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INDUSTRIAL PLANTS

Chapter fourteen:

Crane

**DOUBLE DEGREE MASTER IN
“PRODUCTION ENGINEERING AND MANAGEMENT”**

**SEAT OF PORDENONE
UNIVERSITY OF TRIESTE**

Generality

The **cranes** are appliances from the discontinuous operation used for the lifting and moving of goods and materials, usually in the presence of difference of level, obstacles etc. present on the ground which make it difficult or nearly impossible their handling in another way.

The cranes are used for limited distances, because moving with ground vehicles (truck, articulated lorry, motor vehicles for the transport of specific or special purpose) is more practical, faster and less risky.

The cranes are distinguished by bridge cranes for two main differences:

- ***the runways are not above-elevated;***
- ***some crane, in addition to the movement of translation, allowing rotation of the load.***

Generality

For the sizing or verification can be made reference to what is explained for the bridge crane, although in the case of cranes which possess a movement of rotation or of variation of the arm, account must be taken to a **horizontal force** due to the pair of acceleration or deceleration acting on the shaft of the mechanisms (acceleration between 0.1 and 0.6 m/s² according to the speed of rotation and of the arm of the crane).

If you examine the crane swivel, you should consider another horizontal force resulting centrifugal acceleration produced by the load carried

Generality

The cranes are used in many areas: in construction, transport, engineering companies etc. and are irreplaceable in loading and unloading of ships in ports, shipyards and construction sites. There are cranes of all shapes and sizes, suitable for different uses and environments, capable of lifting up to tens of thousands of kN.



Gantry cranes

The **gantry crane** are used in applications where it is not possible to create elevated runways.

Are devices of lifting loads in the form of a portal with running rails installed on the ground. They are used in outdoor parks, docks, etc.

It can have the gantry cranes with one or two lateral arms especially in the case we should handle the loads outside the running rails. In this way avoids the filming of the loads and avoids the presence of obstructions in the area between the rails.



Gantry cranes

In the past, the gantry cranes were mostly made of reticular structures, while today they prefer the solid wall structure.



The truck-winch can slide on both the upper (cranes without side arms) which on the underside of the bridge (crane with one or two arms).

Gantry cranes

The gantry crane can have the following characteristics:

- command at ground through panel or of cabin protected from the elements;
- maximum distance between the rails 100 m;
- maximum linear speed 100 m/minute;
- maximum speed of the truck-winch 60 m/minute;
- maximum lifting speed 30 m/minute.

Gantry cranes

A particular case of **gantry cranes** is that which provides that one of the two runways is raised, in which case the crane is called "**at semi-portal**" or "**portal lame**" or "**lame**". Its use is in the external environment when they are huddled in buildings or within their departments usually under the bridge crane of greater reach.

They have gauges up to 30 m and payloads up to 300 kN.



Gantry cranes

The sizing mode or verification of gantry cranes are indistinguishable from those presented in the bridge cranes. The only caveat to which attention must be given is that which in the presence of lateral reach the reaction forces are determined with the carriage-winch in the two end positions.



