CHAPTER 5
REPAIRS

SECTION 501
GENERAL

501.1 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 11.~~))

501.2 Permitted materials. Except as otherwise required or permitted by this code, materials permitted by the applicable code for new construction shall be used. Like materials shall be permitted, provided no hazard to life, health or property is created.

501.3 Conformance. The work shall not make the building less conforming than it was before the repair was undertaken.

501.4 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 502
BUILDING ELEMENTS AND MATERIALS

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

502.2 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 503
FIRE PROTECTION

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

SECTION 504
MEANS OF EGRESS

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

SECTION 505
ACCESSIBILITY

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

SECTION 506
STRUCTURAL

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

506.1.1 Seismic evaluation and design. Seismic evaluation and design of an existing building and its components shall be based on the following criteria.

506.1.1.1 Evaluation and design procedures. The seismic evaluation and design shall be based on the procedures specified in the *International Building Code*, ASCE 31 or FEMA 356. The procedures contained in Appendix A of this code shall be permitted to be used as specified in Section 506.1.1.3.

506.1.1.2 IBC level seismic forces. When seismic forces are required to meet the *International Building Code* level, they shall be one of the following:

1. One-hundred percent of the values in the *International Building Code*. The *R*-factor used for analysis in accordance with Chapter 16 of the *International Building Code* shall be the *R*-factor specified for structural systems classified as "Ordinary" in accordance with Table 12.2-1 of ASCE 7, unless it can be demonstrated that the structural system satisfies the proportioning and detailing requirements for systems classified as "Intermediate" or "Special."
2. Those associated with the BSE-1 and BSE-2 Earthquake Hazard Levels defined in ((~~FEMA 356~~)) ASCE 41. Where ((~~FEMA 356~~)) ASCE 41 is used, the corresponding performance levels shall be those shown in Table 506.1.1.2.

TABLE 506.1.1.2
((~~FEMA 356~~)) ASCE 41 AND ASCE 31 PERFORMANCE LEVELS

OCCUPANCY CATEGORY (BASED ON IBC TABLE 1604.5)	PERFORMANCE LEVEL FOR USE WITH ASCE 31 AND WITH ((~~FEMA 356~~)) ASCE 41 BSE-1 EARTHQUAKE HAZARD LEVEL	PERFORMANCE LEVEL FOR USE WITH ((~~FEMA 356~~)) ASCE 41 BSE-2 EARTHQUAKE HAZARD LEVEL
I	Life Safety (LS)	Collapse Prevention (CP)
II	Life Safety (LS)	Collapse Prevention (CP)
III	Note a	Note a
IV	Immediate Occupancy (IO)	Life Safety (LS)

a. ((~~Performance levels for Occupancy Category III shall be taken as halfway between the performance levels specified for Occupancy Category II and IV.~~)) Where seismic forces are permitted to meet reduced *International Building Code* levels, the performance level for Occupancy Category III shall be Life Safety (LS). Where seismic forces are required to meet the *International Building Code* levels, acceptance criteria for Occupancy Category III shall be taken as 80 percent of the acceptance criteria specified for Occupancy Category II performance levels, but need not be less than (more restrictive than) the acceptance criteria specified for Occupancy Category IV performance levels.

506.1.1.3 Reduced IBC level seismic forces. When seismic forces are permitted to meet reduced *International Building Code* levels, they shall be one of the following:

1. Seventy-five percent of the forces prescribed in the *International Building Code*. The *R*-factor used for analysis in accordance with Chapter 16 of the *International Building Code* shall be the *R*-factor as specified in Section 506.1.1.2 of this code.
2. In accordance with the applicable chapters in Appendix A of this code as specified in Items 2.1 through 2.5 below. Structures or portions of structures that comply with the requirements of the applicable chapter in Appendix A shall be deemed to comply with the requirements for reduced *International Building Code* force levels.
   2.1. The seismic evaluation and design of unreinforced masonry bearing wall buildings in Occupancy Category I or II are permitted to be based on the procedures specified in Appendix Chapter A1.
   2.2. Seismic evaluation and design of the wall anchorage system in reinforced concrete and reinforced masonry wall buildings with flexible diaphragms in Occupancy Category I or II are permitted to be based on the procedures specified in Appendix Chapter A2.
   2.3. Seismic evaluation and design of cripple walls and sill plate anchorage in residential buildings of light-frame wood construction in Occupancy Category I or II are permitted to be based on the procedures specified in Appendix Chapter A3.
   2.4. Seismic evaluation and design of soft, weak or open-front wall conditions in multiunit residential buildings of wood construction in Occupancy Category I or II are permitted to be based on the procedures specified in Appendix Chapter A4.
   2.5. Seismic evaluation and design of concrete buildings and concrete with masonry infill buildings in all occupancy categories are permitted to be based on the procedures specified in Appendix Chapter A5.
3. In accordance with ASCE 31 based on the applicable performance level as shown in Table 506.1.1.2 using the BSE-1 earthquake hazard level as defined in ASCE 41.

