Recent years have seen extensive developments in the use of concentration horizons for developing deposits, both in the Soviet Union and abroad. This has involved the use of main ore chutes as an essential feature of the ore transport system. The function of these chutes is similar to that of main ore haulage roadways, and they must be kept in good condition if the mine is to operate efficiently. The state of main ore chutes is determined by several factors, primarily correct design and slope angle.

In Soviet mines the main ore chutes are generally vertical. The length reaches 600 m (Fig. 1). It is supposed that vertical ore chutes are better than inclined chutes, chiefly because there is less likelihood of blockages.

In foreign mines the main ore chutes nearly always run at an angle of 50-80°. The length of the elbow varies from 45 to 100 m (see table) and is seldom more than 210 m. Figures 2, 3, and 4 show typical ore transport systems in foreign mines.

Of the fifteen foreign mines studied, twelve had inclined ore chutes, and the others had partly vertical and partly inclined chutes.

Experience gained in foreign mines shows that inclined ore chutes have considerable advantages over others, particularly where the fall height of the ore is great.
We shall examine the forces acting in an ore column in a vertical and an inclined ore chute, filled to height H with equal amounts of ore (Fig. 5a, b) with the same physical and mechanical properties and the same distributions of grain sizes.

When the ore column moves downward, lateral friction arises between the ore and the walls of the chute, so the vertical pressure on the column is distributed nonuniformly, decreasing at the chute walls. This is known from the theories of Birbaumer and Jansen [11].

![Fig. 4. Transport of ore and dirt in No. 5 shaft of the Falconbridge Mine (Canada): 1) No. 5 shaft; 2) ore chute; 3) dirt chute; 4) underground crusher room.](image)

![Fig. 5. Stress in ore column in (a) a vertical ore chute and (b) an inclined ore chute.](image)