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 applicable 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.

5. All exposed reinforcing steel must be cleaned in accordance with SSPC-SP2 or SSPC-SP3.

6. Field Quality Control: Bid Package shall include the requirement that a qualified testing agency is retained to test materials and perform installation inspections.

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.

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 and ACI 318.

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 byASTM C-231 or C-173.

b. Silica Fume: ASTM C 1240, amorphous silica

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.

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. Joint Detailing Guidelines

1. Construction in line with faces perpendicular to surface plane of concrete is preferred.

2. Construction Joints are to be detailed such that strength and appearance of concrete are not impaired, with locations indicated on design drawings and approved by Amtrak Design Manager.

3. Control/Contraction Joints in Slabs-on-grade are to be detailed to provide weakened-plane contraction joints and section the concrete into areas as indicated. Contraction joints shall be detailed for a depth equal to at least one-fourth of the slab thickness as follows:

a. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of a joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finish. Eliminate groover tool marks in concrete.

b. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8 inch wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

4. Isolation Joints in Slabs-on-grade shall be detailed to include joint-filler strips at slab junctions with vertical surfaces such as column pedestals, foundation walls, grade beams and other locations as indicated.

a. Full-width joint-filler strips shall be detailed not less than ½ inch or more than 1 inch below finished concrete surface where joint sealant is indicated.

b. Joint filler strips shall be detailed for installation in lengths as long as is practical. Where more than one length section is required, notes indicating lacing or clipping sections together shall be provided.

5. Doweled Joints where movement or shrinkage is anticipated shall be detailed with lubrication or asphalt coating on one-half of dowel length to prevent concrete bonding to one side of joint.

E. Finishing Details

1. Walls: Form tie removal points are to be patched.

2. Floors: Wood float finish.

3. Exterior Paving: Broom Finish.

F. 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.
4. ADA Compliant Detectable Warning Surfaces (where required in the scope of work): ADA compliant detectable warning surfaces should be a contrasting color to surrounding material and are to be installed on new concrete surfaces in accordance with DOTAS and State and Local Codes.
5. Traffic Paint (where required in the scope of work): Traffic paint must be state of federal DOT approved reflective traffic coating as approved by Amtrak Project Manager.

G. Curing

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

H. 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

IV. Concrete Repairs

A. General:

1. Any reinforcement that is broken or has lost 15% or more of the original cross-sectional area must be replaced and supplemented by providing bars of approximately the same diameter, or as directed by the Amtrak Design Manager. New reinforcing bars must be drilled and grouted into the concrete per epoxy grout manufacturer's recommendations. All existing reinforcing steel within spall repair limits shall be protected with an anti-corrosion coating following the cleaning of existing bars.
2. The limits of the repairs must be saw cut along neat lines to a depth of 1" where practical to produce a clean edge.
3. Mechanical expansion or chemical adhesive anchors are required for spalls greater than 1 ½" deep. Less than ½" do not require repair unless directed by Amtrak Design Manager.
4. Notes shall limit equipment to use a maximum 28 lb. size pneumatic hammer or other approved method for concrete removal unless approved by Amtrak Engineering.
5. Notes shall dictate that surface preparation, product mixing and installation, and clean-up per detail(s) and manufacturer's written instructions.
6. The Design Consultant, where the scope dictates, shall inspect concrete surfaces for extent, type, and location of concrete crack and spall repairs in the presence of an Amtrak representative. Cracks less than 0.02" (20 mils) in width typically do not require repair unless otherwise directed by the Design Manager in consultation with the Design Consultant.