

## SECTION 03300 CONCRETE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Formwork, reinforcement, accessories, cast-in-place concrete, finishing and curing.

#### 1.2 QUALITY ASSURANCE

- A. Standards for quality of materials, performance of workmanship and standard test methods for work under this section will conform to the latest edition of the following:

1. American Society for Testing Materials (ASTM) Standard Specifications and Methods.
2. ACI 301, "Specifications for Structural Concrete for Buildings", latest edition.
3. ACI 302, "Guide for Concrete Floor and Slab Construction".
4. ACI 304, "Recommended Practice for Measuring, Mixing and Placing Concrete".
5. ACI 305, "Recommended Practice for Hot Weather Concreting".
6. ACI 306, "Recommended Practice for Cold Weather Concreting".
7. ACI 318, "Building Code Requirements for Reinforced Concrete", latest edition.
8. ACI 347, "Recommended Practice for Concrete Formwork".
9. CRSI "Recommended Practice for Placing Reinforcing Bars".
10. CRSI "Recommended Practice for Placing Bar Supports".
11. ASTM E 1155, "Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System".

- B. General:

1. All floor slabs must exhibit the required finish, achieve the flatness/levelness tolerances specified and exhibit minimal cracking. These requirements can only be achieved by utilizing specified materials, methods and procedures, installing floor slabs in conformance with these requirements.
2. BJ's encounters excessive forklift traffic in its' daily activities. The most critical building component in the facility is the concrete slab. Color shall be consistent throughout store. To ensure this, provide single aggregate source so that color is homogeneous. All slab joints shall be properly installed throughout the facility.
3. Design loadings for floor slabs:
  - a. Merchandise racks: 18,000 lb. per frame; two legs at 9,000 lb. each. This load is distributed over a cross-sectional area of 4.875 sq. in. (1-5/8" x 3") on a steel plate welded to the base of each leg.
  - b. Forklift trucks: Loaded forklift trucks at approximately 9,500 lbs. Front wheel maximum loading equals 4,000 lb. (approximate). Construct slab according to ACI 300, Table 1.1, Class 5 for Industrial Vehicular Traffic.

- C. Concrete Testing Service

1. Engage a testing laboratory acceptable to Architect to perform material evaluation tests and to design concrete mixes.
  2. Materials and installed work may require testing and retesting at any time during progress of work. Tests including retesting of rejected materials for installed work, shall be done at Contractor's expense.
  3. Testing agency shall have minimum of five years experience with at least five projects of same dollar value.
- D. Test Pour: Contractor shall provide test pour of 9' x 20' employing all materials and labor standards which shall be approved for placement and finish by and at the sole discretion of BJ's Construction Manager. This test pour shall serve as standard for finish of all future pours, and shall be located under proposed location of the Johnson Air Unit.

### 1.3 SUBMITTALS

- A. Product Data: Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials and others as requested by Architect.
- B. Reinforcement Shop Drawings: Submit original shop drawings prepared by registered Professional Engineer for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315 "Details and Detailing of Concrete Reinforcement" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures.
- C. Samples: Submit samples of materials as requested by Architect, including names, sources and descriptions.
- D. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test.
- E. Materials Certificates: Provide material certificates in lieu of materials laboratory test reports when permitted by Architect. Materials certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification.

## PART 2 - PRODUCTS

### 2.1 FORM MATERIALS

- A. Plywood: PS 1, B or better grade, Douglas Fir or Spruce species; sound, undamaged sheets with clean true edges, sealed; minimum 5/8" thickness.
- B. Lumber: Standard grade; minimum 3/4" thick.
- C. Prefabricated Steel Type: Minimum 16 gauge, matched, tight fitting, stiffened to support weight of concrete.

- D. Tubular Column Type: Round, spirally wound laminated materials, inside surface treated with release agent.
- E. Form Ties: Snap-off metal type of adjustable length, cone type; manufactured by Burke, with outside diameter of 1".
- F. Form Release Agent: Colorless mineral oil which will not stain concrete or impair natural bonding characteristics of coating intended for use on concrete.

