

Standard

Adequate curing methods for repairs shall be implemented as soon as possible to ensure that the repair does not dry out too quickly. Corrosion protected materials shall be touched-up upon completion of all intended curing and acid cleaning.

All repaired products shall be inspected by quality control personnel to ensure that proper repair procedures including curing have been followed and that the results are acceptable. Repairs shall be evaluated after having been cured.

2.9 Acceptability of Appearance

Uniformity of color and intensity of shading are generally a matter of subjective individual judgment. Therefore, it is beyond the scope of this Standard to establish definitive rules for product acceptability on the basis of appearance. The finished face surface shall have no obvious imperfections other than minimal color and texture variations from the approved samples or evidence of repairs when viewed in good typical daylight illumination with the unaided naked eye at a 20 ft (6 m) viewing distance. Appearance of the surface shall not be evaluated when light is illuminating the surface from an extreme angle as this tends to accentuate minor surface irregularities.

Unless approved otherwise in the sample/mockup process (see Article 1.5.4) the following is a list of finish defects that shall be properly repaired, if obvious when viewed at a 20 ft (6 m) distance.

1. Ragged or irregular edges.

Commentary

area and the original surface due to the different age and curing conditions of the repair. Time (several weeks) will tend to blend the repair into the rest of the member so that it should become less noticeable. Gross variation in color and texture of repairs from the surrounding surfaces will require removal of the repair material and reapplication of new repair material. Small cracks, under 0.010 in. (0.25 mm), may not need repair, unless failure to do so can cause corrosion of reinforcement. If crack repair is required for the restoration of structural integrity or member finish, cracks may be filled or pressure injected with a low viscosity epoxy.

To match specified architectural finishes, repair mixes should be developed early, following approval of initial sample. A trial and error process is normally required for each newly developed face mix to effectively match color and texture.

C2.9 Acceptability of Appearance

It should be stated in the contract documents who the accepting authority will be — contractor, architect, engineer of record, owner or jobsite inspector.

At the time the visual mockups or initial production units are approved, the acceptable range in color, texture and uniformity should be determined.

1. It is strongly recommended that all edges of precast concrete units be detailed with a reasonable radius or chamfer, rather than leaving them as sharp corners. Sharp corners chip easily during handling and during service in the building. It can be difficult to cast concrete to a 45 degree point because of the size of the aggregates. When the edge is sharp, only fine aggregate collects there and this weakens the edge. Also, voids occur due to the interference of larger aggregate. Therefore, this edge should have a cutoff or quirk. The size of the quirk return should not be less than 3/4 in. (20 mm), nor less than 1.5 times the maximum aggregate size used in the concrete mix.

Standard

2. Excessive air voids (commonly called **bug-holes**) larger than 1/4 in. (6 mm) evident on the exposed surfaces.

3. Adjacent flat and return surfaces with greater texture and/or color differences than the **ap**-proved samples or mockups.

4. Casting **and/or** aggregate segregation lines evident from different concrete placement lifts and consolidation.

5. Visible mold joints or irregular surfaces.

6. Rust stains on exposed surfaces.

7. Units with excessive variation of texture and/or color from the approved samples, within the unit or compared with adjacent units.

Commentary

2. Sculptured panels, channel panels, and panels with deep returns may have visible air voids on the returns. These air voids or "**bug/blow** holes," become accentuated when the surface is smooth, acid-etched **or** lightly sandblasted. If the air holes are of a reasonable size, 1/8 to 1/4 in. (3 to 6 mm), it is recommended that they be accepted as **part** of the texture. Filling and sack-rubbing could be used to eliminate the voids. However, **this** procedure may cause color differences. Samples or the mockup panel should be used to establish acceptable air void frequency, size, and distribution.

3. Returns in some finishes will not appear exactly like the front face (down-face) due to a number of factors such as mix proportions, variable depths (and pressures) of concrete, and small differences in consolidation techniques, particularly in **the** case of intricate shapes with complex flow of concrete. The effect of gravity during consolidation forces the large aggregates to the bottom and the smaller aggregates, plus the sand and cement content, upwards. Consequently, the down-face in the mold will nearly always be more uniform and denser than the **re**-turns or upper radius.

