

## CANTILEVER RACK SPECIFICATIONS

### PART 1 GENERAL

#### 1.1 SCOPE

This specification is intended to describe the general requirements applicable to a proper structural cantilever rack design. In addition, it is to serve as a quick reference of general information related to custom-engineered, structural cantilever rack systems.

#### 1.2 APPROVED MANUFACTURER

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#### 1.3 REGULATORY ORGANIZATIONS AND GROUPS

- American Institute of Steel Construction (AISC);
- American National Standards Institute (ANSI);
- American Society of Civil Engineers (ASCE);
- American Society for Testing and Materials (ASTM);
- American Welding Society (AWS);
- Canadian Institute of Steel Construction (CISC);
- Canadian Standards Association (CSA);
- Canadian Welding Association (CWA);
- International Code Council (ICC);
- National Research Council Canada;
- Research Council on Structural Connections (RCSC);
- Steel Deck Institute (SDI).

#### 1.4 QUALITY ASSURANCE

The cantilever rack manufacturer shall be an established firm with a minimum of five years of experience in the design and fabrication of structural cantilever rack systems. The system design shall be under direct supervision of a civil or structural engineer experienced in the design of cantilever racks in accordance to the standards set forth by the organizations and officials listed in §1.3. The installation contractor shall be a firm experienced in installing cantilever rack systems.

The supplier shall warrant the cantilever rack materials to be free from manufacturing defects for a period of one year. Warranty does not cover damage caused by conditions beyond the control of the supplier.



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## 1.5 PROJECT APPROVAL

The client or owner must submit signed, approved drawings prior to the fabrication of the cantilever rack. The client or owner shall be responsible for all quantities and dimensions, including the verification of and coordination with field conditions. The client or owner shall verify all critical dimensions and conditions of existing construction that relate to the cantilever rack project prior to manufacturing. Cogan must be notified, in writing, of any elements found to be inconsistent or not compatible with the details indicated by approval drawings.

## **PART 2 ARCHITECTURAL SPECIFICATIONS**

### **2.1 OVERVIEW**

Cantilever racks shall be freestanding, custom-engineered, pre-fabricated structures designed in accordance to the appropriate methods and in compliance with the applicable codes published by the organizations and officials listed in §1.3. Cantilever racks installed indoors shall be designed to support static gravity loads. Cantilever racks installed outdoors shall be designed to support static gravity loads and to resist appropriate climatic loads.

### **2.2 ARMS AND ROOF ARMS**

Arms are structural elements that shall support static gravity loads. A structural bolted connection fixes the arms to the rack column on one end and is unsupported (or free) on the opposing end, resulting in a cantilevered rack arm. Arms shall be designed to resist a uniformly distributed load exerted by the product that is supported and shall be manufactured of structural S-sections, W-sections or equivalent structural profiles. The product shall be centered on the arms and shall not exceed the edge of the arm. All arms shall be manufactured with a positive inclination from the horizontal. Straight arms shall have a minimum inclination of 1½° from the horizontal and inclined arms are sloped 3° from the horizontal.

Roof arms shall be supported at the top of the rack columns and designed to resist climatic loads (snow, rain, wind, etc.) that are applied the roof deck. Roof arms shall not support any product loads. Roof arms shall have a negative inclination to the horizontal in order to facilitate rain drainage and snow removal. Roof arms are typically longer than the racks arms and usually exceed the rack arm length by a minimum of six inches.

All rack arms and roof arms shall be connected to the rack column using ASTM A325 structural bolts.

### **2.3 COLUMNS**

Rack columns are the vertical structural elements that support the rack arms and roof arms and transfer gravity loads to the rack base and anchoring slab. Rack columns shall be manufactured of structural W-sections and shall have a shop-welded base plate. The two flanges of each column shall be punched for the bolted connection to the rack base at the bottom of the column. The two flanges of each column shall be punched with a pre-determined, regular hole pattern for the connection of the rack arms. The columns in a cantilever rack system shall be tied together with horizontal braces and cross braces. Braces are bolted to the columns with ASTM A325 structural bolts. When the cantilever rack is installed outdoors, the design of the columns shall taken into consideration the effects of climatic loads that may be exerted directly to the column or transferred from the rack arms, roof arms, and any siding, cladding or other enclosure material.

### **2.4 BASES**

Rack bases are the horizontal structural elements, connected to the bottom of each column, that transfer the loads from the cantilever rack system to the anchor slab. The rack bases establish the lateral stability of the rack system in the direction of the rack arms. Rack bases shall be manufactured of structural W-sections and shall be punched for anchor bolts. Typically the rack bases are the same length as the rack arms, but are not permitted to be less than the height of the column divided by seven (minimum 1/7<sup>th</sup> of column height).



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## 2.5 BRACES

Braces provide lateral stability to the rack system along the length of the system by tying each column together. Each rack system shall be braced with cross braces and horizontal braces. Braces shall be manufactured of structural angles and flat steel and shall be connected to the columns with ASTM A325 structural bolts.

## 2.6 ANCHORS

Cantilever rack systems shall be installed on a concrete slab of adequate strength. The client or owner shall be responsible for adequate anchoring conditions and shall be responsible for the installation of adequate anchor bolts. Anchors shall resist the column loads indicated on the approvals drawings.

## 2.7 ROOF AND DECK SIDING

When the cantilever rack system is installed outdoors, a roof and/or side walls may be supplied. Roof and wall elements shall be designed for all the applicable climatic loads of the installation site. Roofs shall consist of roof arms, treated lumber purlins, corrugated roof deck and trim. Walls shall consist of treated lumber girts, corrugated cladding and trim.

## 2.8 ARM STOPPERS

Stoppers help prevent the product from slipping or rolling off the rack arms. Arm stoppers are available in the following three model types:

- A housing sleeve is bolted to the end of the rack arm and a 1¼-inch square, galvanized tube serves as a removable stopper. The stopper height shall measure 6-inches or 12-inches above the top of the rack arm;
- A plate welded to the end of the arm shall create a lip above the top of the rack arm;
- A structural angle welded across the top flange of the rack arm.

## 2.9 BASE STOPPERS

Stoppers help prevent the product from slipping or rolling off the rack bases. Base stoppers shall be ¾" diameter solid bar housed in a receiver welded on the bottom flange of the base. Base stoppers shall be removable and shall measure 6-inches or 12-inches above the top of the base.

## **PART 3 STRUCTURAL SPECIFICATIONS**

### **3.1 DESIGN CRITERIA**

The cantilever rack manufacturer shall design the cantilever rack system for a load capacity of uniformly distributed live load specified by the client. The manufacturer shall include dead loads for the cantilever rack. In addition to general geometric details (i.e. arm length, quantity of arms per column, column height, column spacing, etc.), the client shall specify whether the cantilever rack shall be installed indoors or outdoors. When the cantilever rack shall be installed outdoors, the effects of all applicable climatic loads of the installation site shall be considered in the design.

### **3.1 DIMENSIONAL PROPERTIES**

The systems shall include \_\_\_\_\_ columns and the column height shall be \_\_\_\_\_ feet.

Columns shall be equally spaced at a distance of \_\_\_\_\_ inches.

The columns shall support arms on \_\_\_\_\_ side(s).

The system shall be designed for \_\_\_\_\_ arms per column and the arm length shall be \_\_\_\_\_ inches.

### **3.3 VERTICAL (GRAVITY) LOADS**

The system shall be designed for self-weight and arms shall be designed to support a maximum static load of \_\_\_\_\_ -lb.

### **3.4 LATERAL LOADS AND CLIMATIC LOADS**

The cantilever rack shall be designed for the appropriate lateral loads, as contributed by impacts and seismic conditions. Design methods are simplified by considering a minimum lateral load equivalent to 2% of the total gravity (vertical).

The system shall be designed for the applicable seismic and climatic loads of the installation site, located in the following zip code/postal code: \_\_\_\_\_.

Check the applicable condition:

The system shall be installed indoors and the effects of the applicable climatic loads shall not be considered in the design.

The system shall be installed outdoors and the effects of the applicable climatic loads shall be considered in the design.

## **PART 4 MATERIAL STANDARDS**

### **4.1 ARMS AND ROOF ARMS**

Rack arms and roof arms shall be structural S-sections, W-sections or equivalent structural profiles meeting or exceeding the material requirements of ASTM A572 Grade 50 and/or CSA G40.21 350W. Connection plates shall meet the material requirements of ASTM A36 44W.

### **4.2 COLUMNS AND BASES**

Rack columns and bases shall be structural W-sections meeting or exceeding the material requirements of ASTM A572 Grade 50 and/or CSA G40.21 350W. Base plates and connection plates shall meet the material requirements of ASTM A36 44W.

### **4.3 BRACES**

Rack braces shall be manufactured of structural angles and flat bar meeting or exceeding the material requirements of ASTM A36 44W.

### **4.4 BOLTED CONNECTIONS**

All bolted connections (arm to column, roof arm to column, base to column, and brace to column) shall be made with high strength structural bolts meeting the requirements of ASTM A325.

### **4.5 FINISH**

All components shall be powder-coated Cogan Grey.

Exceptions:

- Wide flange beams shall have one coat of liquid paint, applied by airless electrostatic process.



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## **PART 5 INSTALLATION STANDARDS**

### **5.1 WORK AREA**

The area where the cantilever rack is installed shall have a concrete slab, troweled smooth and level. The concrete areas where rack column and base placement occurs shall be capable to withstand the loads specified by the rack manufacturer.

### **5.2 WORK AREA AND INSPECTION**

Working areas shall be inspected and cleaned of all debris to ensure that adequate access is provided to the installers. The client or owner shall advise the installation company of any embedded floor obstacles that may interfere with the installation of floor anchors.

### **5.3 PREPARATION**

The rack contractor's technician shall inspect the job site prior to the preparation of approval drawings.

### **5.4 INSTALLATION**

Erection of the cantilever rack shall be in accordance with the specifications and instructions contained in the erection manual and installation drawings. The installation plan is based on the specifications, dimensions and approval of the dealer and/or client. All drawings must be reviewed carefully prior to installation.

#### **5.4.1 BOLT TIGHTENING**

Bolts are installed in properly aligned holes, but need only be tightened to the snug tight condition. The snug tight condition is defined as the tightness that exists when all plies in a joint are in firm contact. This may be obtained by an impact wrench or the full effort of a man using an ordinary spud wrench.

Once the installation of the cantilever rack is complete, all bolts should be verified. If installation was performed using an impact wrench, random inspections should be made to ensure that the wrench is obtaining the desired torque.

It should be verified during actual installation in the assembled steelwork that the wrench adjustment selected by the calibration does not produce a nut or bolt head rotation from snug tight greater than 1/3 turn. When securing all hardware, make sure that end of bolt is flush with or exceeds the face of nut.

### **5.5 ON-SITE MODIFICATIONS**

Any modifications required during installation (on-site) of any Cogan products shall be proposed to and approved by a product engineer employed by Cogan. Cogan shall not guarantee any products modified without the consent from a product engineer employed by Cogan.

## **Cogan Wire & Metal Products Ltd.**

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