## 2.2 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A 615, 60 ksi yield grade; deformed billet steel bars, plain finish.
- B. Reinforcing Steel At Construction Joints: ASTM A 615, 60 ksi yield strength, smooth steel bars, plain finish, coat bar with oil. Bars shall be used as dowels at 24" on center at control and construction joints, 3'-0" long, 1'-6" extension into each pour.
- C. Welded Steel Wire Fabric: Only where noted, install ASTM A 185, plain type, in flat sheets, plain finish, tensile strength = 60 ksi, 6/6 x 2.9/2.9.
- D. All Accessories, Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for support of reinforcing; stainless steel or galvanized in accordance with ACI 315, or plastic tipped.
- E. Fabrication: Fabricate concrete reinforcing in accordance with ACI 315 and ACI 318.
- F. Engineered Reinforcing Fibers: Interior slabs on grade shall be reinforced with UL rated monofilament or fibrillated polypropylene fibers for reinforcing of concrete members. Fibers shall be 3/4" in length and used at dosage rate of 5.0 million fibers and 1.5 lbs. per cu. yd. Product shall be "Fiberstand" by the Euclid Chemical Co. Or "Fibermesh Inforce e3" by Fibermesh, Inc.

## 2.3 CONCRETE MATERIALS

- A. Cement: ASTM C 150, Independent Light, Type I, Portland type. Maximum of 5-1/2 sacks of Portland cement per yard.
- B. Fine And Coarse Aggregates: ASTM C 33. Coarse aggregate maximum 1" size for footings; 1-1/2" in slab on grade; 3/4" for all other concrete.
- C. Water: Clean and not detrimental to concrete.
- D. Air Entrainment Admixture:
  - 1. Non-corrosive, Non-chloride Accelerator: "Accelguard 80" by The Euclid Chemical Company or approved equal. Admixture shall conform to ASTM C 494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. Admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory (of at least 1 year's

duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures.

2. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than 0.5% chloride ions are not permitted.
3. Certification: Written conformance to above mentioned requirements and chloride ion content of admixture will be required from admixture manufacturer prior to mix design review by Engineer.

E. Grout:

1. Non-shrink grout shall be "Euco NS" by The Euclid Chemical Co., or "Masterflow 713" by Master Builders. Factory pre-mixed grout shall conform to ASTM C 1107, "Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)". Grout manufacturer shall furnish test data from an independent laboratory indicating that grout when placed at fluid consistency shall achieve 95% bearing under 4' x 4' base plate.
2. Where high fluidity and/or increased placing time is required, use "Euco Hi-Flow Grout" by The Euclid Chemical Co. or "Masterflow 928" by Master Builders. Grout manufacturer shall furnish test data from an independent laboratory indicating that grout when placed at fluid consistency shall achieve 95% bearing under 18" x 36" base plate.

## 2.4 COMPOUNDS, SEALERS AND ACCESSORIES

- A. Curing Compound: Concrete floor slabs shall be sealed with one coat of Ashford Formula manufactured by Curecrete chemical Company, 1203 W. Spring Creek Place, P.O. Box 551, Springville, UT, 1-800-998-5664. Repair cracks, spalling, and crevices in floor slab prior to application. Apply in strict accordance with manufacturer's recommendations. Do not use on floors which will receive finish materials not compatible with sealer.
- B. Exterior Concrete Paving Curing: At loading slabs, trailer drop slabs, and equipment slabs, provide 7-day cure, or WR Meadows Company "Type WP-40" White Pigmented Resin-Based Spray-on Curing Compound, meeting ASTM C 309, Type II, Class B.
- C. Joint Sealant: Non-moving interior saw cut control, contraction, and construction joints shall be filled with Tamms Industries "DURAL 340". Apply in accordance with manufacturer's recommendations and ACI 302 Paragraph 4.10 "Joint Material". All moving joints shall be sealed per Section 07900 "Joint Sealers". Provide backup strip for joints, depth equal to joint thickness. Concrete surface on both sides of joints shall be masked.
- D. Slab Edge And Expansion Joint Filler: ASTM D 994-71, bituminous impregnated preformed type, 1/2 inch thick. Install at all points of contact between slabs and vertical surfaces such as columns and walls.
- E. Vapor Barrier: Polyethylene sheet, minimum 6 mil. thickness.

