



GWINNETT COUNTY
Department of Planning & Development
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RACKING SYSTEMS

Structural Plan Review & Building Permit Requirements

(October 24, 2008)

SCOPE: To specify plan review and permit requirements for storage systems including but not limited to pallet racks, movable shelf racks, stacker racks, shelving systems, and conveyors. For the purpose of this document, racks are typically loaded with materials using mechanical equipment in contrast to shelving which receives materials manually.

1. **Racks/Conveyors/Shelving which requires a building permits** (if one or more of the following conditions applies):
 - a. Racks/Conveyors/Shelving with storage level at more than 7 feet above the supporting floor; or
 - b. Racks/Shelving which occupy a floor area (excluding aisles) greater than 1200 sq. ft.; or
 - c. Racks/Shelving with rated load capacity per storage level greater than 500 lbs.; or
 - d. Electrical work associated with conveyors; or
 - e. Relocated racks/conveyors/shelving previously installed at another location which satisfies one or more of the conditions indicated per items 1.a, 1.b., 1.c., or 1.d.

[NOTE: Shelving installed within the scope of a building permit for an interior finish construction project (except for warehouse storage use) which satisfies one or more of the conditions indicated per items 1.a, 1.b, or 1.c. does not require a separate building permit provided the required documentation per items 4.a, 4.b, and 4.c. is included on the construction documents approved for the interior finish building permit.]
2. **Racks/Conveyors/Shelving which require design by a Georgia Registered Professional Engineer** (if one or more of the following conditions applies):
 - a. Racks/Conveyors/Shelving with storage level at more than 10 feet above the supporting floor; or
 - b. Racks/Shelving which occupy a floor area (excluding aisles) greater than 3000 sq. ft.; or
 - c. Racks/Shelving with rated load capacity per storage level greater than 1000 lbs.; or
 - d. Existing racks/shelving which satisfy one or more of the conditions indicated per items 2.a, 2.b, or 2.c. and are located in a space to be used by a tenant of occupancy classification which is different from the previous tenant; or
 - e. Relocated racks/conveyors/shelving previously installed at another location which satisfies one or more of the conditions indicated per items 2.a, 2.b., or 2.c.
3. **Plan review & permit process**
 - a. To begin the plan review process, present three (3) complete sets of the required documentation stated in item 4 to **Development Review Section** (of Dept. of P & D) to obtain the *Interior Finish Plan Review Application* form.
 - b. Present the three (3) complete sets of the required documentation (included in item 3.a.) to the **Fire Marshal's Office** in addition to the *Interior Finish Plan Review Application* form to obtain review and approval of the submitted documentation and a signature of authorization on the form.
 - c. Present two (2) complete sets of the required documentation (included in item 3.b.) with Fire Marshal's approval stamp to **Building Plan Review Section** (of Dept. of P & D) with completed application form to obtain review and approval of the submitted documentation and a signature of authorization on the form.
 - d. To obtain the permit, submit to **Building Permits Counter** the approved set of documentation stamped "COUNTY COPY" by **Building Plan Review Section**, the completed *Interior Finish Plan Review Application* form with required authorization signatures, and a completed *Building Permit Application* form (available at the permits counter or at county's web page). The building permit fee is assessed at a rate of five (5) dollars per thousand (1000) dollars of the **installation costs only** in addition to a fee of fifty (50) dollars for a Certificate of Completion (C. C.).

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4. Documentation required for issuance of a building permit:

- a. Provide tenant floor plan layout (with key plan) clearly locating all proposed racks/conveyors/shelving by dimensioning aisle widths and distances from permanent fixtures including but not limited to racks/conveyors/shelving, walls, equipment, and exit doors. The key plan shall schematically identify the specific floor area of the overall building footprint within which the proposed racks/conveyors/shelving are to be located.
- b. Provide rack configuration drawings for storage racks and elevation drawings for conveyors/shelving. Drawings shall clearly indicate the material, size, location, and orientation of each structural component which comprises the racks/conveyors/shelving.
- c. Provide details which clearly indicate the required anchorage at the base of racks/conveyors/shelving to the supporting structure including type, size, spacing, and embedment depth of required anchors. *Anchorage details shall be sealed and signed by a professional engineer registered in the state of Georgia for racks/conveyors/shelving which require engineering design per item 2.*
- d. Provide electrical plans for conveyors (seal and signature by a professional engineer registered in the state of Georgia is required for each project with a construction cost of \$100,000 or greater).
- e. Provide design calculations which have been sealed and signed by a professional engineer registered in the state of Georgia for racks/conveyors/shelving which require engineering design per item 2. (*Refer to item 5 for design calculations requirements.*)

5. Design calculations requirements: (*only required for racks/conveyors/shelving which require engineering design per item 2.*)

