ISSUES OF CALCULATING THE TRANSVERSE FORCE AND BENDING MOMENTS FOR VARIOUS TYPES OF FENCES IMPOSED BY EXTERNAL FORCES

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Abstract: This article provides information on methods for plotting shear force and bending moment for various beams loaded with external forces. The ways of solving certain issues are indicated.

Keywords:console light, volume strength, torque, shear strength.

Today, the development of construction and technology is directly related to the achievements of some sciences. Including in the science of the strength of materials, many achievements are being made. We know that the resistance of materials teaches us methods of calculating a structure and its elements for strength, fragility and superiority, as well as calculating the deformations that may occur.

Durability- this is the operation of the machine and its parts without long-term wear.

Invariability- this does not create a large deformation of the machine and its parts.

Priority- this is the ability of the machine and its parts to maintain the initial state of equilibrium under the influence of an external force.

The forces applied to the structural elements are called external forces. External forces are divided into active and passive forces.

The active forces are as follows;

1. Cumulative force applied to the point P (N).
2. Evenly distributed along the length of the force or intense force $q\left(\frac{H}{м}\right)$
3. Double force or torque M (Nm)
4. Surface impact force.
5. Volumetric force.

Passive forces are reaction forces.

From the action of external forces, the body is deformed, and internal stress forces are formed in its cross-section. To determine them, the method of cuttings is used.

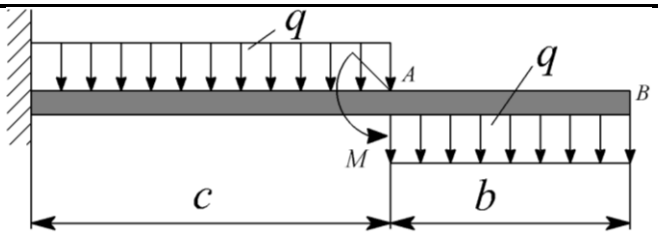
The deformation at which the bending moment is created in the cross sections of the beam is called bending. A straight slope is called if external forces that have at least one axis of symmetry lie in this plane. An oblique bend is called if the external forces are outside the axis of symmetry.

Below we will look at some of the issues related to bending and their solution:

Let's consider plotting the transverse force and bending moment for a console consisting of two spans.(Picture 1)

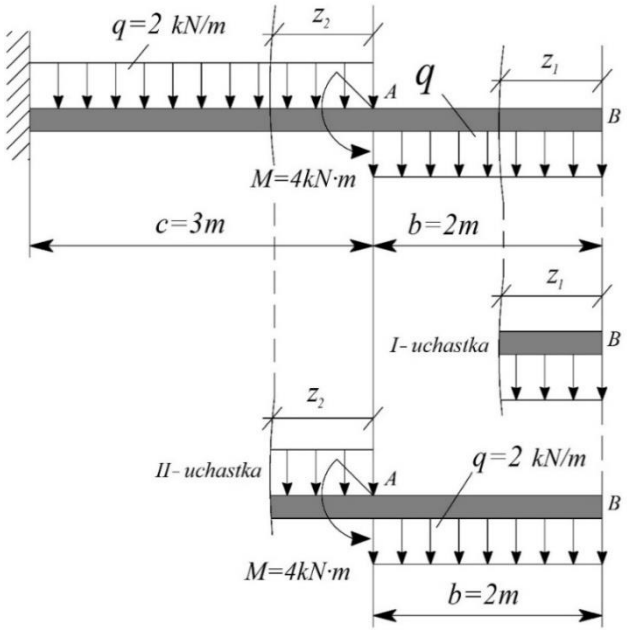
Given:

$$a=1;\ b=2;\ c=3.\ q=2\ kN/m;\ \ M=4\ kN\cdot m;$$



(Picture 1)

Solution: according to the method of cutting, we can cut each interval at a distance of z with a fikran edge and separately draw a segment separated from the console.



2-picture. The console maybe plots divergent.

