



# STORAGE RACKS PLAN REVIEW LIST (2014 LABC)

Plan Check Submittal Date: \_\_\_\_\_

Plan Check / PCIS Application #: \_\_\_\_\_

Job Address: \_\_\_\_\_

Applicant (name & phone #): \_\_\_\_\_

Reviewed by (print first / last name): \_\_\_\_\_ Telephone #: \_\_\_\_\_

E-mail: [first.name.last.name@lacity.org](mailto:first.name.last.name@lacity.org)

Your feedback is important, please visit our website to complete a Customer Survey at [www.ladbs.org/LADBSWeb/customer-survey.jsf](http://www.ladbs.org/LADBSWeb/customer-survey.jsf).

If you have any questions or need clarification on any plan check matters, please contact a plan check supervisor or call our Customer Hotline at (213) 482-0056

## INSTRUCTIONS FOR PROCEEDING WITH THE PLAN CHECK (PC) PROCESS:

1. Review corrections circled on this Plan Check Correction Sheet and on the plans and calculation sheets.
2. Provide a written response or reference to details pursuant to the corrections. Location of any revisions on the plans shall be identified as part of your responses. For any questions related to the PC corrections, email or call the Plan Check Engineer.
3. Phone or email the PC engineer for a verification appointment after you have addressed the corrections. Verification of corrections is only done by appointment.
4. Complete item #2 above and bring the originally checked set of plans and calculations to the meeting along with this plan correction sheets. Unprepared responses with incomplete plans or calculations may result in cancellation of the meeting.
5. During the appointment, the plan check engineer will go over the corrections and comments. Once all the items have been corrected to comply with the code requirements and clearances are obtained, the permit will be ready to be issue.

## IMPORTANT ITEMS TO READ:

1. Your early attention is suggested to the approval process from other Departments as listed in the Clearance Summary Worksheet due to possible delays resulting from a public hearing or other processes required by other Departments.
2. The permit application will expire 18 months from the plans submittal date.
3. Please be advised that the permit will be issued upon verification of compliance with the corrections included herein. The approval of plans does not permit the violation of any section of the Building Code, or other ordinance or state law.
4. Numbers in parenthesis refer to Code sections of the 2014 edition of the Los Angeles Building Codes.
5. RMI referenced in the plan correction sheet refers to the Rack Manufacturers Institute, ANSI/MH 16.1-08, Specification for the Design, Testing, and Utilization of Industrial Steel Storage Racks.

REVIEW THE FOLLOWING CHECKED SUPPLEMENTAL CORRECTIONS, INFORMATION BULLETINS AND FORMS. REVISE PLANS TO SHOW COMPLIANCE.

Supplemental Correction sheet(s) attached:

Structural - General

Review the following checked information bulletins, forms and Affidavits. Revise plans to show compliance (Copies can be obtained at [www.ladbs.org](http://www.ladbs.org))

P/BC 2008-024 Structural Observation

P/BC 2008-100 Use of slab on grade as foundations

## PART I: GENERAL REQUIREMENTS

### A. PERMIT APPLICATIONS

1. Provide a key plan showing property lines, street names, and location of building(s) with proposed storage racks and copy it to the PCIS application's plot plan sheet.
2. Valuation is revised to \$ \_\_\_\_\_.  
Pay additional plan check fee of \$ \_\_\_\_\_.
3. Provide complete and correct legal description (Tract, Lot, Block, Grant Deed). Provide complete information for applicant, owner, engineer, architect, and contractor.
4. The permit application must be signed by the property owner, or licensed contractor, or authorized agent at the time the permit is to be issued:
  - a. For owner-builder permits: Owner's signature can be verified with owner's driver license. Owner's representatives must present owner's approval with a notarized letter from the owner.
  - b. For contractor building permits: Prior to the issuance of a building permit, the contractor shall have the following:
    - i) Certificate of workers Compensation Insurance made out to the Contractors State License Board.
    - ii) Notarized letter of authorization for agents.
    - iii) Copy of Contractors State License or pocket ID.
    - iv) Copy of City of Los Angeles business tax registration certificate or a newly paid receipt for one.

### B. CLEARANCES

1. Obtain all clearances as noted on the attached Clearance Summary Worksheet. Applying immediately for the signoff is necessary as it can take months for some departments to review the project. Comply with conditions given during approval prior to the permit issuance.