## 2.5 PROPORTIONING AND DESIGN OF MIXES

- A. Mix Design: All mix designs shall be proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trail Mixtures" of ACI 318-89. Submit mix designs on each class of concrete for review. Proposed mix designs shall be accompanied by complete standard deviation analysis or trail mixture test data.
- B. Design Strength: Provide concrete of the following strength:
  - 1. 5,000 psi, 28-day compressive strength for exterior loading slab areas.
  - 2. 4,000 psi, 28-day compressive strength for all interior slabs on grade.
  - 3. 3,000 psi, 28-day compressive strength for all other locations.
- C. Admixture: Concrete slabs placed at air temperatures below 50° F shall contain specified non-corrosive, non-chloride accelerator. Air entrained concrete shall contain approved air entraining admixture. Pumped concrete, concrete for industrial slabs, synthetic fiber concrete, architectural concrete, concrete required to be watertight or concrete with water/cement ratio below 0.50 shall contain specified high-range water-reducing admixture (superplasticizer).
- D. Air Content: Concrete exposed to freezing and thawing and/or required to be watertight shall have air content of 4.5% to 7.5%. Interior slabs subject to vehicular abrasion, shall have maximum air content of 3%.
- E. Slump: Concrete containing high-range water-reducing admixture (superplasticizer) shall have maximum slump of 4" unless otherwise approved by BJ's Construction Manager. Concrete shall arrive at job site at slump of 2" to 3", be verified, then high-range water-reducing admixture added to increase slump to approved level. All other concrete shall have maximum slump of 4". Water shall not be added to concrete at job site unless so directed by BJ's.
- F. Water/Cement Ratio: Concrete subject to freezing and thawing shall have maximum water/cement ratio of 0.50 (4000 psi at 28 days or more). Concrete subjected to deicers and/or required to be watertight shall have maximum water/cement ratio of 0.45 (5000 psi at 28 days or more). Reinforced concrete subjected to brackish water, salt spray or deicers shall have maximum water/cement ratio of 0.40 (5000 psi at 28 days or more).

## 2.6 CONCRETE MIXING

- A. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.
  - 1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify site conditions.

- B. Verify requirements for concrete cover over reinforcement.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

### 3.2 PREPARATION

- A. Clean previously placed concrete with steel brush. Apply bonding agent in accordance with manufacturer's instructions.
- B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

### 3.3 FORMS

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral, static and dynamic loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position. Unless otherwise specified by the Architect or Engineer, formwork shall be constructed to the tolerance limits listed in ACI 301 Table 4.3.1 – "Tolerances for Formed Surfaces".

### 3.4 PLACING REINFORCEMENT

- A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports.

### 3.5 CONCRETE PLACEMENT

- A. Place concrete in accordance with ACI 301.
- B. Notify Architect/Engineer minimum 24 hours prior to commencement of operations.
- C. Ensure reinforcement, inserts, embedded parts, formed joint fillers and joint devices are not disturbed during concrete placement.
- D. Install vapor barrier under interior slabs on grade. Lap joints minimum 6 inches and seal watertight by taping edges and ends with water resistant tape.
- E. Repair vapor barrier damaged during placement of concrete reinforcing. Repair with vapor barrier material; lap over damaged areas minimum 6 inches in all directions and seal watertight.
- F. Install joint fillers in accordance with manufacturer's instructions.
- G. Separate slabs on grade from vertical surfaces with 1/2" thick joint filler.

- H. Extend joint filler from bottom of slab to within 1/8" of finished slab surface.
- I. Install joint devices in accordance with manufacturer's instructions.
- J. Install joint device anchors. Maintain correct position to allow joint cover to flush with floor and wall finish.
- K. Install joint covers, if any, in single length pieces.
- L. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- M. Place concrete continuously between predetermined expansion, control and construction joints.
- N. Do not interrupt successive placement; do not permit cold joints to occur.
- O. Saw cut contraction joints: For exposed interior and exterior concrete provide saw cut contraction joints within 24 hours after placement. Maximum joint spacing shall be 45 times slab thickness unless otherwise noted on drawings. Soff-Cut saw shall be used immediately after final finishing to depth of 1-1/4". Fill joints with specified epoxy compound.
- P. Screed floors on grade level, maintaining surface flatness of maximum 1/4 inch in 10 feet.

### 3.6 SEPARATE FLOOR TOPPINGS

- A. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean. Broom finish at areas of epoxy flooring.
- B. Place required dividers, edge strips, reinforcing and other items to be cast in.
- C. Apply bonding agent to substrate in accordance with manufacturer's instructions.
- D. Screed toppings level, maintaining surface flatness of maximum 1/8 inch in 10 feet.

### 3.7 FINISHING

- A. Concrete walls exposed to view on building exterior shall have smooth rubbed finish.
- B. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.
- C. Place, consolidate, strike off and level slab to proper elevation. After concrete has stiffened sufficiently to permit operation, and water sheen has disappeared, surface shall be floated, at least twice, to uniform sandy texture.
- D. All interior slabs shall then receive steel troweled finish; after floating, concrete shall be power troweled at least twice to smooth dense finish, except at epoxy flooring (provide broom finish).

