforced concrete on tensile cement, taking into account the influence of the underlying surface; $\varepsilon_{\text{св}}$ is the average value of the associated expansion of the reinforced bands; A_{bn} is the reduced cross-sectional area of the reinforced strip; ν is the Poisson's ratio; $x_x$is the force per unit length l; x_y is the force per unit length b; y_x - force in a strip of length L; y_y is the force in a strip of length B.
The equilibrium equations have the form:

$$x_x b = 2y_x; \quad 2x_y l = 3y_y \quad (3)$$

Self-tension in concrete of unreinforced fields:

in the direction of the x $\sigma_x = \frac{x_x}{h_{\text{сл}}}$; in the direction of the y axis $\sigma_y = \frac{x_y}{h_{\text{сл}}}$;

Self-tension in concrete of reinforced strips:

in the direction of the x $\sigma_{bx} = \sigma_{\text{св}} - \frac{y_x}{A_{\text{бп}}}$; in y direction $\sigma_{by} = \sigma_{\text{св}} - \frac{y_y}{A_{\text{бп}}}$:

Here, σsv is self-stress in a single strip caused by its reinforcement.
Stresses in the reinforcement of bordering strips:

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 6, Issue 11 , November 2019

in the direction of the x $\sigma_{ax} = \sigma_{acв} + \frac{y_x}{A_{бп}} n$:;

in the direction of the y $\sigma_{ay} = \sigma_{acв} + \frac{y_y}{A_{бп}} n$; (4)

We will calculate the real design of the carriageway of the superstructure of the road bridge with a length of L = 18 m and a width of B = 12 m (see Fig. 1). The width of the reinforced strips c = 1,0 m; The thickness of the layer of stress concrete h = 10 cm. The reinforcement coefficient referred to the strip area is μ = 0.01 (strip reinforcement is carried out by 13 rods with a diameter of 10 mm per meter of strip length and width).

Reinforcement coefficients related to the field area *bh* and 22*lh*:

$$\mu_x = \frac{13 \cdot 0{,}785 \cdot 2}{1000 \cdot 10} = 0{,}002; \ \mu_y = \frac{13 \cdot 0{,}785 \cdot 3}{750 \cdot 10 \cdot 2} = 0{,}002;$$

According to experimental data: ε_0 = 0,0013; ε_{sv} = 0,0006; initial (secant) elastic modulus of concrete on tensile cement two days after the end of wetting ε_{bn} = 35x103 MPa; Poisson's ratio v = 0,2; After substituting the initial data in equations (1-3) and transformations, we obtain the system of equations:

$$37{,}5x_x - 7{,}5x_y + 0{,}4y_x - 43500 = 0;$$

$$10{,}0x_x - 50x_y + 0{,}54y_y + 58000 = 0;$$

$$500x_x = y_x; \ 500x_y = y_y;$$

Solving this system of equations, we obtain the forces per unit width and length of the structure of the carriageway of the superstructure from self-stressed concrete:
force per unit length l unreinforced field: x_x = 1,89 MPa;
force per unit length b_f unreinforced field: x_y = 1,87 MPa;
force in a strip of length$L$ the reinforced circuit: y = 945,3 kN;
force in the strip of length B the reinforced circuit: y_y = 935,8 kN;
Thus, stresses in an unreinforced field:

$$\sigma_x = \frac{x_x}{h_{сл}} = 1{,}89 МПа; \ \sigma_y = \frac{x_y}{h_{сл}} = 1{,}87 МПа;$$

Substituting the values in formulas (4), we obtain the stresses in the reinforcement of the bordering strips:
in the direction of the x axis: σ_{ax} = 205.8 MPa;
in the direction of the y axis: σ_{ay} = 204.9 MPa.

V. CONCLUSION AND FUTURE WORK

Based on the obtained experimental data, the loss of self-stress from shrinkage and creep can be taken equal to 30% of the initial value. Consequently, the steady-state self-stress in concrete is σbt = 0.7 · 1,89 = 1,32 MPa. This value of self-voltage provides the necessary water resistance.

REFERENCES

[1]. Salikhanov S.S.An experimental study of the joint work of a layer of self-stressed concrete with the main beam of the bridge span. // Scientific works of the republican scientific and technical conference with the participation of foreign scientists "Resource-saving technologies in railway transport" on December 6-7, 2014. TashIIT, Tashkent, 94-95 pp., 2014.
[2].Salikhanov S.S. Ballast-free bridge bed of railway bridges using self-stressed concrete. // Scientific works of the republican scientific and technical conference with the participation of foreign scientists "Resource-saving technologies in railway transport" on December 6-7, 2013. TashIIT, Tashkent, 94-95 pp., 2013.
[3]. Salikhanov S.S. Bridge repair using self-stressed concrete. // Scientific works of the republican scientific and technical conference with the participation of foreign scientists "Resource-saving technologies in railway transport" on December 6-7, 2013. TashIIT, Tashkent, 104-106 pp., 2013.
[4]. Salikhanov S.S., Livshits Y.D., Shtilman E.I. Bridge roadway and the method of its construction.Copyright certificate №.804755. Bulletin of inventions, №.6, 1981.