Note: Item 3 uses the lesser of an earthquake with a 10 percent chance of exceedance in 50 years or $^2/_3$ of the maximum considered earthquake to be consistent with Item 4 below and with *Seattle Building Code* Chapter 34.

4. Those associated with the BSE-1 Earthquake Hazard Level defined in ((~~FEMA 356~~)) ASCE 41 and the performance level as shown in Table 506.1.1.2. Where ((~~FEMA 356~~)) ASCE 41 is used, the design spectral response acceleration parameters S_{XS} and S_{X1} shall not be taken less than 75 percent of the respective design spectral response acceleration parameters S_{DS} and S_{D1} defined by the *International Building Code* and its reference standards.

506.1.2 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.

506.2 Repairs to damaged buildings. Repairs to damaged buildings shall comply with this section.

506.2.1 Dangerous conditions. Regardless of the extent of structural damage, dangerous conditions shall be eliminated.

506.2.2 Substantial structural damage to vertical elements of the lateral-force-resisting system. A building that has sustained substantial structural damage to the vertical elements of its lateral-force-resisting system shall be evaluated and repaired in accordance with the applicable provisions of Sections 506.2.2.1 through 506.2.2.3.

506.2.2.1 Evaluation. The building shall be evaluated by a registered design professional, and the evaluation findings shall be submitted to the code official. The evaluation shall establish whether the damaged building, if repaired to its predamaged state, would comply with the provisions of the *International Building Code*. Wind forces for this evaluation shall be those prescribed in the *International Building Code*. Seismic forces for this evaluation are permitted to be the reduced level seismic forces specified in Section 506.1.1.3.

506.2.2.2 Extent of repair for compliant buildings. If the evaluation establishes compliance of the predamaged building in accordance with Section 506.2.2.1, then repairs shall be permitted that restore the building to its predamaged state using materials and strengths that existed prior to the damage.

506.2.2.3 Extent of repair for noncompliant buildings. If the evaluation does not establish compliance of the predamaged building in accordance with Section 506.2.2.1, then the building shall be rehabilitated to comply with applicable provisions of the *International Building Code* for load combinations, including wind or seismic forces. The wind design level for the repair shall be as required by the building code in effect at the time of original construction, unless the damage was caused by wind, in which case the design level shall be as required by the code in effect at the time of original construction or as required by the *International Building Code*, whichever is greater. Seismic forces for this rehabilitation design shall be those required for the design of the predamaged building, but not less than the reduced level seismic forces specified in Section 506.1.1.3. New structural members and connections required by this rehabilitation design shall comply with the detailing provisions of the *International Building Code* for new buildings of similar structure, purpose and location.

506.2.3 Substantial structural damage to vertical load-carrying components. Vertical load-carrying components that have sustained substantial structural damage shall be rehabilitated to comply with the applicable provisions for dead and live loads in the *International Building Code*. Undamaged vertical load-carrying components that receive dead or live loads from rehabilitated components shall also be rehabilitated to carry the design loads of the rehabilitation design. New structural members and connections required by this rehabilitation design shall comply with

the detailing provisions of the *International Building Code* for new buildings of similar structure, purpose and location.

506.2.3.1 Lateral-force-resisting elements. Regardless of the level of damage to vertical elements of the lateral- force-resisting system, if substantial structural damage to vertical load-carrying components was caused primarily by wind or seismic effects, then the building shall be evaluated in accordance with Section 506.2.2.1 and, if noncompliant, rehabilitated in accordance with Section 506.2.2.3.

506.2.4 Less than substantial structural damage. For damage less than substantial structural damage, repairs shall be allowed that restore the building to its predamaged state using materials and strengths that existed prior to the damage. New structural members and connections used for this repair shall comply with the detailing provisions of the *International Building Code* for new buildings of similar structure, purpose and location.

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

SECTION 507
ELECTRICAL

507.1 Material. Existing electrical wiring and equipment undergoing repair shall comply with the *Seattle Electrical Code* ((~~be allowed to be repaired or replaced with like material~~.

~~507.1.1 Receptacles.~~ ~~Replacement of electrical receptacles shall comply with the applicable requirements of Section 406.3(D) of NFPA 70.~~

~~507.1.2 Plug fuses.~~ ~~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.~~

~~507.1.3 Nongrounding-type receptacles.~~ ~~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.~~

~~507.1.4 Group I-2 receptacles.~~ ~~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.~~

~~507.1.5 Grounding of appliances.~~ ~~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 508
MECHANICAL

508.1 General. Existing mechanical systems undergoing repair shall not make the building less conforming than it was before the repair was undertaken.

SECTION 509
PLUMBING

509.1 Materials. Plumbing materials and supplies shall not be used for repairs that are prohibited in the *International Plumbing Code*.

509.2 Water closet replacement. 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].