- E. After floating, exterior surfaces shall receive broom finish. Texture shall be as approved by BJ's Construction Manager from sample panels.
- F. All troweled finished floors shall achieve  $F_F25/F_L20$  ( $F_L17$  for elevated slabs) tolerance. All floated and broomed slabs shall achieve  $F_F20/F_L17$  tolerance.
- G. In areas with floor drains, maintain floor level at walls and pitch surfaces uniformly to drains at 1/8" per foot nominal.
- H. Curing compound or other curing method shall be initiated immediately after final finishing.
- I. Sealing and dustproofing compound shall be applied on all exposed floor surfaces where indicated on drawings. Application shall take place just prior to completion of construction.
- J. All exposed concrete walls shall be rubbed to uniform texture.

### 3.8 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Cure floor surfaces in accordance with ACI 308.



- D. Concrete shall be kept continuously moist and above 50° for seven days. If high early strength concrete is used, time requirement may be reduced to three days.

### 3.9 ASHFORD FORMULA APPLICATION INSTRUCTIONS

(Please Call 800/998-5664--Kent Barrus or Vernon Talbot with any application questions.)

- A. General: All applications are to be performed only by contractors/applicators certified by Curecrete Distribution. To verify certification, please check with the project manager for BJ's or call Curecrete Distribution at 800/998-5664. There are many variables involved in each project. The following are general instructions only--certified applicators are qualified to make adjustments in the process and timing of the application to meet local conditions and make each floor turn out optimally.

- B. Surface Preparation: Apply Ashford Formula to clean, bare concrete only. All construction debris, chalk lines, curing membranes, control joint slurry/dust, or bond breakers must be removed from the surface prior to application of the Ashford Formula. If weather conditions are cold, hot or windy, or the site is in an enclosed building, please see the reverse for specific instructions.

- C. Application Instructions:

Step 1. Using a high volume, low pressure sprayer, apply the Ashford Formula at the rate of 200 square ft. per gallon. Using a walk behind or riding scrubber, distribute the Ashford Formula evenly over the area being treated. Continue going over the slab with the scrubbing machines so that the entire floor is scrubbed once each 10-15 minutes.

Step 2. After the Ashford has become slippery (which can take from 30-45 minutes in ordinary conditions--if it happens more quickly, see the other side for unusual conditions instructions) lightly mist the surface with water. Agitate with the scrubbing machine to work the water into the Ashford making it more soluble again. Allow the surface to become slippery a second time, usually 15 to 20 minutes.

Step 3. Thoroughly flush the surface with water and then with the scrubbing machine brushes engaged, the squeegee down, and the vacuum on, remove the Ashford from the slab. Re-flush any remaining slippery areas to remove all Ashford residue.

The above process begins the process of sealing and hardening the slab. With regular maintenance and a good finish, a sheen should begin to develop over a period of 6-9 months. Care should be taken to keep anything from staining the surface. Hydraulic equipment and cutting machines should be diapered or kept off the slab. Any spills should be promptly cleaned up. Harsh cleaning materials should be avoided--see the maintenance instructions available from Curecrete.

BJ's Wholesale Club/Ashford Formula--Unusual Conditions Instructions

- D. Hot Weather/Windy Application Guidelines:

The Ashford should not become slippery or dry during the 40 minute soak in period. During the first 15 minutes, prevent slipperiness or drying by applying material liberally. If the slab begins to dry out or become slippery before 15 minutes, apply more Ashford.

If the slab begins to dry out or become slippery after 15 minutes, but before 40 minutes, mist with water.

1. In hot conditions, more material should be ordered. The 200 square ft. per gallon standard will be insufficient.
2. Smaller sections should be done--2000-5000 square ft. at time.
3. Drum pumps or other high-volume pumps must be used to get enough material on the slab.
4. Have plenty of water on site for misting and flushing the slab.

E. Cold Weather Application Guidelines:

Only apply Ashford if the ambient temperature is over 35 degrees Fahrenheit.

In cold weather, apply Ashford at the rate of 200 square ft. per gallon. Let the material become slippery, then, using a walk behind or riding scrubbing machine, flush and squeegee from the slab. If, due to cold temperatures, the Ashford hasn't become slippery with 1 hour, squeegee from the slab only--do not flush. Not flushing will allow more material to remain in the pores of the concrete. Puddling water should be kept off the slab for a week after application to prevent whitening.

