STRAIGHTENING THE BOX CURVE OF A STEEP ARCH

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ABSTRACT

This article examines the issues of straightening flat curved lines lying on a plane. To straighten the curve, a box curve of the steep vault was constructed along its width AB and height OS. The box curve of a steep vault consists of four arcs of a circle. To straighten the vault, it was necessary to determine the length of each arc of the circle. The author of the article used the small chord method. As the name itself shows, the method consists in inscribing a broken line into a rectifiable flat curve, the links of which represent small chords of the curve.

Thus, straightening and determining the length of box flat curves of steep vaults are used in the construction of bridge arches, entrances to buildings and subways, etc.

Keywords: Straightening, point, method, deployment, plane, chord, curve, line, arch, straight line, segment, arc.

Box curves of vaults refer to open box curves. They are used in the construction of vaults and arches of bridges, entrances to buildings, various ceilings, such as subways, etc. Gentle and steep vaults are distinguished by the ratio of their width AB and height OS. The hollow vault has AB/2>OS, and the steep vault has AB/2<OS. To measure the value of box curves (more precisely, circles), an approximate method is used, which consists in the fact that the length of the arc ACB of the circle is measured by a tangential CL segment (Fig. 1), cut off on it by rays NA and NB. Point N lies on the continuation of straight line MO at a distance MN = 3R. The accuracy of such a construction (at <60) is quite sufficient for practical purposes.

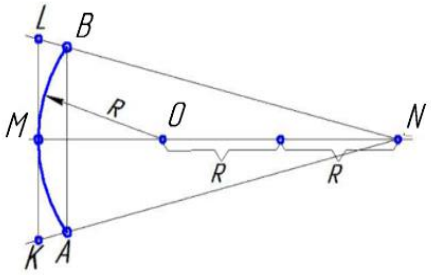

Рис. 1

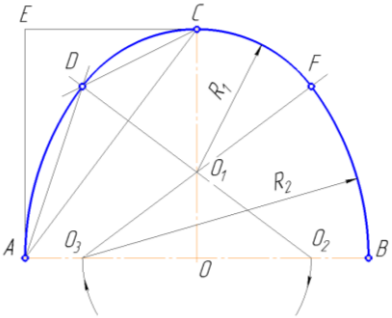

Рис. 2

When using graphical deployment techniques, it is always necessary to straighten curved lines lying on a plane. To do this, the method of small chords is used, as the

name itself shows, the method consists in inscribing a broken line into the rectifiable curve, the links of which represent small chords of the curve. If a curve needs to be straightened, then its chords are successively plotted on a certain straight line and the entire resulting segment is taken as the length of the arc of the curve.

Let's consider straightening the box curve of a steep vault. First, let's construct a curve for a steep vault along its width equal to AB = 60 mm and height OC = 100 mm (Fig. 2). The segment AB is divided in half, a rectangle AESO is constructed and a diagonal AC is drawn in it. The perpendicular is continued until it intersects with the segments: OS at point O1 and AB at point O2. Point O3 is obtained using a circular arc of radius OO2. Points O1, O2 and O3 are the centers of arcs of radii R1 and R2, with the help of which the contour of the curve is constructed.When straightening the arc AF of a circle of radius R36 (Fig. 3), a perpendicular is drawn through the middle of the chord AF until it intersects with the arc at point M. To the right of the center of the arc of the circle - point O-, two segments are laid along the perpendicular, equal to the radius R36 of the arc, and a point is obtained N straight lines AN and BN, until they intersect with the tangent to the arc at point M, we obtain the segment KL=AF=GB=36. This segment is, to a sufficient approximation, equal to the length of the arc AF. Similarly, we define the arc FC =CG=34. When determining

The actual dimensions of the FC arc are similarly determined as shown in Figure 3, which is 32 mm. Arcs FC=CG, if so then CG=32 mm.

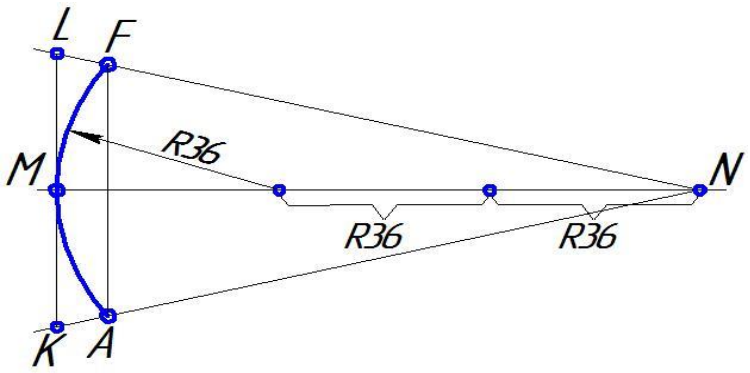

Рис. 3

The ASV arc should be made with sufficiently high accuracy equal to the length of the box curve of the hollow vault. If the curve needs to be straightened, then the length of the arc is successively plotted on a certain straight line and the entire resulting segment is taken as the arc length of the curve.

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