# HÄLSINGBORG WATER SUPPLY

*ERIC BENGTSSON, Chief Engr., Water Board of Hälsingborg, and ERIK ISGÅRD, C.E., Cons. Engr. of VBB*

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The town of Hälsingborg is situated on the north-western coast of the province of Skåne. The population has increased from 24,670 inhabitants in 1900 to 78,290 in 1963. At the same time the annual water consumption increased from 0.75 mill.m³ to 10.2 mill.m³, see *Fig. 1.* This means that there has been a simultaneous increase in the per capita consumption, which is now 370 litres per capita per day, see *Fig. 2.* This development is typical of expanding Swedish towns.

The expansion may be illustrated by the reservoirs of the town. The first water supply in 1885 included a ground reservoir of 1,200 m³, which served the coastal plain by gravity, and an elevated tank for the higher parts of the town. The latter was demolished in 1963, as the space was required due to the town's expansion. Another ground reservoir was constructed in 1905 at Ringstorp. In the style of the age it was given an imposing appearance (*Fig. 3*), and has in fact been mistaken for the nearby royal palace of Sofiero. The reservoir was provided with two compartments, one of which was reserved for a salt water supply. No salt water pipes, however, were constructed. The town obtained two new elevated reservoirs in

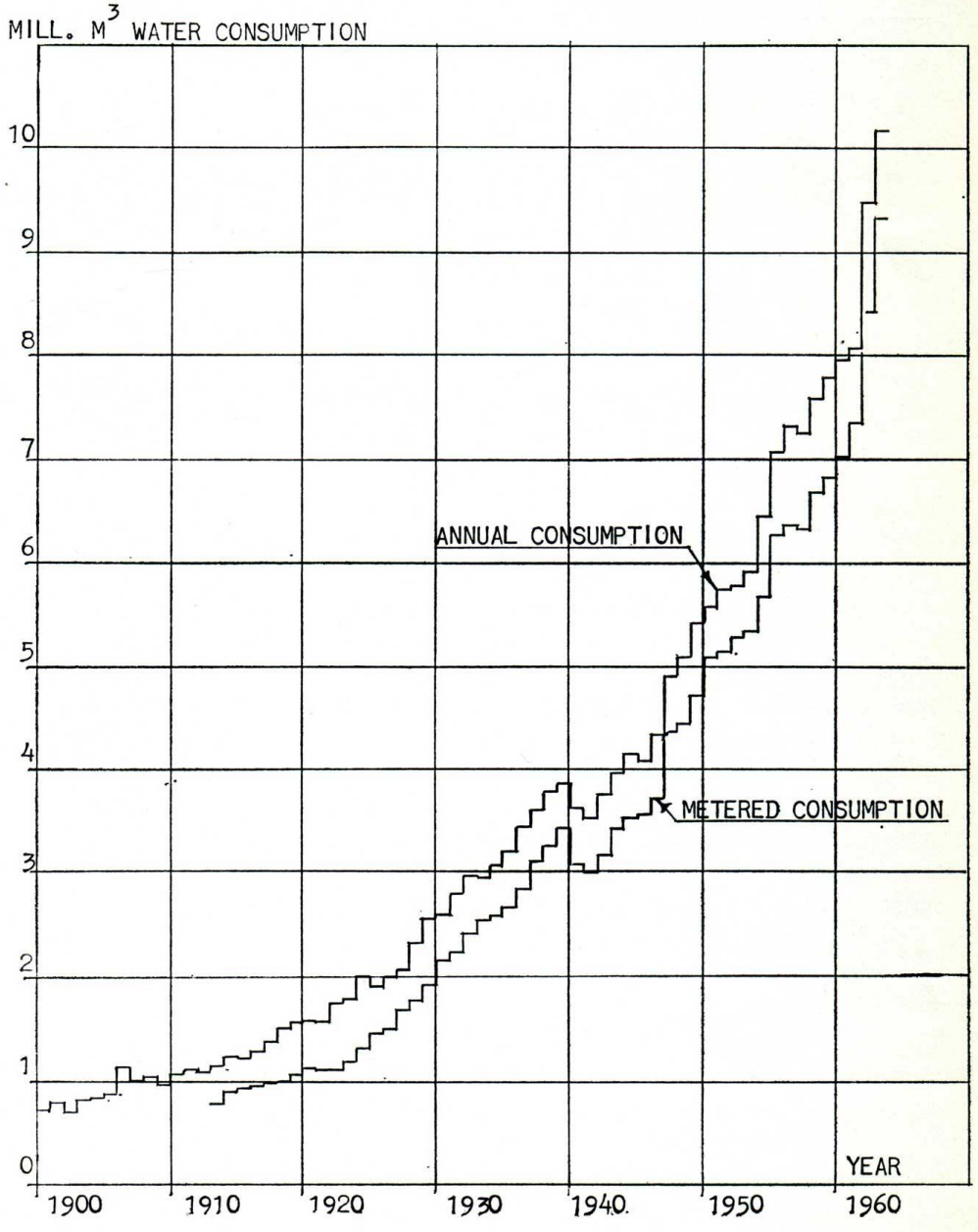


*Fig. 1. Development of annual water consumption in Hälsingborg 1900—1963*

