

CHAPTER 4

REPAIRS

SECTION 401 GENERAL

401.1 Scope. Repairs as described in Section 302 shall comply with the requirements of this chapter. Repairs to historic buildings shall comply with this chapter, except as modified in Chapter 10.

401.2 Permitted materials. Except as otherwise required herein, work shall be done using materials permitted by the applicable code for new construction or using like materials such that no hazard to life, health or property is created.

401.3 Conformance. The work shall not make the building less conforming to the building, plumbing, mechanical, electrical or fire codes of the jurisdiction, or to alternative materials, design and methods of construction, or any previously approved plans, modifications, alternative methods, or compliance alternatives, than it was before the repair was undertaken.

401.4 Flood hazard areas. In flood hazard areas, repairs that constitute substantial improvement shall require that the building comply with Section 1612 of the *International Building Code*.

SECTION 402 SPECIAL USE AND OCCUPANCY

402.1 General. Repair of buildings classified as special use or occupancy as described in the *International Building Code* shall comply with the requirements of this chapter.

SECTION 403 BUILDING ELEMENTS AND MATERIALS

403.1 Hazardous materials. Hazardous materials that are no longer permitted, such as asbestos and lead-based paint, shall not be used.

403.2 Glazing in hazardous locations. Replacement glazing in hazardous locations shall comply with the safety glazing requirements of the *International Building Code* or *International Residential Code* as applicable.

Exception: Glass block walls, louvered windows, and jalousies repaired with like materials.

SECTION 404 FIRE PROTECTION

404.1 General. Repairs shall be done in a manner that maintains the level of fire protection provided.

SECTION 405 MEANS OF EGRESS

405.1 General. Repairs shall be done in a manner that maintains the level of protection provided for the means of egress.

SECTION 406 ACCESSIBILITY

406.1 General. Repairs shall be done in a manner that maintains the level of accessibility provided.

SECTION 407 STRUCTURAL

407.1 General. Repairs of structural elements shall comply with this section.

407.1.1 Seismic evaluation and design. Seismic evaluation and design of an existing building and its components shall be based on the assumed forces related to the response of the structure to earthquake motions.

407.1.1.1 Evaluation and design procedures. The seismic evaluation and design of an existing building shall be based on the procedures specified in the *International Building Code*, Appendix A of this code (GSREB), ASCE 31 or FEMA 356.

407.1.1.2 IBC level seismic forces. When seismic forces are required to meet the *International Building Code* level, they shall be based on 100 percent of the values in the *International Building Code* or FEMA 356. Where FEMA 356 is used, the FEMA 356 Basic Safety Objective (BSO) shall be used for buildings in Seismic Use Group I. For buildings in other Seismic Use Groups the applicable FEMA 356 performance levels shown in Table 407.1.1.2 for BSE-1 and BSE-2 Earthquake Hazard Levels shall be used.

407.1.1.3 Reduced IBC level seismic forces. When seismic forces are permitted to meet reduced *International Building Code* levels, they shall be based on 75 percent of the assumed forces prescribed in the *International Building Code*, applicable chapters in Appendix A of this code (GSREB), the applicable performance level of ASCE 31 as shown in Table 407.1.1.2, or the applicable performance level for the BSE-1 Earthquake Hazard Level of FEMA 356 shown in Table 407.1.1.2.

**TABLE 407.1.1.2
IBC SEISMIC USE GROUP EQUIVALENTS TO FEMA 356
AND ASCE 31 PERFORMANCE LEVELS^a**

SEISMIC USE GROUP (BASED ON IBC TABLE 1604.5)	PERFORMANCE LEVELS OF ASCE 31 AND FEMA 356 BSE-1 EARTHQUAKE HAZARD LEVEL	PERFORMANCE LEVELS OF FEMA 356 BSE-2 EARTHQUAKE HAZARD LEVEL
I	Life Safety (LS)	Collapse Prevention (CP)
II	Life Safety (LS)	Collapse Prevention (CP)
III	Note b	Note b
IV	Immediate Occupancy (IO)	Life Safety (LS)

- a. The charging provisions for Seismic Use Group equivalents to ASCE 31 and FEMA 356 BSE-1 for reduced *International Building Code* level seismic forces are located in Section 407.1.1.3.
- b. Performance levels for Seismic Use Group III shall be taken as halfway between the performance levels specified for Seismic Use Groups II and IV.

407.1.2 Wind design. Wind design of existing buildings shall be based on the procedures specified in the *International Building Code* or *International Residential Code* as applicable.

407.2 Reduction of strength. Repairs shall not reduce the structural strength or stability of the building, structure, or any individual member thereof.

Exception: Such reduction shall be allowed provided the capacity is not reduced to below the *International Building Code* levels.