1. Using the cutting method, we determine the cross-Force value

for the plot, the first landing: $0 \le z_1 \le b,\ \ b = 2$

$Q_{y1} = q \cdot z_1;$

$Q_{y1}(z_1 = 0) = q \cdot z_1 = 2 \cdot 0 = 0\ ;$

$Q_{y1}(z_1 = 1) = q \cdot z_1 = 2 \cdot 1 = 2\ \ kN\ ;$

$Q_{y1}(z_1 = 2) = q \cdot z_1 = 2 \cdot 2 = 4\ \ kN\ ;$

-second attempt for point: $0 \le z_2 \le c,\ \ c = 3$

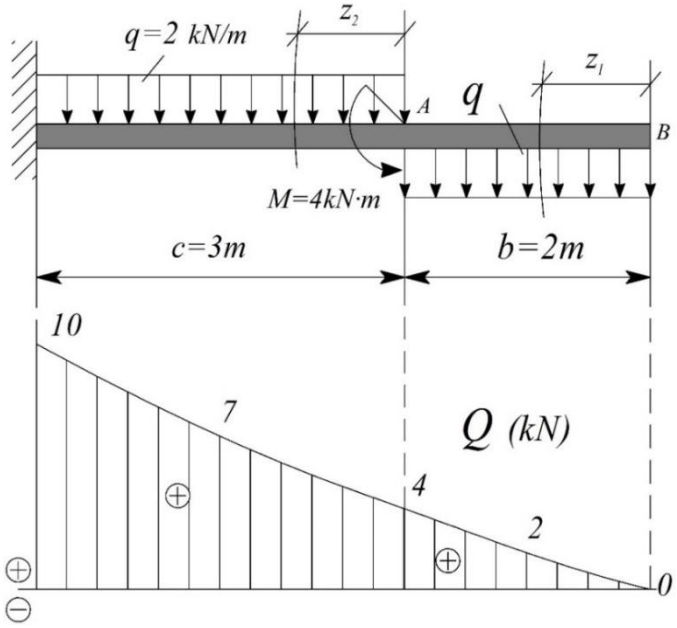
$Q_{y1} = q(b + z_2);$

$Q_{y2}(z_2 = 0) = q(b + z_2) = 2(2 + 0) = 4\ kN\ ;$

$Q_{y2}(z_2 = 1{,}5) = q(b + z_2) = 2(2 + 1{,}5) = 7\ kN\ ;$

$Q_{y2}(z_2 = 3) = q(b + z_2) = 2(2 + 3) = 10\ kN\ ;$

Using the found values, we build a cross-power of graphic design



3-picture. The cross-power of graphic design formed in the Kansol region.

2. We determine the value of the bending moment

-the first attempt for point: $0 \le z_1 \le b,\ \ b = 2$

$$M_{x1} = -q \cdot \frac{z_1^2}{2};$$

$$M_{x1}(z_1 = 0) = -2 \cdot \frac{0^2}{2} = 0;$$

$$M_{x1}(z_1 = 1) = -2 \cdot \frac{1^2}{2} = -1\ kN \cdot m;$$

$$M_{x1}(z_1 = 2) = -2 \cdot \frac{2^2}{2} = -4\ kN \cdot m;$$

-second attempt for point: $0 \le z_2 \le c,\ \ c = 3$

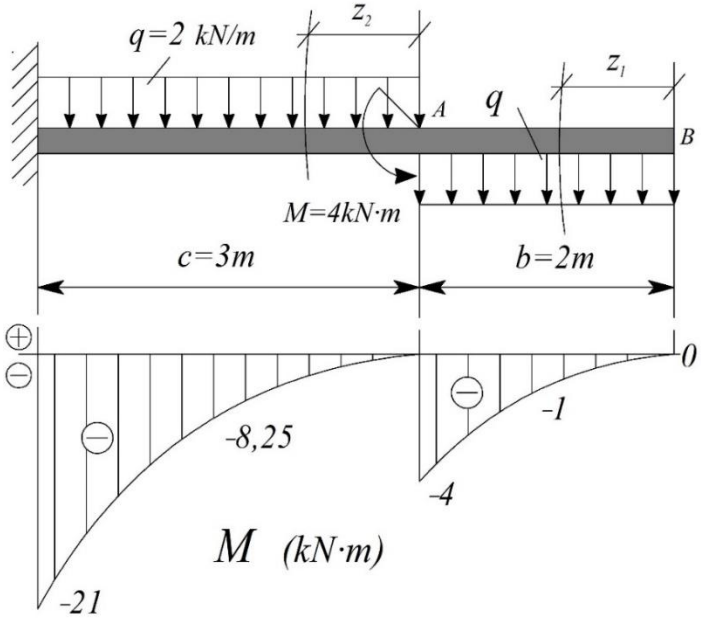
$$M_{x2} = -q\frac{(b + z_2)^2}{2} + M;$$

$$M_{x2}(z_2 = 0) = -2\frac{(2+0)^2}{2} + 4 = 0;$$

$$M_{x2}(z_2 = 1{,}5) = -2\frac{(2+1{,}5)^2}{2} + 4 = 16{,}25\ kN \cdot m;$$

$$M_{x2}(z_2 = 3) = -2\frac{(2+3)^2}{2} + 4 = 29\ kN \cdot m;$$

Using the found values, we construct an diagram of the transverse force and the bending moment.



4-picture. An diagram of cross-force generated in the console region.

Calculated the values of the shear force and bending moment for the console region, plotted diagrams for each of the values. In conclusion, we can say that the solution of such issues opens up new opportunities in urban planning, construction of buildings and structures.

References:

1. O'razboyev M.T. Materiallar qarshiligi asosiy kursi. Oliy o'quv yurtlari uchun darslik. -T.: O'qituvchi, 1973.
2. S.M. Xasanov Mexanika. Materiallar qarshiligi. Darslik. T. 2020.
3. Kachurin V.K. Sbornik zadach po soprotivleniyu materialov. – M.: Nauka, 1970.
4. Abdukhamidov S.K., Akhatov K,N, Khudoykulov Sh.Sh.
5. Free Vibrations of an Elastic Two-Layer Plate https://openaccessjournals.eu/index.php/ijiaet/article/view/248
6. http://www.edu.uz – educational site.
7. http://www.edu.ru – educational site.
8. http://www.intuit.ru – distance learning site.