### C. ADMINISTRATION

1. Each sheet of the architectural and structural plans must bear the signatures, registration number and expiration date of registration of an architect or engineer registered in the State of California
2. Show on the plans a complete description of the entire scope of work.
3. The address of the building and the name/address of the owner are required on all plans. The name and address of the consultants are required on their plans.
4. Two sets of plans will be required during permit issuance. Plans must be: (106.3.2.2. & 106.3.3.)
  - a. Quality blue or black line drawings with uniform and light background color.
  - b. Max. 36' x 48" size with minimum 1/8" lettering size.
  - c. Sticky back details must produce prints without contrasting shades of background color.
5. The final set of plans must be approved and stamped by (Fire Dpt), (Disable Access Division)
4. Provide the following with each set of plans:
  - Floor Plans
  - Two Elevations

**PART II: BUILDING CODE**

**PLAN DETAILS**

- 1. Floor plan of the building is required to show location of storage racks and to differentiate between all types of proposed storage racks. Floor plan must also show aisle widths and exiting scheme from the building in which storage racks will be placed.
- 2. Building permits are required for storage racks over 5'-9" high. Structural plans, details, and calculations are required for the construction of storage racks. (106.2)
- 3. Lower portions of posts exposed to damage by forklift trucks or other moving equipment shall have two possible ways to safeguard racks against the consequences of minor collisions: 1) provide protective devices, 2) reinforce the bottom portion of the front column and/or bracing (RMI 1.4.9 Commentary)
- 4. Storage area shall be separated from adjacent occupancies in accordance with LABC Table 508.4

**CALCULATIONS**

- 1. Nonbuilding structures shall be designed in accordance with the seismic requirements of ASCE 7-10 Section 15.5. R=4,  $\Omega_0=2$ , Cd=3.5 (ASCE 7-10, Table 15.4-1)
- 2. Importance factor of 1.5 shall be used for storage racks in structures open to the public, such as warehouse and retail stores. (ASCE 7-10 15.5.3.5 Exception)
- 3. Steel storage racks shall be designed for each of the following operating weights, W or  $W_p$ . The design shall consider the actual height of the center of mass of each storage component. (ASCE 7-10, 15.5.3.6)
  - a. Weight of rack + every storage level loaded to 67% of its rated load capacity
  - b. Weight of rack + the highest storage level only loaded to 100% of its capacity
- 4. Vertical distribution of Seismic forces shall be as specified in ASCE 7-10 Section 12.8.3 (hx = each steel storage level of the rack) (ASCE 7-10, 15.5.3.7)
- 5. The assumed total relative displacement for storage racks shall be not less than 5% of the height above the base unless a value is justified in accordance with ASCE7-10 Section 11.1.4 (ASCE 7-10, 15.5.3.8)
- 6. Storage racks located in buildings at levels above the grounded level shall be designed to resist earthquake forces that consider the response of the building and storage rack to earthquake ground motions as specified in RMI Section 8.3.
- 7. Racks shall be designed for the most critical load combination in accordance with RMI 2. (RMI 2.1)
- 8. The rigid connection assumption for the frame design shall be demonstrated by calculation or by testing in an approved manner. (RMI 3)
- 9. The effects of perforations on the load carrying capacity of compression members shall be included in the design in accordance with section 4 of the RMI specification. Determination of Q shall be based on stub column tests in accordance with section 9.2 of the RMI specification.
- 10. Beams shall be designed as simply supported. (RMI 5.1)
- 11. For unbraced racks at vertical plane, design columns with effective length factor of 1.7. (RMI 6.3.1.1)
- 12. Design beam column connection for upward force of 1,000 lbs. (RMI 7.1.2)
- 13. For movable shelf racks, design each connection at the top shelf and other fixed shelves for an upward force of 1,000 lbs. (RMI 7.1.3)
- 14. In accordance with RMI Section 1.4.10, where racks are braced against the building structure, the building structure shall be designed for the horizontal and vertical forces listed in RMI Section 2.
- 15. Support of racks by foundations, concrete floor slabs or other means shall be in conformance with Chapter 18. All values of allowable foundation pressure are for footings having a minimum width of 12 inches and a minimum depth of 12 inches into natural grade. Where storage racks are supported by slab on grade, a maximum allowable soils bearing value of 500 psf will be allowed unless a soils report recommends a higher value for slabs on grade.

16. Engineer of record shall verify the conditions of the existing slab on grade supporting storage racks and make his/her observations as part of the plans. Structural calculations and details shall be required for rack locations with close proximity to expansion and construction joints. In addition, the engineer shall indicate if cracks are present and provide adequate mitigation measures.
17. Design base plate based on the maximum allowable bearing stress,  $F'_p$  for allowable stress design (ASD) and on the maximum bearing loads,  $\phi_c P_p$  for load resistance and factor design (LRFD). (RMI 7.2)
18. Design anchors to resist uplift forces due to vertical and lateral forces in accordance with appendix D of ACI 318. Design strength of anchors must be reduced by multiplying the allowable load by 0.75 as required by ACI Appendix D3.3.4.4. Design of the anchors must be designed to be governed by tensile or shear strength of a ductile steel element. (RMI 8, ACI D3.3.4.4)
19. Design of anchors using section 1908 and Table 1908.2 shall not be used where load combinations include earthquake loads or effects. (LABC 1908.1)
20. At working load the deflections of pallet racks and stacker-rack, including possible deformations in the end connections, shall not exceed 1/180 of the span measured with respect to the beam ends. (RMI 5.3)
21. Where the configuration of the cross section precludes calculation of allowable loads and deflections, the determination shall be made by tests according to RMI Section 9. (RMI 5.2)
22. Structural observation per Section 1704 is required for this project. The engineer of record shall prepare an inspection program, including the name(s) of the individuals or firms who will perform the work. The inspection program shall be shown on the first sheet of the structural drawings. (See attached "General Notes for Structural Observation" form)

## **COMPACT STORAGE**

1. The building plans shall clearly show all locations of proposed compact storage area(s). The maximum area for a compact storage system shall be limited to 1,500 square feet for areas protected with sprinkler systems designed as NFPA-13 Ordinary Hazard Group 2 and 5,000 square feet for systems designed as Extra Hazard Group 1.
2. Each compact storage area shall be enclosed with walls and a ceiling to show compliance with the area limitations per NFPA-13 Hazard Group. The walls shall extend from floor to ceiling. Walls and ceiling shall be of any material allowed by the building code for the type of construction. In lieu of an enclosed room, the compact storage area shall be completely bounded by a continuous lintel. The lintel shall be at least 8 inches deep measured from the ceiling. The lintel shall be constructed of noncombustible material (glass is not allowed unless it's fire rated). The perimeter of the lintel shall extend horizontally a maximum of 5 feet beyond the perimeter of the compact storage area. In this case, the fire sprinkler deflector shall be a maximum of 1 inch below the ceiling.
3. A fire sprinkler permit is required for the installation of fire sprinklers in compact storage areas. All compact storage areas, enclosures, and lintels shall clearly be shown and identified on the fire sprinkler plans.
4. Room containing compact storage requires an appropriate structural support to accommodate the weight of the compact storage rack system.
5. Structural calculations shall be provided for each compact storage area justifying that the floor framing system is capable of supporting a design live load of 125 psf or the actual weight of the compact storage system, whichever is greater.
6. Compact storage rack located in building at level above the ground level, the force and displacement shall meet the requirement of ASCE 7-10 Sec. 15.5.3.1 with  $F_p = (0.4a_p S_{DS} W_p I_p / R_p)(1 + 2z/h)$  (ASCE 7-10 eq.13.3-1). Where  $a_p = 2.5$ ,  $R_p = 4.0$ ,  $\phi = 2.0$ , and  $C_d = 3.5$  shall be used per ASCE 7-10 Section 15.5.
7. Verify the adequacy of existing concrete slab on grade thickness and allowable soil bearing when compact storage racks are located in building at level of ground level. New foundation system to support the gravity loads and to hold down the uplift force may be required.
8. Design force that include seismic loads for anchorage of compact storage rack to concrete shall be determined using load combinations with overstrength factor,  $\phi = 2.0$ , per ASCE 7-10 Sec. 15.5.3.2.
9. Support of compact storage rack by concrete floor slab shall be designed per ACI 318 Appendix D. Justify that the proposed anchor bolt size, embedment, and spacing is adequate for combined shear and tension forces in the existing concrete slab.
10. Provide details and calculations for proposed anti-tip and braking system.

11. Compact storage rack uprights, beams and shelving connectors' capacities need not be determined for storage rack to meeting all of the following:
  - (1) rack height is less or equal to 8' and
  - (2) actual material weight to be supported by rack is no more than 40#/cu ft.
12. The capacity of the compact storage rack supporting more than 40#/cu ft. or more than 8' in height, uprights, beams and shelving connectors' capacities shall be evaluated in accordance with RMI/ANSI MH 16.1 per Section 2209.1. Testing shall be conducted by LA City licensed test lab.

**NOTES ON PLANS**

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1. Provide material specifications for:
 

<input type="checkbox"/> Concrete	<input type="checkbox"/> Steel	<input type="checkbox"/> Welds	<input type="checkbox"/> Bolts
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2. All rack installation and racks manufactured in conformity with the code shall display in one or more conspicuous locations a permanent plaque each not less than 50 square inches in area and showing the maximum permissible unit load in clear, legible print. (RMI 1.4.2)
3. Deputy inspection is required for all structural welds except for welding done in an LADBS Licensed fabricator's shop. (1704.2.5.2)
4. All welding, except when performed at the shop of an LADBS Licensed fabricator, shall be done by LADBS certified welders. (1705.2.2.1.3)
5. Provide Los Angeles City Research Report Number (LARR#) for ( ) approved concrete anchors, and ( ) alternate connectors such as clips.
6. The clear space below sprinklers shall be a minimum of 18 inches between the top of the stored material and the ceiling sprinkler deflector. Note on plans."

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**ADDITIONAL CORRECTIONS**

Items	Code Sec. No.