6. Rust stains caused by reactive iron pyrites or other contaminants will occur where such contaminants are found as **part** of the aggregates. Rust stains may also be caused by particles of steel left by the aggregate crusher, pieces of tie wire from the cage assembly, or particles of steel burned off in welding and accidentally left in the mold. These stains (and steel particles) should be removed from the surface as soon as they are observed. Rust stains caused by corroding reinforcing steel **are** not common. When reinforcing steel does corrode, it reflects shortcomings in design, concrete quality or workmanship. Rust stains due to corrosion of hardware should not occur if the hardware has been protectively coated or where it is entirely behind a weatherproofed joint.

1. It should be recognized that some blemishes or variations in color occur in architectural precast concrete panels. Uniformity in color is directly related to ingredients supplying the color.

Panels containing aggregates and matrices of contrasting **colors** will appear less uniform than those containing **mate**-rials of similar color (as the size of **the coarse** aggregate **de**-creases, less **matrix** is seen and the more uniform the color of the panel will appear). It is advisable to match the color **or** tone of the matrix to that of the **coarse** aggregate so minor segregation of the aggregate will not be noticeable.

Color uniformity is difficult to achieve on gray, buff, and pigmented concrete surfaces. The use of white cement will give better color uniformity than gray cement. **Al**-

Standard

Commentary

6. Blocking stains evident on exposed surface.

9. Areas of backup concrete bleeding through the facing concrete.

10. Foreign material embedded in the face.

11. Visible repairs at 20 ft. (6 m) viewing distance.

12. Reinforcement shadow lines,

13. Cracks visible at a 20 ft (6 m) viewing distance.

2.10 Sealers or Clear Surface Coatings

If sealers or clear surface coatings are specified, they shall be tested on reasonably sized samples of

lowable color variation in the gray cement is enough to cause noticeable color differences in precast concrete panels. The slightest change of color is readily apparent on the uninterrupted surfaces of smooth off-the-mold concrete, and any variation is likely to be regarded as a surface blemish. As a general rule, a textured surface is aesthetically more satisfactory (greater uniformity) than a smooth surface. The surface highlights and natural variations in aggregate color will, to a large extent, camouflage subtle differences in texture and color of the concrete. The degree of uniformity (different shadings and to some extent, depth of color) between panels and within panels in a sandblasted finish, as in all exposed aggregate processes is generally in direct proportion to the depth of exposure. For example, a light sandblasting may look acceptable on a small sample; but uniformity is rather difficult to achieve in reality.

Sunlight, and exposure to the elements may even out the variation to a great extent.

8. Blocking used to separate production pieces from each other in the storage yard or during shipment should consist of non-staining material. Blocking used for extended periods of time should allow the precast concrete unit to cure in a similar environment as the rest of the unit, both under and around the blocking, by not trapping moisture or preventing air circulation to the blocked area. Plastic bubble type pads are available and are well suited for this purpose. Lumber or padding wrapped with plastic should not be used for blocking, unless in an area that is not visible in the final structure.

12. Reinforcing steel in some finishes may show up as light shadow lines usually directly over the steel depending on mix, concrete cover, vibration of reinforcement, placing, etc. In a few cases, a dark shadow pattern is displaced from the steel above.

13. It should be recognized that a certain amount of crazing or cracking may occur without being detrimental. With respect to acceptability of cracks, the cause should be determined as well as the stress condition a crack will be under with the precast concrete unit in place.

While some of these cracks may be repaired and effectively sealed, their acceptability should be governed by the importance and the function of the panel under consideration. The decision regarding acceptability must be made on an engineering basis as well as on visual appearance.

C2.10 Sealers or Clear Surface Coatings

Sealers or clear surface coatings may be considered for the possible improvement of weathering characteristics. The quality of concrete normally specified for architectural precast con-