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PRISMATIC ELBOW DEVELOPMENT

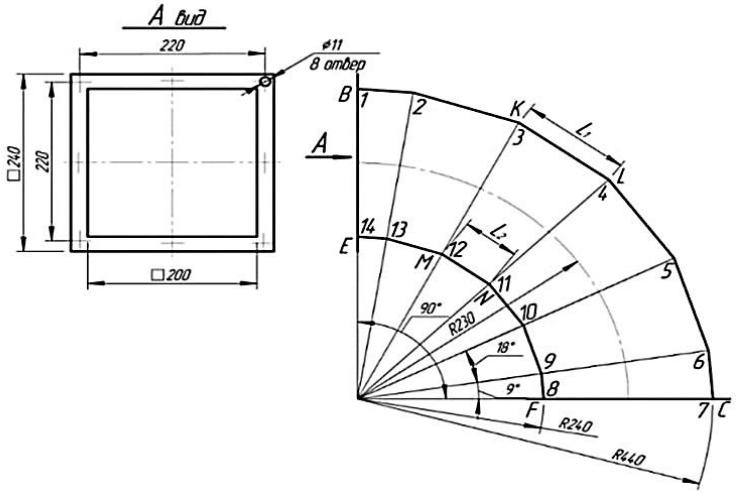
Xusanbaev Abdulkasim Mamajonovich
Associate Professor, Fergana State Technical University

Abstract: This article discusses issues of the development (unfolding) of a prismatic elbow. The author of the article believes that in practice it is often necessary to work with geometric surfaces cut by a plane and to create patterns (templates) of these surfaces. The author conducted an experiment with a water pipe, chimney and the bend of air suction pipes. To make a prismatic elbow, templates were made from steel sheet. These templates are bounded by curves and sinusoidal lines, and their shapes and sizes are determined by the diameter of the groove. The prismatic elbow with a central angle of 90° is shown with dimensions; it is sufficient for manufacturing the template and products from thin metal sheets. The use of elbow developments in production increases labor productivity and product quality.

Keywords: development, surface, elbow, productivity, angle, labor, product, central, dimensions, geometric, plane, manufacturing.

In practice, it is often necessary to work with geometric surfaces and create templates for these surfaces. Examples include water pipes, chimneys and air suction pipe bends. To make such an elbow (Fig. 1), templates are made of steel sheet (Fig. 2). These patterns are limited to curves and sine lines, and their shapes and sizes are determined by the diameter of the groove. Prismatic suction pipes and elbows are commonly used in chemical laboratories of universities, schools, and factories.

Rice. 1 Air suction elbow



In our example, this is a welded elbow with a central angle of 90°, an average radius of curvature of 230 mm and a cross section of 200 × 200 mm (Fig. 2). Thus, the elbow is divided into six sections, namely: 90° angles, two extreme sections and four sections with 180° angles.

Each section unfolded like a prism, cut out by one or two slopes. The scan lines of a prism are broken lines. To reduce the number of broken lines, save steel sheets and increase the strength of welds, section developments should be positioned as shown in the drawing. With this arrangement, the welded joints of adjacent sections coincide with each other, which is very important.

Now let's determine the distances L1 and L2 in Figure 1.

To do this, we will use the formula $MN = \frac{\pi \cdot R \cdot \alpha}{180^\circ}$

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where, MN – this is the length of the base of the sector

π – constant number

R – sector radius

α - central slope of the sector,

1. $MN = \frac{3.14 \cdot 440 \cdot 18^\circ}{180^\circ} = \frac{24868.8}{180^\circ} = 138.16$

Let us assume that MN = L_1 = 138.2

$BC = \frac{2\pi \cdot R}{4} = \frac{2 \cdot 3.14 \cdot 440}{4} = \frac{2763.2}{4} = 690,8$

$L_1 = \frac{BC}{5} = \frac{690,8}{5} = 138,16$

$MN = \frac{2\pi \cdot R \cdot \alpha}{180^\circ} = \frac{3.14 \cdot 240 \cdot 18^\circ}{180^\circ} = \frac{13564.8}{180^\circ} = 75.36$

We accept MN = L_2 = 75.4

EF = $L_2 \cdot 5$ = 75.36 · 5 = 376.8

$EF = \frac{2 \cdot \pi \cdot R}{4} = \frac{2 \cdot 3.14 \cdot 24}{4} = \frac{1507.2}{4} = 376.8$

Let's determine the 1:4 part of the arc's circumference $\overset{\sim}{BC}$.

$BC = \frac{2 \times R}{4} = \frac{3.14 \cdot 240 \cdot 18^\circ}{180^\circ} = \frac{13564.8}{180^\circ} = 690,8$

Determine the length of the sector arc L_1

$L_1 = \frac{BC}{5} = \frac{690,8}{5} = 138,16$

$MN = L_1$ is proof that $MN = L_1 = 75,4$

EF – сумма длины 5 ти секторов, $EF = L_2 \times 5 = 75,36 \times 5 = 376,8$

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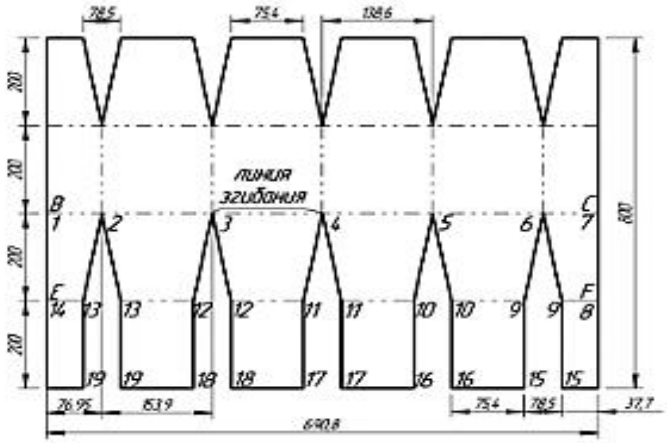

$$EF = \frac{2\pi R}{4} = \frac{2 \times 3{,}14 \times 24}{4} = \frac{1507{,}2}{4} = 376{,}8$$

Rice. 2. Knee development

The equality MN = L = 376.8 mm is proof that the arc is located on a plane of five equal parts in real size. The elbow of the prism with a central angle of 90° is rotated onto a plane of a given size.

The main purpose of the reamer is to make a template and product from thin metal sheets (Fig. 2).

Therefore, a prism elbow with a central angle of 90° shown with dimensions is sufficient for making a template and product from metal thin sheets. The use of knee reamers in production increases labor productivity and product quality.

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