1918 when the adjacent villages of Ramlösa and Råå were incorporated. Their conspicuous silhouettes are still to be seen.

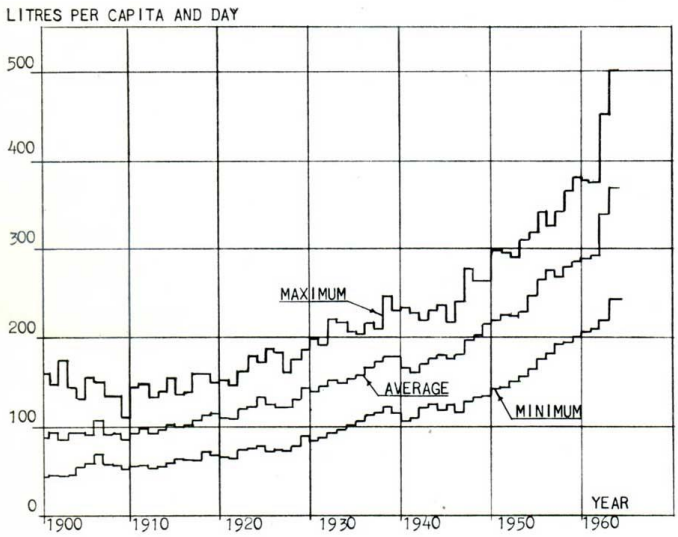


*Fig. 2. Per capita consumption in Hälsingborg 1900—1963*

The new age was displayed by the "mushroom-shaped" water tower at Fredriksdal (*Fig. 4*). Constructed in 1960—1961, it represents an advanced technical and architectural design as well as an advanced construction. A volume of 7,600 m³ of water is contained in the conical, elevated reservoir, which is divided into two concentric compartments. Either of them may be cleared without interrupting the services. The shell of concrete, without any insulation, is prestressed. The reservoir is 26 m above ground and rests on 8 cylindrical columns, founded on loose, weathered sandstone (*Fig. 5*). The reservoir was cast on the ground and then raised by 32 hydraulic jacks. After each lift of 10 cm light-metal insertions were placed under the jacks. After three such lifts these were replaced by a concrete cylinder (*Fig. 6*). At a height of two cylinders the concrete of the columns was cast in situ. The reservoir being raised up from the ground is shown on *Fig. 7*.

There are only a few rivers and lakes in the north-western part of Skåne, and therefore the original water supplies had to rely on ground water. The first waterworks at Bergaliden were situated right in the town and served from 1885 to the beginning of this year. The wells eventually supplied 2 mill.m³ a year.

