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5. New Building for Continuous Casting at the Piombino Steel Plant (Italy)

Owner: Steelworks of Piombino
Plant project: Steelworks of Piombino
Structural steel project: S. Caramelli, G. Mazzali
Contractor: Costruzioni Metalliche Finsider S.p.A. Guasticce (Leghorn)
Duration of work: 12 months
Service date: 1982
Volume of building: 380,000 m³
Weight of structural steel: 5700 t.

The portal frames are made of I sections welded to the columns and bolted to the transversal beam by means of butt straps.

The longitudinal portal frames consist of the sliding rail caisson and the shearing and gusset beams. The wind braces saddle the expansion joint; they have a lattice structure, with a double wall in the sliding plane and single walled in the other plane. The carrying loads of the crane beams vary from 160 to 20 t. The carrying beams have 18, 24 and 30 m spans and have a symmetric I section with the following heights: 2.20, 2.70 and 3.40 m. The dimensions were chosen mainly as a result of fatigue tests; 600.000 cycles for the passage of the wagon and a charge load of 47 t per wheel have been allowed for on the 160 t crane.

The building is composed of:

- ground floor storage and shipping bay
- continuous casting plant bay
- cooling floor bay
- viaduct for transfer carriage.

Structurally speaking there are two bays AB & BC having spans of 38 m and 34 m respectively. The frame centre lines are spaced at multiples of 6 m or more precisely 18, 24 and 30 m.

Due to the dimensions of the area the columns elements were restricted to 2.8 m so as to minimize their obstruction; this led to the use of solid portal frames.

The roofing consists mainly of two static ventilators weighing 8 and 10 t. The support structure consists of longitudinal girders which have a solid section under the ventilators and a lattice structure elsewhere and are simply supported by the beams on the pillars. The support girders are fixed to the purlin beams.

The lack of space required to build a piezometric tower necessitated the placing of a 60 m³ tank at a height of 40 m on the roof.

The supporting frame covers the area between the 4th and 5th columns of the bay BC around the reinforced concrete support base of the machine.