1. The Ashford should be kept at room temperature prior to application to make it easier to apply. Although freezing will not harm Ashford, it is difficult to thaw. Application is easier if the Ashford is kept warmer.
2. If heaters are used to keep the concrete warm, they must be vented outside. Vent all heaters properly; vent exhaust from any gasoline/diesel motors or generators too. Unvented heaters cause carbonation--a reaction with the top layer of concrete that makes the surface weak. Carbonation doesn't show up immediately, but several months later. Ashford will not prevent carbonation. Even some building ventilation systems may not be fully operation in terms of bringing in sufficient quantities of outside air, so don't rely on them to remove carbon dioxide from the air.

F. Exterior Application Guidelines:

Concrete in the open is more subject to the quick-drying effects of wind, sunlight, or low humidity. Even if the temperatures are not hot, wind can dry out a slab quickly. Refer to the hot weather guidelines (see above) for instructions on how to deal with quick-drying conditions.

G. Interior Application Guidelines:

The main concern in interior applications is carbonation. Exhaust from engines/heaters causes carbonation--a reaction with the top layer of concrete that makes the surface weak. Carbonation doesn't show up immediately, but several months later. Ashford will not prevent carbonation. If heater are used to keep the concrete warm, they must be vented outside. Vent exhaust from any gasoline/diesel motors or generators too. Even some building ventilation systems may not be fully operational in terms of bringing in sufficient quantities of outside air, so don't rely on them to remove carbon dioxide from the air.

### 3.10 SEALING JOINTS

- A. All contraction or construction joints in exposed floors subjected to traffic, as noted on drawings, shall be filled with specified epoxy joint filler. Construction joints shall be saw cut to specified depth before filling. Epoxy joint filler shall be mixed and installed in strict accordance with manufacturer's directions. Joints shall not be filled earlier than 90 days after slab placement.
- B. Seal joints as final operation prior to BJ's installation of shelving.
- C. Clean surfaces of joints by removing laitance and loose particles, and remove all sand. Clean with compressed air and wire brush.
- D. Pour mixed material into joint. Fill to 2/3 of full depth. Allow joint filler to settle. Complete filling, within one hour of initial pour, to full depth of joint.

### 3.11 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. The required testing services shall be performed by a Testing Agency selected by the Owner. All services performed by the Testing Agency shall be paid for by the Owner.
- B. Testing Agencies shall check the size, spacing and location of reinforcing bars to insure that they are in conformance with the approved shop drawings.
- C. Sampling and testing for quality control during placement of concrete shall include the following:
  - 1. Sampling fresh concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
    - a. Slump: ASTM C 143; one test at point of discharge for each load of each type of concrete; additional tests when concrete consistency seems to have changed.
    - b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each set of cylinders taken of air-entrained concrete.
    - c. Concrete Temperature: Test hourly when air temperature is 40 °F (4 °C) and below, and when 80 °F (27 °C) and above; and each time a set of compression test specimen is made.
    - d. Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
    - e. Compressive Strength Tests: ASTM C 39; a minimum of 4 concrete test cylinders shall be made for each 50 cubic yards or fraction thereof of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days and one specimen retained in reserve for later testing, if required.

- f. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
- D. Test results shall be reported in writing to Architect, Structural Engineer and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.
  - 1. Strength level shall be considered satisfactory so long as the average of all sets of three (3) consecutive strength test results equal or exceed specified  $f'c$  and no individual strength test result falls below specified strength  $f'c$  by more than 500 psi. Should strength of test cylinders fall below required strength level, the Architect may require changes in water/cement ratio for the remainder of the work. If core tests show deficient strengths, Architect may require removal of work or load tests on the portion of the structure which fails to develop required strength. Such load tests shall conform to building code required for reinforced concrete (ACI 318).
  - 2. Subgrade material shall be inspected immediately prior to each pour by testing agency for proper compaction and moisture content. General Contractor shall modify as required to receive each pour.
- E. Nondestructive Testing: Impact hammer, sonoscope or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- F. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Cost of additional testing, including design professional services and testing consultants, and removal and replacement of deficient concrete, including material and labor costs, shall be borne by the Contractor when unacceptable concrete is verified.

### 3.12 PATCHING

- A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.
- C. Patch imperfections as directed in accordance with ACI 301.

### 3.13 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirement.

- B. Repair or replacement of defective concrete will be determined by Architect/Engineer/BJ's/and Owner.
- C. Do not patch, fill, touch up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

END OF SECTION