*Fig. 3. Reservoir at Ringstorp, Hälsingborg, constructed in 1905. Volume 2,200 m³*

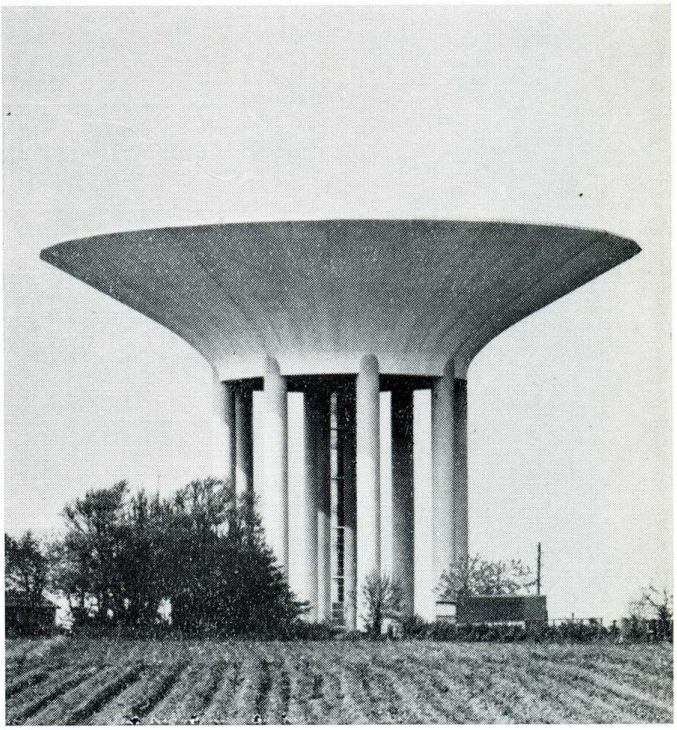

*Fig. 4. Elevated water tower at Fredriksdal, Hälsingborg, constructed in 1960—1961. Engineers and architects, VBB*

This was a valuable asset, available in the centre of the demand and thus reduced the draught on mains and reservoirs.

At the fishing-village of Råå to the south of the town are the plains of Örby, a gravel field of 2 sq.kms.