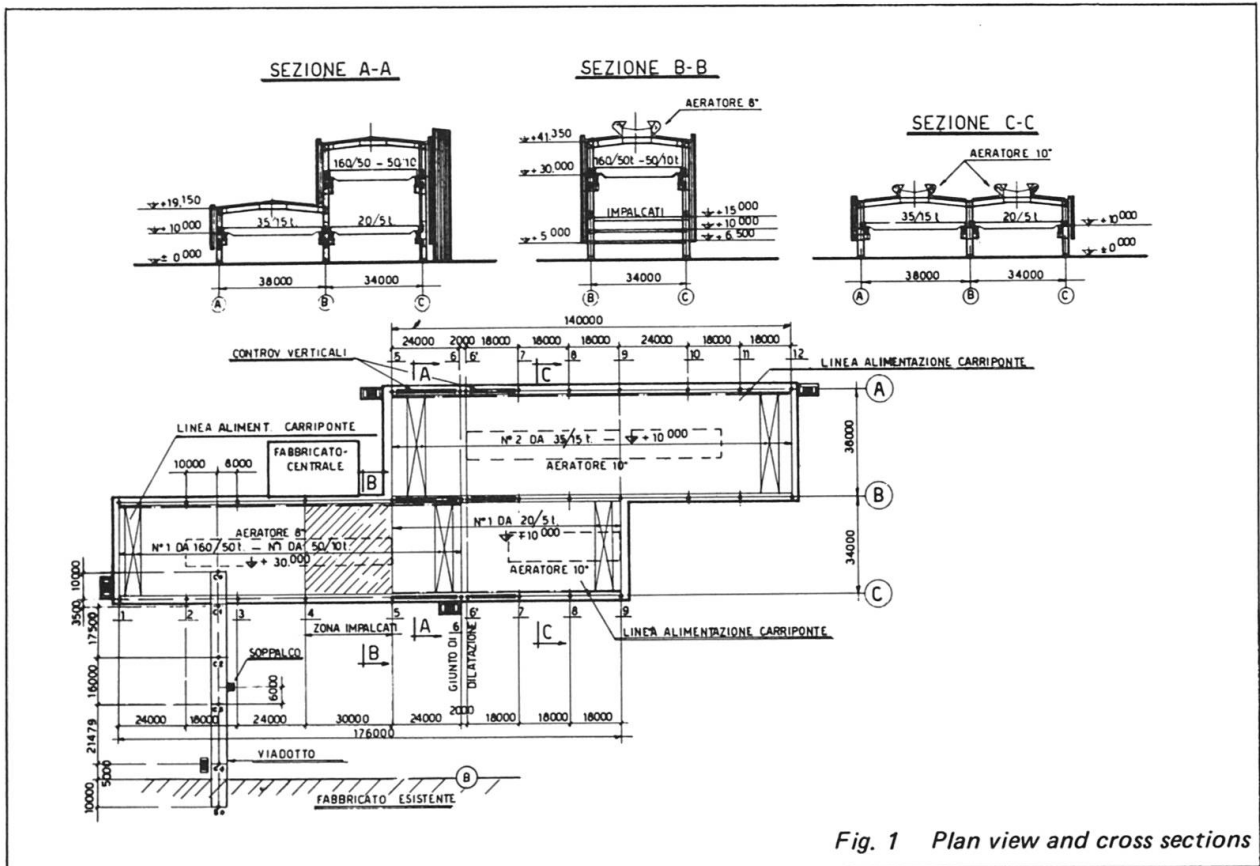


Fig. 1 Plan view and cross sections

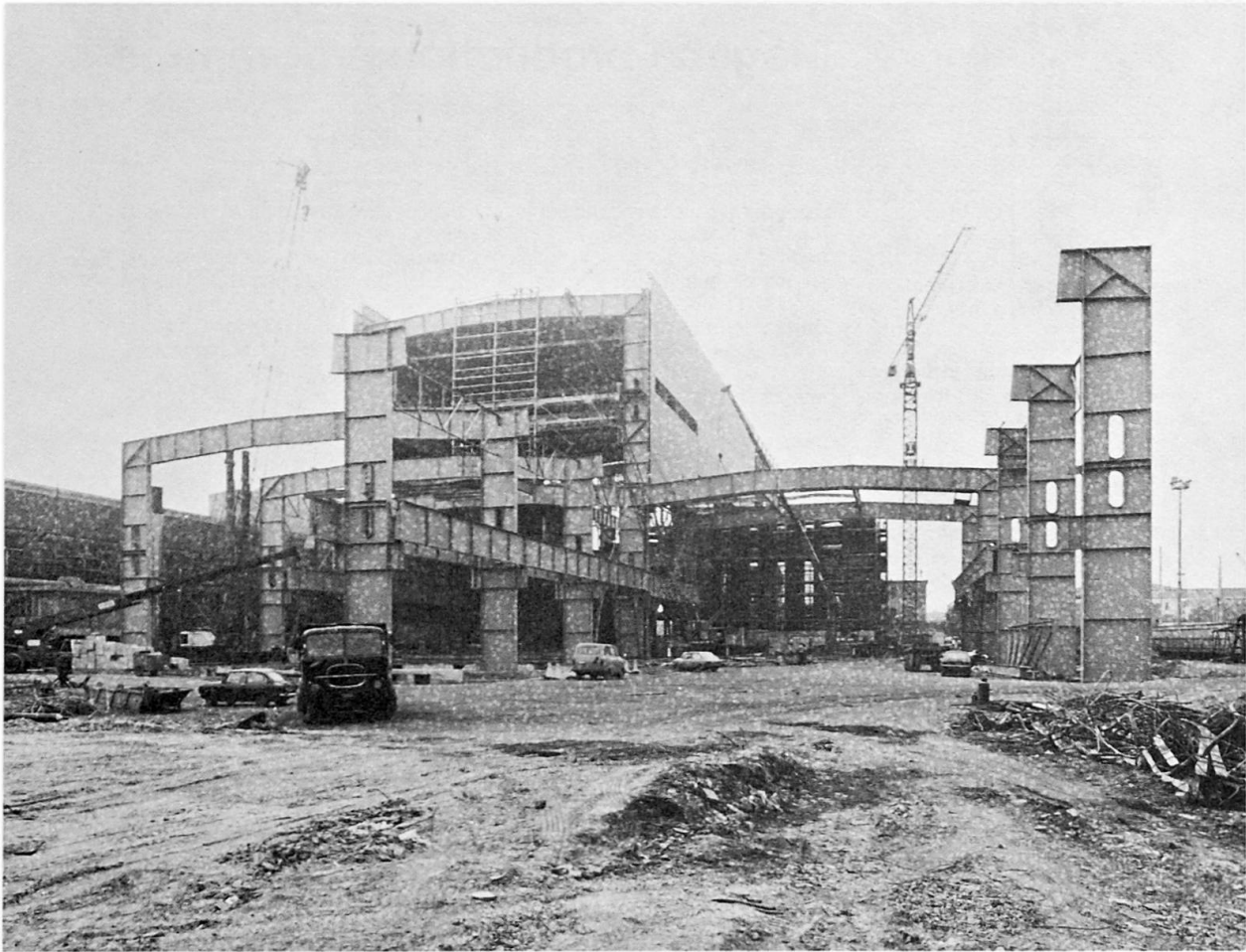


Fig. 2 The building under construction



Fig. 3 Last stages of assembly

The structure is made of columns fixed at the base carrying simply supported beams and brackets fixed to the portal frame pillars.

The horizontal forces on the frame are transmitted totally to the reinforced concrete base by means of appropriate anchorages. This solution was adopted in order to fulfill the requirement that the horizontal movement of the structure be limited to a maximum value of 0.5 mm. The building is connected to the adjoining "old teeming bay" by a viaduct for the ladle carrying wagon. The viaduct is composed of single columns with end transverse beams supporting the two way transport system of the roof.