Wall cranes

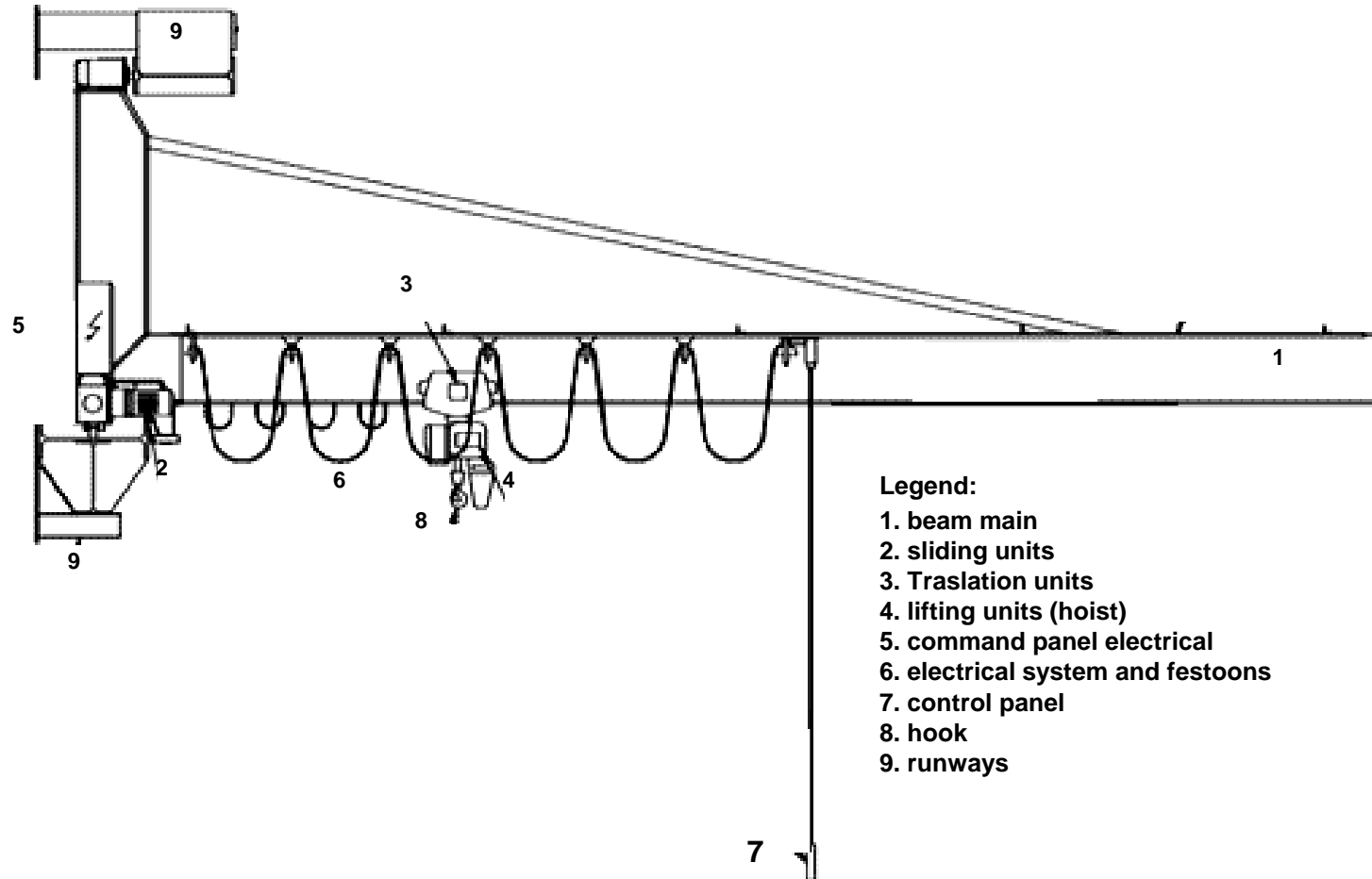
The **wall cranes** are made for the movement of goods within the factory. They raise the load vertically in space by means of a hoist and using the accessories suitable for this operation; also allow the translation of the load along the transverse and longitudinal axes by means of the motorized cart and of the heads of the crane.

They slide on rails positioned at a height above the ground, and it remains completely free and available for productive activities.

They have a maximum capacity of 100 kN, a maximum light of 10 m and a maximum speed of travel of 100 m/minute.

Wall cranes

Wall crane



Wall cranes

Wall Crane



Jib cranes

The **jib cranes** are equipment of lifting of loads which realize the rotation of an arm, around a vertical axis (a pivoting or fixed), on which flows an electric hoist or manual. Are in use in the vicinity of the chip removal machines that require lifting and limited horizontal displacements of the loads.



Jib cranes

The capacity is less than 50 kN and arm is a few meters.

The crane is constituted by a supporting structure movable hinged by means of bearings on the fixed structure, which consists of a tubular steel column firmly anchored to a concrete base

The moving structure is represented by a swivel arm welded to a tubular element coaxial with the column. The horizontal structure is stiffened by bracing and counter-wind.



Jib cranes

In the case of the **annual audit of a jib crane**, not operated manually, by ARPA (Regional Agency for Prevention and Environment), it requires a complete technical documentation in the form of reports, which are essential parts:

- graphical representation of the supporting structure together in scale, of the lifting, of the organs of winding and of the various mechanisms, the main of which, for the equipment revolving, are: arm, frame, support pylon, etc.;
- technical report on the crane in which one must specify the conditions for use of cranes that vary with the number of cycles of conventional lifting, loading regime characterized by a spectrum characterized by a conventional load index, which identifies how many times you exceed a fraction rated load, class of each determined based on the two previous data from CNR 10021, ISO 4301 and FEM 1001. The report should also present calculations of the main structures and then the "structural testing of the crane".

Swivel platform cranes

The **swivel platform cranes** are essentially constituted by:

- a arm, able to lift the loads;
- a platform that can turn on a runway and circular counterweight, so that the center of gravity always fall within the support surface;
- a circular runway.

These types of cranes are used in ports, shipyards, railway stations, warehouses, or mounted on other transport systems (railway wagons, road vehicles, gantry cranes etc.).

Swivel platform cranes

The swivel platform cranes may have the following characteristics:

- capacity of the crane between 5 and 60 kN;
- arm between 7 and 22 m;
- maximum lifting height 18 m;
- operating speed: hoisting – 0,60 – 1,60 m/s – variation of the arm – 0,75 m/s – and rotation of the mobile crew – 1,5 revolutions per minute
- gauge of the rails sliding crane for a binary – 4,50 m – for two binary – 8,50 m – and at semi-portal – 12,5-20 m.

Swivel platform cranes

Swivel platform cranes for port and cranes for construction

