

4.5 LOADS ON HANDRAIL, GUARDRAIL, GRAB BAR, VEHICLE BARRIER SYSTEMS, AND FIXED LADDERS

4.5.1 Loads on Handrail and Guardrail Systems

All handrail and guardrail systems shall be designed to resist a single concentrated load of 200 lb (0.89 kN) applied in any direction at any point on the handrail or top rail and to transfer this load through the supports to the structure to produce the maximum load effect on the element being considered.

Further, all handrail and guardrail systems shall be designed to resist a load of 50 lb/ft (pound-force per linear foot) (0.73 kN/m) applied in any direction along the handrail or top rail. This load need not be assumed to act concurrently with the load specified in the preceding paragraph, and this load need not be considered for the following occupancies:

1. One- and two-family dwellings.
2. Factory, industrial, and storage occupancies, in areas that are not accessible to the public and that serve an occupant load not greater than 50.

Intermediate rails (all those except the handrail), and panel fillers shall be designed to withstand a horizontally applied normal load of 50 lb (0.22 kN) on an area not to exceed 12 in. by 12 in. (305 mm by 305 mm) including openings and space between rails and located so as to produce the maximum load effects. Reactions due to this loading are not required to be superimposed with the loads specified in either preceding paragraph.

4.5.2 Loads on Grab Bar Systems

Grab bar systems shall be designed to resist a single concentrated load of 250 lb (1.11 kN) applied in any direction at any point on the grab bar to produce the maximum load effect.

4.5.3 Loads on Vehicle Barrier Systems

Vehicle barrier systems for passenger vehicles shall be designed to resist a single load of 6,000 lb (26.70 kN) applied horizontally in any direction to the barrier system, and shall have anchorages or attachments capable of transferring this load to the structure. For design of the system, the load shall be assumed to act at heights between 1 ft 6 in. (460 mm) and 2 ft 3 in. (686 mm) above the floor or ramp surface, selected to produce the maximum load effect. The load shall be applied on an area not to exceed 12 in. by 12 in. (305 mm by 305 mm) and located so as to produce the maximum load effects. This load is not required to act concurrently with any handrail or

guardrail system loadings specified in Section 4.5.1. Vehicle barrier systems in garages accommodating trucks and buses shall be designed in accordance with *AASHTO LRFD Bridge Design Specifications*.

4.5.4 Loads on Fixed Ladders

The minimum design live load on fixed ladders with rungs shall be a single concentrated load of 300 lb (1.33 kN), and shall be applied at any point to produce the maximum load effect on the element being considered. The number and position of additional concentrated live load units shall be a minimum of 1 unit of 300 lb (1.33 kN) for every 10 ft (3.05 m) of ladder height.

Where rails of fixed ladders extend above a floor or platform at the top of the ladder, each side rail extension shall be designed to resist a single concentrated live load of 100 lb (0.445 kN) in any direction at any height up to the top of the side rail extension. Ship ladders with treads instead of rungs shall have minimum design loads as stairs, defined in Table 4-1.

4.6 IMPACT LOADS

4.6.1 General

The live loads specified in Sections 4.3 through 4.5 shall be assumed to include adequate allowance for ordinary impact conditions. Provision shall be made in the structural design for uses and loads that involve unusual vibration and impact forces.

4.6.2 Elevators

All elements subject to dynamic loads from elevators shall be designed for impact loads and deflection limits prescribed by ASME A17.1.

4.6.3 Machinery

For the purpose of design, the weight of machinery and moving loads shall be increased as follows to allow for impact: (1) light machinery, shaft- or motor-driven, 20 percent; and (2) reciprocating machinery or power-driven units, 50 percent. All percentages shall be increased where specified by the manufacturer.

4.7 REDUCTION IN LIVE LOADS

4.7.1 General

Except for roof uniform live loads, all other minimum uniformly distributed live loads, L_o in