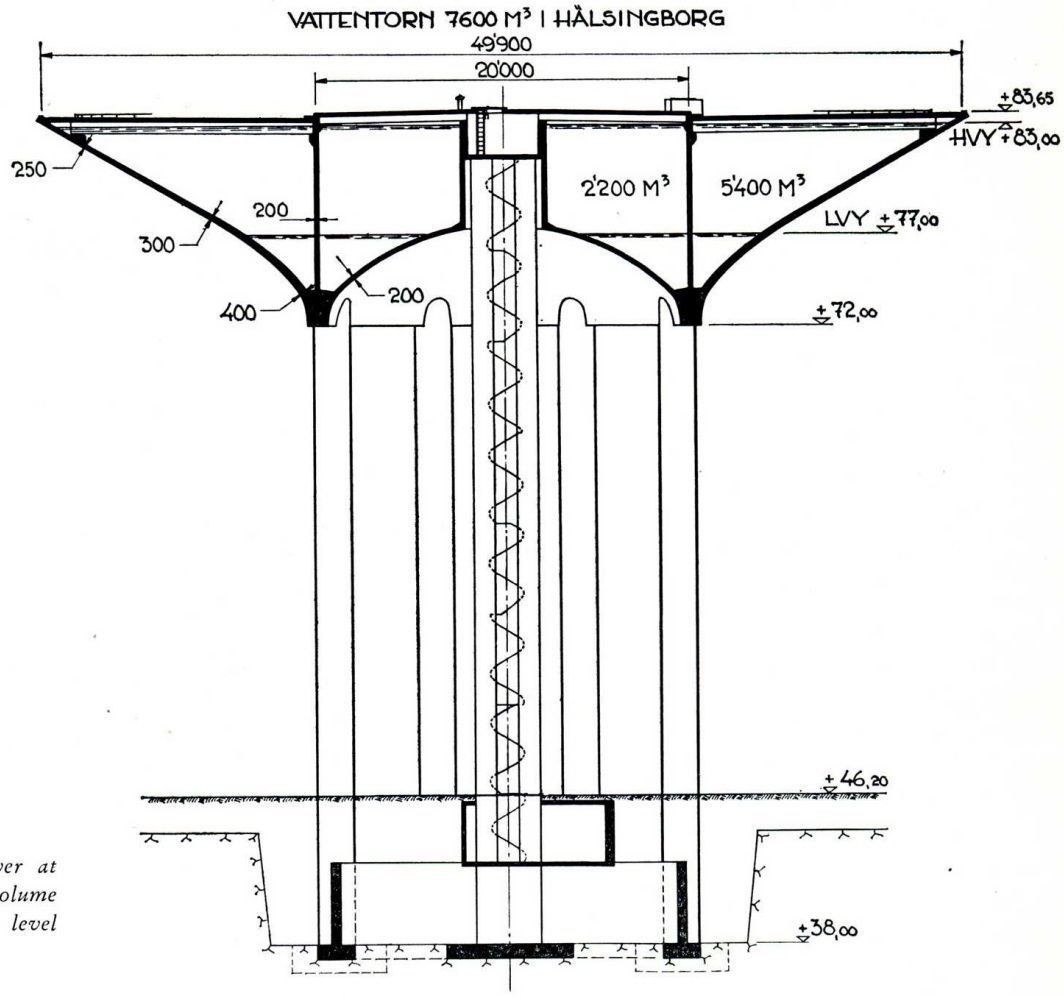


*Fig. 5. Elevated water tower at Fredriksdal. Section. Total volume 7,600 m³. Highest water level 36.8 m above ground*

The field is situated in a depression af clay, which opens to the village. Here it was possible to collect 600 m³ a day of good quality ground water. Since 1918 the town has used this aquifer. As early as in 1926 the ground water was replenished by water from the nearby River Råå. The waterworks of Örby developed over the years into one of the largest plants for artificial replenishment in Sweden. An outline of the present waterworks is shown in *Fig. 8.*

The gravel deposits have a depth between 6 and 15 m, 3—5 m of which are above the highest water level at recharge. About 700,000 m³ of water is estimated to be stored in the gravel. At a maximum daily output of 35,000 m³ the average retention time should then be about 20 days. The passage through the ground smooths out temperature variations. At the present output of 30,000 m³ a day, the well water gets its lowest temperature (5°C) in June and its highest (12°C) in November.

The ground water is at present collected in 19 wells and 2 well groups. The water is pumped to the high lift pumping station and a reservoir of 1,250 m³. Six pumps deliver the water to the town. Four of them have a capacity of 200 litres per second (l/s) each, one of 100 l/s, and one of 50 l/s at a lift of 75 m. There are two pressure pipes of 600 mm diameter. The pumping station may later be split up, with the existing pumps for the high lift zone and new pumps for a future low lift zone.

Raw water for the replenishment of the aquifer was originally obtained from the River Råå and from some wells drilled in rock belonging to the "rät-lias" era. Since 1964, however, all the water has been obtained from Lake Ringsjön, some 50 km to the east of the town. The lake water is not as hard as the river water and thus, the ground water is steadily changing in quality. This is shown on *Fig. 10*, where total hardness and alkalinity of ground water and lake water

are plotted. The original total hardness of 15.9 German degrees (283 mg/l $CaCO_3$) has in less than one year been lowered to 9.9 (176) but this is still higher than the lake water hardness of 6.7 German degrees (119 mg/l $CaCO_3$).

It was in the early forties that it became evident that the local supplies would be inadequate for the future. Lake Ringsjön was considered as the most suitable source. After legislative procedures lasting for 10 years the Swedish Supreme Court in 1959 finally permitted the exploitation of the lake for the water supply of the towns of Hälsingborg, Landskrona and Eslöv. The maximum draw-off was limited to 660 l/s and the permission will cease by 1980.

The treatment of the lake water was studied in a pilot plant arranged for chemical flocculation and rapid filtration as well as for slow sand filtration and for a combination of these methods. The water was found to require about 50 mg/l of alum and 5 mg/l of sulphuric acid in its treatment, but the water still had some taste. By using slow sand filtration taste and odour were no problem. In exceptional cases the colour could, however, exceed 20 mg/l Pt.-scale. It was decided to treat water by slow sand filtration and chlorination but space has been reserved for chemical treatment as well.