407.3 Damaged buildings. Damaged buildings shall be repaired in accordance with this section.

407.3.1 New structural frame members. New structural frame members used in the repair of damaged buildings, including anchorage and connections, shall comply with the *International Building Code*.

Exception: For the design of new structural frame members connected to existing structural frame members, the use of reduced *International Building Code* level seismic forces as specified in Section 407.1.1.3 shall be permitted.

407.3.2 Substantial structural damage. Buildings that have sustained substantial structural damage shall comply with this section.

407.3.2.1 Engineering evaluation and analysis. An engineering evaluation and analysis that establishes the structural adequacy of the damaged building shall be prepared by a registered design professional and submitted to the code official. The evaluation and analysis may assume that all damaged structural elements and systems have their original strength and stiffness. The seismic analysis shall be based on one of the procedures specified in Section 407.1.1.

407.3.2.1.1 Extent of repair. The evaluation and analysis shall demonstrate that the building, once re-

paired, complies with the wind and seismic provisions of the *International Building Code*.

Exception: The seismic design level for the repair design shall be the higher of the Building Code in effect at the time of original construction or reduced *International Building Code* level seismic forces as specified in Section 407.1.1.3.

407.3.3 Below substantial structural damage. Repairs to buildings damaged to a level below the substantial structural damage level as defined in Section 202 shall be allowed to be made with the materials, methods, and strengths in existence prior to the damage unless such existing conditions are dangerous as defined in Chapter 2. New structural frame members as defined in Chapter 2 shall comply with Section 407.3.1.

407.3.4 Other uncovered structural elements. Where in the course of conducting repairs other uncovered structural elements are found to be unsound or otherwise structurally deficient, such elements shall be made to conform to the requirements of Section 407.3.2.1.1.

407.3.5 Flood hazard areas. In flood hazard areas, damaged buildings that sustain substantial damage shall be brought into compliance with Section 1612 of the *International Building Code*.

SECTION 408 ELECTRICAL

408.1 Material. Existing electrical wiring and equipment undergoing repair shall be allowed to be repaired or replaced with like material.

Exceptions:

1. Replacement of electrical receptacles shall comply with the applicable requirements of Section 406.3(D) of NFPA 70.
2. Plug fuses of the Edison-base type shall be used for replacements only where there is no evidence of over fusing or tampering per applicable requirements of Section 240.51(B) of NFPA 70.
3. For replacement of nongrounding-type receptacles with grounding-type receptacles and for branch circuits that do not have an equipment grounding conductor in the branch circuitry, the grounding conductor of a grounding-type receptacle outlet shall be permitted to be grounded to any accessible point on the grounding electrode system, or to any accessible point on the grounding electrode conductor in accordance with Section 250.130(C) of NFPA 70.
4. Non-“hospital grade” receptacles in patient bed locations of Group I-2 shall be replaced with “hospital grade” receptacles, as required by NFPA 99 and Article 517 of NFPA 70.
5. Frames of electric ranges, wall-mounted ovens, counter-mounted cooking units, clothes dryers, and outlet or junction boxes that are part of the existing branch

circuit for these appliances shall be permitted to be grounded to the grounded circuit conductor in accordance with Section 250.140 of NFPA 70.

SECTION 409 MECHANICAL

409.1 General. Existing mechanical systems undergoing repair shall comply with Section 401.1 and the scoping provisions of Chapter 1 where applicable.

[P] SECTION 410 PLUMBING

410.1 Materials. The following plumbing materials and supplies shall not be used:

1. Sheet and tubular copper and brass trap and tailpiece fittings less than the minimum wall thickness of .027 inch (0.69 mm).
2. Solder having more than 0.2-percent lead in the repair of potable water systems.
3. Water closets having a concealed trap seal or an unventilated space or having walls that are not thoroughly washed at each discharge in accordance with ASME A112.19.2M.
4. The following types of joints shall be prohibited:
 - 4.1. Cement or concrete joints.
 - 4.2. Mastic or hot-pour bituminous joints.
 - 4.3. Joints made with fittings not approved for the specific installation.
 - 4.4. Joints between different diameter pipes made with elastomeric rolling O-rings.
 - 4.5. Solvent-cement joints between different types of plastic pipe.
 - 4.6. Saddle-type fittings.
5. The following types of traps are prohibited:
 - 5.1. Traps that depend on moving parts to maintain the seal.
 - 5.2. Bell traps.
 - 5.3. Crown-vented traps.
 - 5.4. Traps not integral with a fixture and that depend on interior partitions for the seal, except those traps constructed of an approved material that is resistant to corrosion and degradation.

410.2 Water closet replacement. When any water closet is replaced, the replacement water closet shall comply with the *Arizona State Plumbing Code*. The maximum water consumption flow rates and quantities for all replaced water closets shall be 1.6 gallons (6 L) per flushing cycle.

Exception: Blowout-design water closets [3.5 gallons (13 L) per flushing cycle].

