



# 2010 STAIR DESIGN CHECKLIST PROJECT \_\_\_\_\_ FLOOR \_\_\_ OCCUPANCY \_\_\_\_\_

Fill in the blanks with the calculated results to determine compliance with stair requirements.  
Use the most populated floor in the building to determine the most restrictive stair geometry.

**CAUTION:** This checklist is NOT intended to be used without the Codes and will NOT guarantee full compliance with your particular building design.

This information is based on the 2009 edition of NFPA 101 (LSC) and 2009 edition of IBC  
Code references noted are from NFPA 101 followed by the IBC reference

## STAIR WIDTH

- Calculated occupant load (OL) of floor (see Table 7.3.1.2 / Table 1004.1.1) \_\_\_\_\_
- Number of exits (X) required minimum (7.4.1.1 and 7.4.1.2) / 1021.1 \_\_\_\_\_
  - 2 if OL = 50 to 499 (unless single exit exception is met)
  - 3 if OL = 500 to 999
  - 4 if OL = 1000 or more
  - More than the minimum may be required if travel distance cannot be met
- Total minimum exit width (W) = occupant load (OL) x exit capacity factor (F) - (Tables 7.3.3.1 / 1005.1, 1009.1) \_\_\_\_\_
- Handrails shall encroach not more than 4-1/2" into required stair width (7.2.2.2.1 / 1012.8) \* new in 2003 LSC & 2006 IBC
- Minimum stair width = exit width (W) ÷ number of exits (X) \_\_\_\_\_ = \_\_\_\_\_" - (NOTE: See 101:7.3.3.2 for stair capacity increase)
  - But not less than 44" (36" for stairs where occupant load of all floor served less than 50) / 22" @ Equipment access
  - 57" width if serving area of refuge to accommodate 48" clear between handrails
  - 50% at main entrance of assembly (12.3.6 / 1028.2) - 50% at main entrance wall of large mercantile (101:36.2.5.7 only)
  - New in LSC 2006 - 56" width to LED if each is stair serving more than 2000 above that floor (7.2.2.2.1.2(B))
  - New in IBC 2009 403.5.1 Minimum 30 feet between stair enclosures or 1/4 of floor diagonal in high rise
  - New in IBC 2009 403.5.2 Additional stair or occupant self evacuation elevators (IBC 3008) in high rise over 420 feet building height

## RISER AND TREAD (101:7.2.2.2 / IBC 1009.4)

- Floor to floor height in inches (H) <sup>\*1</sup> \_\_\_\_\_
- Number of risers (N) = H ÷ 7 (rounded to next whole number) \_\_\_\_\_ <sup>\*2</sup>
- Riser height in inches (R) = H ÷ N (7.2.2.2.1) 7" maximum \_\_\_\_\_ <sup>\*2</sup>
- Minimum tread depth (13" if (H) is 21" or less (7.1.7.2) or 11" minimum if (H) is greater than 21") \_\_\_\_\_ <sup>\*2</sup>
  - IBC requires a sloped surface (1:12 or less) at less than 12" elevation change (IBC 2009 - 1003.5) No handrails req'd if <1:20 slope
  - Rectangular (Typical) Tread depth is measured at right angles to the tread leading edge. (IBC 1009.4.2)

\*1 Where floor to floor heights are different in multi story buildings, risers must be recalculated for each condition

\*2 For Tread and Riser at stepped aisles in grandstands or theater seating in assembly occupancies - see 101:12.2.5.6 / IBC 1028

## LANDINGS (7.2.2.3.2 / 1009.4)

- If floor to floor height (H) is greater than 144" (12 feet), intermediate landings are required
- Number of intermediate landings L=(H ÷ 144) round down to next whole number \_\_\_\_\_  
(examples - if L=0.75=0 intermediate landings / if L=1.01=1 intermediate landing / if L=2.9 =2 intermediate landings)
- Landing width (at least same as stair width minimum) \_\_\_\_\_
- Landing depth (if stair changes direction, then same as stair else 48" maximum length if straight) \_\_\_\_\_
  - If ADA Handicapped (48") clearance required, then maintain 48" clear at handrail height at switchback landings

## HANDRAILS (7.2.2.4.1 / 1012)

- Both sides of stair AND within 30" of required egress width (7.2.2.4.1.1 & 7.2.2.4.1.2 / 1012.9)
- If over 69" stair width, intermediate handrail required with not less than 20" clear between  
Note: verify that strength of handrails and guards complies with building code requirements (IBC 1607.7)
- Height - 34" - 38" above line of tread nosings to top of rail (7.2.2.4.4.1 / 1012.2) - 30" to 34" at alternating tread devices
  - (42" handrail height only allowed by LSC not IBC if it is the top of a guard - 7.2.2.4.4.3) see 7.3.2.2 for means of egress
- 4-1/2" Maximum projection with 2-1/4" minimum clearance from wall or guard (7.2.2.4.4.5) / permitted by IBC 1012.7
- 1-1/4" minimum to 2" maximum diameter round (7.2.2.4.4.6(1) / 1012.3.1). See exceptions for Group R in IBC 1012.3.2
- If not round, must be graspable shape with 4" to 6-1/4" circumference (7.2.2.4.4.6(2) / 1012.3.1)
- Continuous and graspable for full length of flight (7.2.2.4.4.7 / 1012.4)
- Return handrails to wall, guard or floor or terminate at newel post (7.2.2.4.4.9 / 1012.6)
- Extend handrail 12" at top of flight and at slope 1 tread at bottom of flight (7.2.2.4.4.9./1012.6)
- Add 12" level at bottom if serving area of refuge (ADA/ABA Requirement)
- Continuous at turns and returns (7.2.2.4.2 / 1012.4)
- No projections that may engage loose clothing or straps (7.2.2.4.3)

## GUARDS (7.1.8 & 7.2.2.4.5 / 1013)

- Are landing(s) more than 30" above grade? \_\_\_\_\_ (guard required by 7.1.8 must comply with 7.2.2.4.5) IBC 1013.1
- Are tread(s) more than 30" above grade and with an open side? \_\_\_\_\_ (guard required - 7.1.8 and IBC 1013.1)
- OSHA 1910.24(h) requires "standard railings" 42" high at open sides of fixed stairs & platforms.  
OSHA permits compliance with NFPA 101 for stair design (OSHA 1910.35)
- Height of guard 42" above line of tread nosings, ramps, landings, and platforms to top of guard (7.2.2.4.5.2) IBC 1013.2  
Note: verify that strength of guard complies with building code requirements (IBC 2006:1607.7.1)
- Continuous for full length of flight and continuous at inside turns and returns (7.2.2.4.2)
- Intermediates to so that 4" sphere will not pass (6" sphere at tread/riser triangle) (7.2.2.4.5.3 / 1013.3)
- Exception: 4-3/8" sphere shall not pass above 36" to 42" (1013.3)
- 4" sphere shall not pass at open risers - Implied by LSC 7.2.2.4.5.3 and IBC:1013.3. Stated in IBC 300 for Bleachers
- 21" max clear between parallel top & intermediate rails at industrial, storage, mechanical areas, & detention  
See (LSC:7.2.2.4.5.3(2) - IBC:1013.3 Exception #3 & #4)
- 48" visual screen at any landing at exterior stair 4 floors or more in height (7.2.2.6.2)
- See IBC:1026.3 for Exterior stairs at ends of breezeway corridors. (35 square feet clear area above 42" guard height)