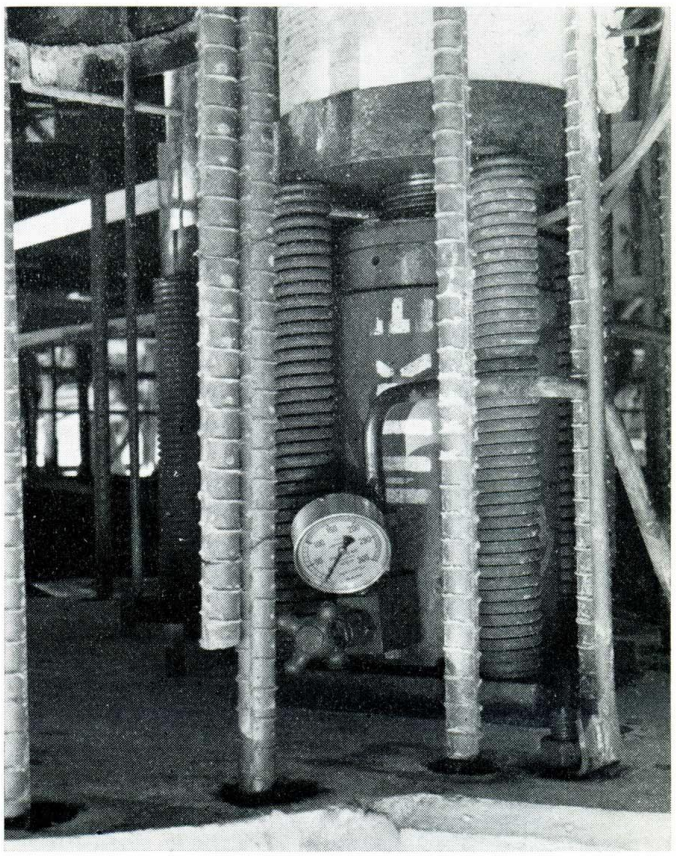

*Fig. 6. Construction of elevated water tower at Fredriksdal. Jack for lifting the reservoir from the ground*

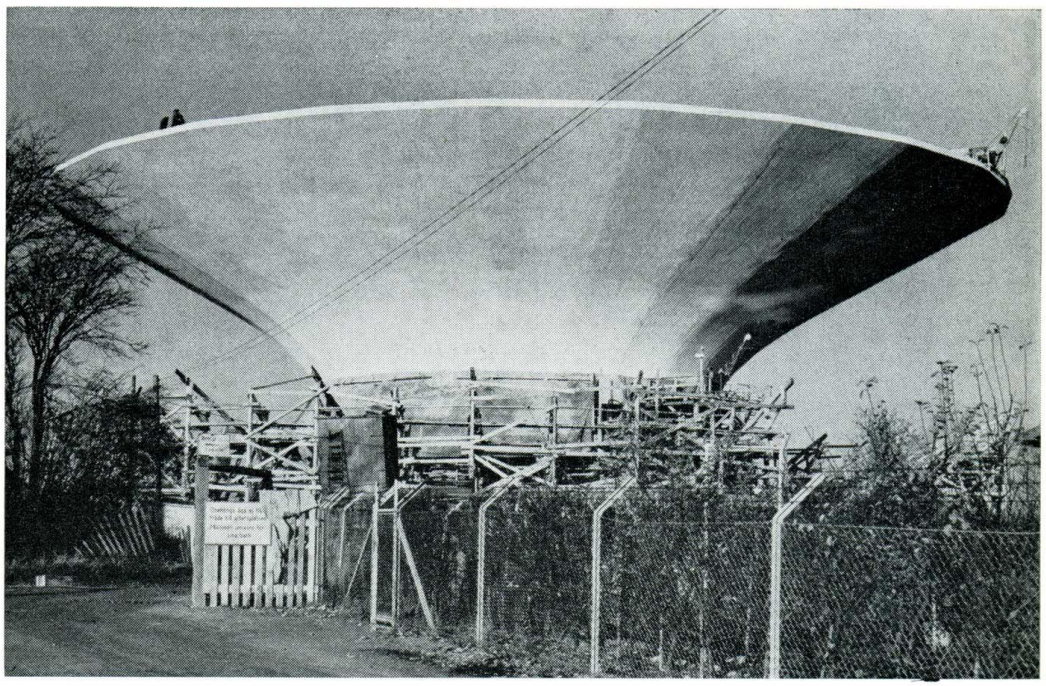

*Fig. 7. Construction of elevated water tower at Fredriksdal. Reservoir under lifting from ground. Contractor: Skånska Cementgjuteriet*