- a. Calculations shall demonstrate the structural adequacy of the applicable racks/conveyors/shelving (*including structural members and connections*) to support the superimposed weight of contents and to resist the required seismic design forces in accordance with the requirements of **2006 International Building Code with 2007 Georgia Amendments (IBC) sections 1613.5 (seismic), 2208.1 (for steel racks/conveyors/shelving only), and 1997 Rack Manufacturers Institute Specification for the Design, Testing, and Utilization of Industrial Steel Storage Racks (2006 RMI Specifications) (for steel racks/conveyors/shelving only).**
- b. Steel racks/conveyors/shelving shall be designed in accordance with the load combinations of **section 2 of the 1997 Rack Manufacturers Institute Standard Specification for the Design, Testing, and Utilization of Industrial Steel Storage Racks (2006 RMI Specifications)** for either the ASD design method (**section 2.1**) or the LRFD design method (**section 2.2**) as required per **IBC 2006 section 2208.1.**
- c. Calculations shall indicate the maximum weight of contents for each level of racks/conveyors/shelving.
- d. Calculations for seismic design of racks/conveyors/shelving **supported at grade** shall comply with the requirements of **IBC sections 1613.5, 2208.1 and ASCE 7-05 sections 15.5.3, 15.5.3.1 and 13.3.1** as follows:

$$\bullet \text{ } F_p = (SDS \times I_p \times W_p) / R$$

where: **SDS = (Refer to item 5.h.)**

I_p = 1.0 (except **I_p = 1.5** for systems located in areas accessible to the general public, or for systems required to function after an earthquake, or for systems which support hazardous materials)

W_p = Case 1 – Weight of rack plus every storage level loaded to 67% of its rated capacity; Case 2 – Weight of rack plus highest storage level only loaded to 100% of its rated capacity

R = 4 (per **Table 15.4-1 ASCE 7-05**)

- **F_{p max} = 1.6 x SDS x I_p x W_p; F_{p min} = 0.3 x SDS x I_p x W_p** ASCE 7-05 section 13.3.1
- Vertical distribution of seismic forces shall comply with **ASCE 7-05 section 12.8.3 and 15.5.3.3**
- *Refer to items 5.e. and 5.f. for alternate methods of seismic design for racks/conveyors/shelving **supported at grade.***

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- e. Alternatively, racks/conveyors/shelving **supported at grade** not need to comply with the requirements of item 5.d. provided they are designed as structures to satisfy the requirements of **Table 15.4.1 ASCE 7-05** with Response Modification Factor (R) no greater than 4.
- f. Calculations for seismic design of racks/conveyors/shelving **supported at or below grade** shall comply either with the requirements of items 5.d, 5.e. or, alternatively, with the requirements of **ASCE 7-05 section 15.5.3 ,ASCE 7-05 12.8.1.1and section 2.7, Earthquake Forces, of the 2006 RMI Specifications and Earthquake Design data (ASCE 7-05, section 15.5 “Non-building structures Similar to Buildings” & Subsection 15.5.3 “ Steel Storage Rack”** as follows:
- (1) **$V = C_s \times I_p \times W_s$**
where: **V** = Seismic base shear
 C_s = $-(1.2 \times SD1)/(R \times T^{2/3})$ (when fundamental period T is calculated)
Or alternatively,
 C_s = SDS/R (not less than $0.14 \times SDS$)
 $SDS, SD1$ = (Refer to item 5.h.)
 R = 4 (braced direction); 6 (unbraced direction)
 T = fundamental period of the system in each of two (2) orthogonal directions
 I_p = 1.0 (except $I_p = 1.5$ for systems located in areas accessible to the general public, or for systems required to function after an earthquake, or for systems which support hazardous materials)
 W_s = (Refer to RMI Specifications section 2.7.2)
- (2) Vertical distribution of seismic forces shall comply with **section 2.7.4 of the 2006 RMI Specifications.**
- (3) Refer to item 5.d. for alternate method of seismic design for racks/conveyors/shelving **supported at grade.**
- g. Calculations for seismic design of racks/conveyors/shelving **supported above grade** shall comply with the general requirements of **(ASCE/SEI 7-05 table 20.3.1; IBC 2006 section 1613.5; ASCE/SEI 7-05 section 11.4.3-** and the specific requirements of **ASCE 7-05 section 15.5.3.1 and 13.3.1** If the weight of the racks/conveyors/shelving is less than 25% of the combined weight of the racks/conveyors/shelving and the supporting structure, the seismic design forces for the racks/conveyors/shelving shall be determined in accordance with **ASCE 7-05 section 15.5.** Otherwise, the seismic design forces shall be determined based on the combination of the racks/conveyors/shelving structure and the supporting structural system in accordance with **Section 13.3.1 of ASCE 7-05.**
- h. Design values for the spectral response acceleration coefficients SDS and $SD1$ shall not be less 0.27g and 0.14g, respectively, for construction sites classified as Site Class D per **ASCE/SEI 7-05 table 20.3.1; IBC 2006 section 1613.5 and ASCE/SEI 7-05 section 11.4.3.**
- i. Calculations shall document the required size of each structural framing component (*including but not limited to posts, beams, and bracing*) and specify the corresponding member connections (*including but not limited to beam-post, post-base plate, brace-post*).
- j. Calculations shall document the structural adequacy of the existing floor structure to support the concentrated post loads from racks/conveyors/shelving.
- k. Calculations for cantilever racks, drive-in and drive-thru racks, portable racks, and rack buildings shall be in accordance with appropriate design specifications published by nationally recognized technical organizations including but not limited to AISC, ASCE, and AISI and shall address the requirements of items 5.a., 5.c., 5.h. (*design values only*), 5.i., 5.j. in addition to the requirements of **IBC 2006 chapter 16 and 22.**

6. **Contacts:** Building Plan Review Section– 678.518.6040
Development Review Section – 678.518.6010
Fire Marshal’s Office – 678.518.6100