STORAGE RACKS
PLAN CHECK CORRECTION SHEETS
(2023 LABC)

Plan Review Date: _____

Plan Check #: _____ Permit Application Number: _____

Job Address: _____

Plan Check Engineer: _____ Phone: _____ Email: _____

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

If you have any questions or need clarification on any plan check matters, please contact your plan check engineer and/or his or her supervisor.

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

1. **Review corrections circled on this Plan Check Correction Sheet**, the plans, and the 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. Any of the forms requested by this document can be found on-line at https://www.ladbs.org/forms-publications/forms/green-building.
3. Phone or email the Plan Check engineer for a verification appointment after you have addressed the corrections. Verification of corrections is only done by appointment.
4. Bring the originally checked set of plans and calculations at the time of your appointment with this plan correction sheet.
5. **If you have any questions or need clarification on any plan check matters, please contact a plan check supervisor at (213) 202-3400**.

IMPORTANT ITEMS TO READ:

1. Your early attention is suggested to the approval process from other Departments as listed on the Plan Check Correction Sheet or the Clearance Summary Worksheet due to possible delays resulting from a public hearing or other processes required by other Departments. The City Planning Department, the Community Redevelopment Agency, and others may have requirements that could significantly affect the final design of the project.
2. The permit application will expire 18 months from the plan check 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, Zoning Code, other ordinance, or State law.
4. Italicized numbers refer to Code Sections of the 2020 Edition of the Los Angeles Building Codes.
5. RMI referenced in this plan correction sheet refers to the Rack Manufacturers Institute, ANSI/MH 16.1-12, Specification for the Design, Testing, and Utilization of Industrial Steel Storage Racks

THE FOLLOWING SUPPLEMENTAL CORRECTION SHEETS ARE ATTACHED AND SHALL BE CONSIDERED A PART OF THIS REVIEW. COMPLIANCE WITH THESE CORRECTIONS MUST BE OBTAINED PRIOR TO THE ISSUANCE OF THE PERMIT.

Review the following checked supplemental correction lists, information bulletins and forms. Revise plans to show compliance (Copies can be obtained at www.ladbs.org):

☐ Supplemental Correction List: Structural – General
☐ P/BC 2017-024 Structural Observation
☐ P/BC 2020-100 Acceptable Design and Analysis Methods for Use of Slabs-On-Grade As Foundations

As a covered entity under Title II of the Americans with Disabilities Act, the City of Los Angeles does not discriminate on the basis of disability and, upon request, will provide reasonable accommodation to ensure equal access to its programs, services and activities

****

PART I: GENERAL REQUIREMENTS

A. PERMIT APPLICATION

1. Provide a key plan showing property lines, street names, and location of building(s) with proposed storage rack layout 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. Notarized letter of authorization for agents.
      ii. Certificate of workers Compensation Insurance made out to the Contractors State License Board.
      iii. Copy of Contractor's State License or pocket ID.
      iv. Copy of City of Los Angeles business tax registration certificate (BTRC) or a newly paid receipt for one.

B. CLEARANCES

1. Obtain sign-off for all clearances as noted on the attached Clearance Summary Worksheet. Comply with all conditions given by each departments/agencies as part of their approval prior to permit issuance.

C. ADMINISTRATION

1. Each sheet of the architectural and structural plans must bear the signatures and registration of an architect or engineer registered in the State of California.
2. Show on plans a complete description of the entire scope of work.
3. The address of the building, the name/address of the owner, and names/addresses of the consultants are required on their plans.
4. ☐ (Three) ☐ (Two) sets of plans will be required during permit issuance. One of these sets will be submitted to the County Assessors Office. Plans must be: *106.3.2.2, 106.3.3, California Revenue & Taxation Section 72*
   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 stamped by:
   ☐ Accessibility Div. ☐ Green Building Div.
   ☐ Fire Dept. ☐ Other: _____
6. Provide the following with each set of plans:
   ☐ Floor Plans ☐ Construction Sections
   ☐ Two Elevations ☐ Foundation Plans
   ☐ Structural Details ☐ Other: _____

****

PART II: BUILDING CODE REQUIREMENTS

A. 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. *105.2*
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: *RMI 1.4.9 Commentary*
   a. provide protective devices,
   b. reinforce the bottom portion of the front column and/or bracing.
4. Storage area shall be separated from adjacent occupancies in accordance with LABC Table 508.4

