

AMTRAK ENGINEERING PRACTICES Structures Department Standard Design Practices (SDP)	Section 3 – Minimum Technical Requirements	EP4000
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Concrete

I. Maintenance of Cast-in-Place Concrete

A. General

1. Where existing concrete has shifted out of alignment, sunk, or heaved and has resulted in an uneven walking surface or an unsafe walking surface or an unsafe condition for pedestrians and vehicles, cut and/or grind concrete to create a smooth and safe ADA compliant surface using equipment and materials specifically designed to make concrete repairs.
2. Where concrete has deteriorated and needs to be patched, provide concrete repair materials and methods for resurfacing, and crack infill and patching as per the written instructions of the repair material manufacturer.
3. Documentation:
 - a. The Design Consultant shall prepare drawings documenting the different deficient conditions that require repair and the material and methods to be used at each condition.
 - b. The Contractor and representative from the grinding equipment operators and/or repair material manufacturer shall review the documents and verify all conditions in the field and confirm the proposed repair materials and methods or propose others based upon field conditions.

B. Accessories

1. Crack stitching steel reinforcement shall be stainless steel.
2. Where concrete has been ground, apply concrete sealer to the affected area to protect the newly exposed surface.

C. Installation

1. Concrete repair work shall be performed by contractors trained and certified to use the necessary equipment and by the repair material manufacturer for the type of repair work required.
2. All deteriorated materials requiring replacement shall be removed by saw cutting. Cut lines shall be straight and shall be parallel to the existing construction edges or joints to the maximum extent possible. Once all deteriorated materials have been removed, clean and prepare the existing sound surface as per concrete repair manufacturer's written directions. Feathered edges shall be avoided.
3. Install patch and repair materials only after the surface has been prepared and environmental conditions are as required by the manufacturer.
4. Cast In Place concrete exposed to public view shall be specified as graffiti resistant, such that graffiti can be resisted or removed either by graffiti coating, glazing, or other method, and presented to the Amtrak Design Manager for review for appropriateness.

D. Finish

1. Consult with Design Manager on requirements to match adjacent existing concrete color, finish, and texture.
 - a. Where it is not feasible to match the existing adjacent materials, notify the Amtrak Design Manager in writing with an explanation why the repair materials cannot match the existing and describe what methods will be used to minimize differences in the adjacent finishes.

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II. Cast-In-Place Concrete

A. General Guidelines – Project-specific concrete requirements shall be set to meet the specific needs of each application (e.g. low permeability in caustic environments; high strength or UHPC for durability, longevity or abrasion resistance; workability or pumping distance; carbon reduction goals; etc.).

1. Strength – minimum 4000 psi @ 28 days; 5000 psi for concrete exposed to the elements, caustic agents (including deicing), and/or industrial or storage loading applications.
2. Water/Cement Ratio – maximum .45.
3. Concrete shall contain silica fume and other additives as needed in accordance with ACI 318.
4. All concrete work shall comply with the requirements of the latest edition of the ACI building code (ACI 318), ACI detailing manual (ACI 315), and the specifications for structural concrete for buildings (ACI 301).

B. Requirements

1. Reinforcing steel detailing to be in accordance with ACI 315.
2. Reinforcing steel shall conform to ASTM A615 grade 60
 - a. If the concrete surface will be exposed to elements, at the direction of the design manager, reinforcement shall be either epoxy coated in accordance with ASTM A775, hot dip galvanized in accordance with ASTM A767 or continuous hot-dip galvanized in accordance with ASTM A1094.
 - b. Lap all bars a minimum of 48 bar diameters and otherwise in accordance with applicable codes and standards for the coating selected.
3. WWF shall comply with ASTM A185 and shall be epoxy coated in accordance with ASTM A884 type 1 coating, if exposed to the elements.
 - a. Lap all WWF a minimum of 6 inches.

C. Admixtures (No other admixtures will be accepted without the approval of the Amtrak Design Manager)

1. Provide only the following admixtures:
 - a. Concrete exposed to the ground or weather shall be air entrained between 4-5% as determined by ASTM C-231 or C-173.
 - b. Silica Fume.
 - c. High-range water-reducing admixture (super plasticizer) which conforms to ASTM C-494, type F or G and contains no more than 0.1 percent chloride ions.
 - d. Hardeners when/if the intended use dictates (or topical application as/if appropriate)
 - e. Crystalline waterproofing (or topical application as/if appropriate)
 - f. Where the use of other concrete admixtures is requested by the Design Consultant, provide the following information to the Design Manager:
 - i. Benefits to using admixture (including service life).
 - ii. Potential negative effects, as well as their contributions to workability, durability, and adjustment of set time.
 - iii. Long-term data supporting benefits and negative effects of admixture.

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iv. Effects of the admixture on the total chloride content of the concrete so that the limits prescribed by ACI 318, are not exceeded.

v. Cost differential in dollars per CY and percent increase per CY

D. Finish

1. Walls: Remove form ties and patch.
2. Floors: Wood float finish.
3. Exterior Paving: Broom Finish.

E. Accessories

1. Expansion joint filler: Use preformed strips, non-extruding, and resilient bituminous type.
2. At interior locations, unless site conditions require additional protection, provide polyethylene sheet 8 mil thickness vapor barrier membrane below slabs-on-grade. Overlap seams a minimum of 12” and seal all seams, edges, and penetrations.
3. Provide sleeves in footings and walls for passage of piping, electrical conduit, and other utilities.

F. Curing

1. All concrete shall be protected and cured in strict accordance with ACI 318.

G. Concrete Sealing

1. Seal the concrete surfaces as shown on the drawings and at all interior locations where no additional finish is scheduled.

III. Precast Concrete

- A. Strength – minimum 5000 psi.
- B. Design in accordance with ACI 318 and PCI MNL-12.
- C. Penetration locations should be pre-determined whenever possible