B. CALCULATIONS

1. Non building structures shall be designed in accordance in accordance with the seismic requirements of ASCE 7-16 Section 15.5. R=4, Ω_o=2, C_d=3.5 *ASCE 7-16, 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 7-16 15.5.3.3.1 Exception*
3. Redundancy factor ρ, shall be taken as ρ= 1.3, unless meeting exception in RMI 2.6.2 and clearly detailed on the plans.
4. 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 7-16, 15.5.3.3.2*
   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
5. Vertical distribution of Seismic forces shall be as specified in ASCE 7-16 Section 12.8.3 (h_x = each steel storage level of the rack) *ASCE 7-16, 15.5.3.3.3*
6. The assumed total relative displacement for storage racks shall be not less than 5% of the height above the base, unless a value is determined in accordance with ASCE7-16 Section 11.1.4. *ASCE 7-16, 15.5.3.3.4*

7. Storage racks located in buildings at levels above the ground 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 and 2.6.2.
8. Racks shall be designed for the most critical load combination in accordance with RMI 2. *RMI 2.1*
9. The rigid connection assumption for the frame design shall be demonstrated by calculation or by testing in an approved manner. Where testing is used, a copy of the test report by a third party LA City licensed testing agency shall be provided. The tested assembly shall be the same material, size, and configuration as the connection to be approved. Testing shall be in accordance with RMI 16.1-12, Section 9.6 *RMI 5.4.1*
10. 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.
11. Beams shall be designed as simply supported. *RMI 5.1*
12. For unbraced racks at vertical plane, design columns with effective length factor of 1.7. *RMI 6.3.1.1*
13. Design beam column connection for a minimum upward force of 1,000 lbs. *RMI 5.4.2*
14. For movable shelf racks, design each connection at the top shelf and other fixed shelves for an upward force of 1,000 lbs. *RMI 5.4.3*
15. 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.
16. Support of racks by foundations, concrete floor slabs or other means shall be in conformance with LABC 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.
17. 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.
18. Design base plate based on the maximum allowable bearing stress, F'_p for allowable stress design (ASD) and on the maximum bearing loads, $\varphi_c P_p$ for load resistance and factor design (LRFD). *RMI 7.1*
19. Design force that include seismic loads for anchorage of steel storage rack to concrete shall be determined using load combinations with overstrength factor, Ω_o=2.0, per ASCE 7-16 Sec. 15.5.3.2.
20. Design anchors to resist uplift forces due to vertical and lateral forces in accordance with ACI 318. Design strength of anchors must be reduced by multiplying the allowable load by 0.75 as required by ACI 17.2.3.4.4. Design of the anchors must be designed to be governed by tensile or shear strength of a ductile steel element. *RMI 7.2, ACI 17.2.3.4.4*
21. 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*
22. 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*
23. 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 pages 6-7 of P/BC 2017-024, "General Notes for Structural Observation") *LABC 1704.6.2*

C. COMPACT STORAGE

1. The building plans shall clearly show all locations of proposed compact storage area(s).
2. Compact storage shall comply with NFPA 13. Top of compact storage module shall be at least 18-inches below the sprinkler deflector. *NFPA 13, 20.6.2*
3. A fire sprinkler permit is required for the installation of fire sprinklers in compact storage areas. All compact storage areas 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 7-16 Sec. 15.5.3.1 with

$$F_p = \frac{0.4 a_p S_{DS} W_p}{\left(\frac{R_p}{I_p}\right)} \left(1 + 2\frac{z}{h}\right) \qquad \textit{ASCE 7-16 eq.13.3-1}$$

Where a_p=2.5, R_p=4.0 Ω_0=2.0, and C_d=3.5 shall be used per RMI, 2.6.2.

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, Ω_0=2.0, per ASCE 7-16 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 racks meeting all of the following:
    a. Rack height is less than or equal to 8' and
    b. 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 testing agency.

D. NOTES ON PLANS

1. Provide material specifications for:
   - ☐ Concrete ☐ Steel
   - ☐ Welds ☐ Bolts
   - ☐ Other: (_____)
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*
4. All welding, except when performed at the shop of an LADBS Licensed fabricator, shall be done by LADBS certified welders. *1705.1.12*
5. The following products shall comply with an approved ICC evaluation report or Los Angeles City Research Report. Copy the report and conditions of approval onto the plans and show compliance with those conditions.
   - ☐ Concrete Anchors ☐ Alternate Connectors (clips)
   - ☐ Other: (_____)
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. Clearly note on plans.

ADDITIONAL CORRECTIONS: