

Black text – from standard FAA spec Blue text – additions to FAA standard spec
 Strikeout text – deletions from FAA standard spec Red text – notes to the Engineer/won't appear in spec

I. DESCRIPTION

A. GENERAL

1. Jointed Portland Cement Concrete pavement
 - a) with reinforcement, or
 - b) without reinforcement
2. In accordance with the plans and specifications.

II. MATERIALS

A. AGGREGATES

1. Reactivity
 - a) Test for alkali silica reactivity (ASR)
 - b) Both coarse and fine aggregate
 - c) per ASTM C1260
 - d) Expansion
 - (1) expansion $\leq 0.10\%$ at 16 days acceptable
 - (2) expansion $> 0.10\%$ at 16 days not acceptable
 - (a) make further tests on combination of
 - (i) aggregates
 - (ii) actual cement proposed
 - (iii) proposed reactivity mitigating agents
 - (a) fly ash
 - (b) other
 - (b) Test per
 - (i) ASTM C1260 or
 - (ii) ASTM C1567
 - (iii) expansion $\leq 0.10\%$ at 30 days acceptable
 - (iv) expansion $\geq 0.10\%$ at 30 days not acceptable
 - (a) revise and retest materials/mix until acceptable ASR test results attained, or
 - (b) find alternate aggregate source
2. Fine Aggregate
 - a) Conform to:
 - (1) ASTM C33
 - b) Gradation – per Table 1
 - (1) tested per ASTM C136
 - (2) except as otherwise qualified under Section 6, ASTM C33

**TABLE 1. GRADATION FOR FINE AGGREGATE
(ASTM C 33)**

Sieve Designation (Square Openings)	Percentage by Weight Passing Sieves
3/8 inch	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10

- 3. Coarse Aggregate
 - a) Conform to:
 - (1) ASTM C33
 - (a) within separated size groups
 - (1) Gradation – Contractor to select from Table 2
 - (b) Tested per ASTM C136

Table 2 GRADATION FOR COARSE AGGREGATE ASTM C 33			
Sieve Designations (square openings)	Percentage by Weight Passing Sieves		
	From 1-1/2" to No. 4 (#4)	From 1-1/2" to No. 4 (#67)	From 1" to No. 4 (#57)
inches			
2	100	-	-
1-1/2	90-100	-	100
1	20-55	100	95—100
¾	0-15	90-100	-
½	-	-	25—60
3/8	0-5	20-55	-
No. 4	-	0-10	0—10
No. 8	-	0-5	0—5

- b) if nominal maximum size > 1 inch
 - (1) furnish in two size groups
 - c) aggregate shall be
 - (1) crushed stone, or
 - (2) crushed or uncrushed gravel, or
 - (3) air-cooled blast furnace slag, or
 - (4) crushed recycled concrete pavement, or
 - (5) combination thereof
 - d) Particles shall:
 - (1) be clean, hard, uncoated
 - (2) meet requirements for ASTM Class 4M
 - (3) have dust removed by washing
 - e) Flat and elongated pieces limitation
 - (1) definition:
 - (a) ratio of max:min dimensions > 5:1
 - (2) not more than 8 % flat or elongated
 - (3) as tested per ASTM D4791
 - f) Durability requirement
 - (1) percentage wear ≤ 40%
 - (2) tested per ASTM C131 or C535
 - (3) on case-by-case basis may approved
 - (a) less durable aggregate with
 - (i) if 5-year service record
 - (ii) under similar exposure conditions
4. Aggregate Susceptibility to Disintegration (D) Cracking

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- a) do not use aggregates with history of D-cracking
 - b) Contractor to submit written certification that
 - (1) no D-cracking history exists
 - (2) aggregate meets Caltrans requirements
 - c) Acceptable aggregates
 - (1) crushed stone
 - (a) durability factor per ASTM C 666 > 95 and
 - (b) all other quality tests fulfilled
 - (2) crushed gravel and sand-gravel aggregates
 - (a) Not required to meet freeze-thaw durability ratings
 - (b) shall be approved by Caltrans
- B. CEMENT
- 1. Shall be
 - a) Type II or V for regular strength (28-day) strength concrete
 - b) Type V for High-Early strength concrete.
 - c) conforming to ASTM C150
 - 2. If potential for ASR exists
 - a) specify low-alkali (< 0.6% total equivalent alkalinity) cement
 - 3. Verify total alkalis independently via ASTM C114
 - 4. Will reject cement
 - a) if partially set
 - b) contains lumps of caked cement
 - c) is salvaged from discarded or used bags
- C. CEMENTITIOUS MATERIALS
- 1. Fly Ash or Natural Pozzolan
 - a) meet requirements of ASTM C618 Type F
 - b) loss of ignition < 6%
 - c) not acceptable
 - (1) from furnace operations utilizing
 - (a) liming materials
 - (b) soda ash (sodium carbonate)
 - d) furnish vendor's certified test report for each shipment of fly ash, or
 - e) ~~Engineer will test~~
 - 2. Blast Furnace Slag
 - a) shall be Ground Granulated Blast Furnace (GGBF) slag
 - (1) conforming to ASTM C989
 - (a) Grade 100 or
 - (b) Grade 120
 - (2) use at rate of 25%-55% of total cementitious by mass
- D. PREMOLDED JOINT FILLER
- 1. Conform to
 - a) ASTM D1751, or
 - b) ASTM D1752
 - (1) Type II, or
 - (2) Type III
 - 2. Shall be
 - a) punched to admit dowels
 - b) single piece for full depth and width of joint
 - (1) unless otherwise approved by the Engineer
 - 3. if two pieces required for joint
 - a) abut ends and fasten securely by
 - (1) stapling or

- (2) other positive fastening means approved by Engineer
- 4. Joint filler material must be compatible with joint sealant
- E. JOINT SEALER
 - 1. Meet requirements of Section 42 – Joint Sealing Filler P-605
 - 2. Be of type specified on plans
- F. STEEL REINFORCEMENT
 - 1. ~~Welded deformed steel fabric~~
 - a) conform to ASTM A497
 - 2. ~~Welded wire fabric~~
 - a) conform to ASTM A185
 - 3. ~~Bar Mats~~
 - a) conform to ASTM A184 or A704
 - 4. Deformed steel bars
 - a) conform to ASTM A615 or ASTM A996
 - (1) Grade 50 or 60 not acceptable if bending required
 - (a) Use Grade 40 if bending required
- G. DOWEL AND TIE BARS
 - 1. Tie bars
 - a) Deformed steel bars
 - (1) conform to ASTM A615 or ASTM A996
 - (a) Grade 50 or 60 not acceptable if bending required
 - (i) Use Grade 40 if bending required
 - 2. Dowel Bars
 - a) Plain steel bars
 - (1) Conform to ASTM A615 or ASTM A966
 - (2) free from
 - (a) burring
 - (b) other deformation
 - b) High-strength dowel bars
 - (1) conform to ASTM A714
 - (a) Class 2, Type S
 - (i) Grade I, II or III
 - (b) bare-finish
 - c) Before delivery to site
 - (1) paint
 - (a) one coat
 - (b) conforming to MIL-DTL-24441/20A
 - (i) SSPC Paint 5, or
 - (ii) SSPC Paint 25
 - d) Collars
 - (1) full circular device
 - (a) support dowel and retain epoxy
 - (i) until epoxy hardens
 - (2) metal or plastic
 - e) Sleeves
 - (1) metal, or
 - (a) other approved type
 - (2) must
 - (a) cover 2-3 inches of dowel
 - (b) have closed end
 - (c) have suitable stop
 - (i) hold bar at least 1 inch from end of closed sleeve

- (d) not collapse during construction
- H. WATER
 - 1. clean and free of
 - a) oil, salt, acid, alkali, sugar, vegetable matter
 - b) other substances injurious to finished product.
 - 2. test per AASHTO T26
 - a) if known to be potable may be used without testing
- I. COVER MATERIAL FOR CURING
 - 1. Liquid membrane-forming
 - a) Conform to
 - (1) ASTM C309
 - (a) Type 2
 - (i) Class B, or
 - (ii) Class A
 - (a) wax based only
 - 2. White polyethylene film
 - 3. White burlap-polyethylene sheeting
 - 4. Waterproof paper
- J. ADMIXTURES
 - 1. Must be approved by Engineer
 - 2. Submit
 - a) certificates showing compliance with requirements
 - b) complete test results if requested by Engineer
 - c) Engineer may test samples from production to determine uniformity
 - 3. Air-entraining Admixtures
 - a) Conform to ASTM C260
 - b) consistently entrain air content
 - (1) in specified ranges
 - (2) under field conditions
 - c) Must be compatible with any water reducer used
 - 4. Chemical Admixtures
 - a) Water-reducing
 - (1) High Range water reducers not allowed
 - (a) except for High-Early Strength concrete mix designs
 - b) Set-retarding
 - c) Set-accelerating
 - d) Conform to ASTM C494
 - (1) including flexural strength test
 - 5. Compatibility
 - a) admixtures shall be
 - (1) compatible with each other
 - (2) from same manufacturer
- K. EPOXY RESIN
 - 1. Conform to ASTM C881, Type I, Grade 3, Class C
 - a) Class A or B if surface temperature < 60 deg F
- L. MATERIAL ACCEPTANCE
 - 1. Prior to use Engineer must approve:
 - a) certified test reports
 - b) show
 - (1) ASTM test numbers
 - (2) test results
 - (3) statement re: material pass or fail

III. MIX DESIGN

A. PROPORTIONS

1. Design to achieve flexural strength of 650 psi
 - a) at 28 days for regular mixes
 - b) at [] hrs for high-early strength mixes

NOTES TO ENGINEER: value other than 650 psi should be used if different number used in design calculations, however 650 is recommended based on historical consistency obtainable during construction

- c) design procedure
 - (1) Portland Cement Association's manual
 - (a) "Design and Control of Concrete Mixtures".
 - (i) Chapter 9
 - (2) In addition, provide Combined Aggregate Gradation per III.B
 - (2) To ensure that acceptance are met or exceeded
 - a) must design to higher strength than specified
 - b) amount of overdesign depends on
 - (1) standard deviation of test results
 - (2) accuracy of strength determination from historical results
3. Minimum cementitious material – per cubic yard
 - a) 564 pounds cementitious material
4. Maximum Water/ Cement Ratio (W/C)
 - a) 0.45
5. Submit Mix Design
 - a) prior to start of paving operations
 - b) Include:
 - (1) Strengths
 - (a) For Regular Mixes
 - (i) 7-day
 - (ii) 28-day
 - (b) For High-Early Strength Mixes
 - (i) 1-hour
 - (ii) 2-hour
 - (iii) 4-hour
 - (iv) 8-hour
 - (v) 1-day
 - (vi) 2-day
 - (vii) 7-day
 - (viii) 28-day
 - (ix) planned age at opening if different from above
 - (2) copies of test results
 - (a) test dates
 - (b) complete list of materials
 - (i) cement
 - (ii) fly ash
 - (iii) coarse aggregate
 - (iv) fine aggregate
 - (v) water
 - (vi) admixtures
 - c) show:
 - (1) for each component
 - (a) type
 - (b) brand

- (c) source
 - (d) amount
 - (2) fineness modulus of fine aggregate
 - (3) air content
 - d) Submit no later than 30 days before intended start of paving
 - e) Mix shall not be older than 90 days
 - f) Engineer must approve Job Mix prior to paving
 - g) Mix Design Format
 - (1) Report Format
 - (2) Graph of flexural strength vs. time per III.A.5.b.1
6. Submit revised Mix Design if
- a) change in sources of materials made
7. Test Specimens
- a) Prepare per ASTM C192
 - b) Test Specimens per ASTM C78
8. Slump
- a) per ASTM C143
 - b) for Side-form: 1 to 2 inches
 - c) for Slip-form: ½-inch to 1-1/2-inch
- B. COMBINED AGGREGATE GRADING**
1. In addition to mix requirements per III.A.1.c, check combined gradation of aggregates with
- a) Procedures in US Air Force publication, "Proportioning Concrete Mixtures with Graded Aggregates, A Handbook for Rigid Airfield Pavements".
 - (1) download from
 - (a) http://www.wbdg.org/ccb/AF/AFETL/etl_97_5.pdf
2. Include
- a) Aggregate Grading Controls
 - (1) reports to include screens:
 - (a) 1½", 1", ¾" ½" 3/8", No.4, No. 8, No. 16, No. 30, No. 50, and No. 100.
 - b) Percent Aggregate Retained Graph
 - (1) plot on standard soils gradation graph
 - (2) percent retained on each screen
 - (a) Y-axis is percent retained
 - (b) X-axis is sieve size
 - (3) should be smooth curve transitioning from coarse to fine
 - (c) no significant valley or peak
 - (i) between 3/8-inch sieve and smallest reporting sieve
 - c) Coarseness and Workability Factor
 - (1) Coarseness Factor
 - (a) Definition:
 - (i) percent of combined aggregate retained above the No. 8 sieve which is also retained above the 3/8" sieve
 - (b) Calculation
 - (i) divide percent of material retained above the 3/8" sieve by the percent retained above the No. 8 sieve, times 100:
- $$\text{Coarseness Factor} = (100) \times \frac{(\% \text{ retained above } 3/8 \text{ sieve})}{(\% \text{ retained above } \#8 \text{ sieve})}$$
- (2) Workability Factor

- (c) Definition:
 - (i) percentage of combined aggregate finer than the No. 8 sieve
 - (d) Calculation of Adjustment:
 - (i) increase linearly at a rate of 2.5 units for each 72.5 PCY of cementitious material above or below a baseline cementitious materials content of 564 PCY
 - (e) Plot on Chart similar to Figure 1, below:
 - (i) Coarseness Factor limits
 - (a) not greater than 75
 - (b) not less than 45
 - (ii) Workability Factor limits
 - (a) above Control Line
 - (b) within workability box defined by Control Lines
3. Engineer's approval will consider
- a) job mix gradation values as submitted
 - b) allowance for variance based on historical test results from source
- (3) may reject if historical variance overlay on submitted values fall outside limits

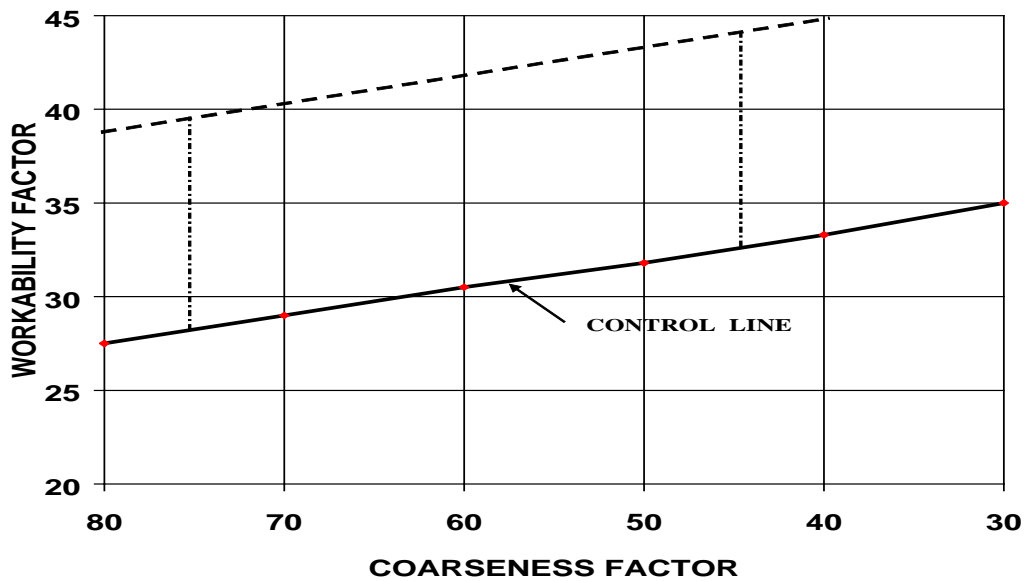


FIGURE 1 – AGGREGATE PROPORTIONING GUIDE

- C. CEMENTITIOUS MATERIALS
- 1. Fly Ash
 - a) if used shall be 20%-30% of total cementitious material by weight
 - (1) unless used as ASR amelioration
 - (a) higher % may be approved by Engineer
 - (b) higher amounts may preclude slip-form paving due to set delay
 - b) if used with GGBS, max replacement rate 10% of total cementitious

2. Ground Slag – GGBS
 - a) Type I or Type II
 - b) may be 25% to 55% of total cementitious material by weight
 - c) if slip forming and temps < 55 deg F, limit shall not exceed 30%

NOTES TO ENGINEER: Acceptance of Fly Ash mandated by Federal law unless sufficient technical reasons exist to disallow.

D. ADMIXTURES

1. Air-Entraining

- a) add so as to ensure uniform distribution
- b) air content to be based on trial mixes to produce
 - (1) required plasticity
 - (2) required workability
- c) Target air content
 - (1) For 1.5" max aggregate: 2.5%
 - (2) For 1" max aggregate: 3.0%
- d) Test air content via
 - (1) ASTM C231 for gravel or stone mixes
 - (2) ASTM C173 for
 - (a) slag mixes
 - (b) porous aggregates

2. Chemical

- a) Water-reducing, set-controlling, or other approved
- b) Add and mix per manufacturers recommendations
- c) Test trial mixes per ASTM C494

E. TESTING LABORATORY

1. Laboratory developing Job Mix

- a) shall meet requirements of
 - (1) ASTM C1077
 - (2) ASTM C78
- b) Submit laboratory certification to Engineer
 - (1) prior to start of mix design
 - (2) include evidence
 - (a) lab is inspected/accredited for test methods required herein
 - (b) by nationally recognized inspection/accreditation organization

IV. CONSTRUCTION METHODS

A. EQUIPMENT

1. General

- a) equipment shall be approved by the Engineer for
 - (1) design
 - (2) capacity
 - (3) mechanical condition
- b) shall be at job site ahead of paving
 - (1) to allow adequate inspection and approval time
- c) [OPTIONAL: Central Plant Mixer will be required for this project.]

2. Batch Plant and Equipment

- a) Shall conform to ASTM C94

3. Mixers and Transportation Equipment

- a) General
 - (1) May be mixed in truck mixers

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- (a) wholly or in part
 - (2) Each mixer to show
 - (a) manufacturer nameplate with
 - (i) capacity of drum in volume
 - (ii) speed of rotation of drum or blades
 - b) Central Plant Mixer
 - (1) shall be examined daily for changes in condition due to
 - (a) accumulation of hard concrete
 - (b) blade wear
 - (2) replace pickup and throwover blades
 - (a) when worn $\frac{3}{4}$ inch or more
 - (3) Contractor to keep copy of manufacture's design on hand showing
 - (a) blade dimensions
 - (i) original height and depth
 - (b) blade arrangement
 - c) Truck Mixers and Agitators
 - (1) Conform to ASTM C94
 - d) Nonagitator Trucks
 - (1) Conform to ASTM C94
- 4. Finishing Equipment
 - a) Standard method: approved slip-form paver
 - (1) designed specifically to
 - (a) spread, consolidate, screed and float-finish concrete pavement
 - (b) in one complete pass
 - (2) result is dense, homogeneous pavement
 - (3) requires minimum of hand finishing
 - (4) heavy-duty with following characteristics
 - (a) per foot of paving lane width:
 - (i) weight 2200#
 - (ii) minimum 6.0 horsepower
 - b) Side-form method approved for:
 - (1) project < 500 sq yds or
 - (2) individual placements < 500 sq yds, or
 - (3) irregular areas, or
 - (4) areas inaccessible to slip-form paving equipment
 - c) hand screeding and float finishing
 - (1) on in small irregular areas
 - (2) if approved by the Engineer
- 5. Vibrators
 - a) Internal Type only
 - (1) 8,000-12,000 vibrations per minute
 - (2) average amplitude 0.02 -0.05 inches
 - (3) except for irregular areas
 - (a) when approved by the Engineer
 - (b) operate per ACI 309, Guide for Consolidation of Concrete
 - b) Number, spacing, frequency
 - (1) as necessary to produce dense, homogeneous pavement
 - (a) must meet recommendations in ACI 309, Guide for Consolidation of Concrete
 - (2) power to operate shall be available on paver
 - (3) shall be automatically controlled
 - (a) stop when forward motion stops

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- (4) shall be equipped with electronic or mechanical means of monitoring status
 - (a) check minimum twice per day
 - (b) or when requested by Engineer
- 6. Concrete Saws
 - a) provide saws adequate in
 - (1) number
 - (2) power
 - b) keep at the site at all times
 - (1) one standby saw
 - (2) adequate supply of blades
- 7. Side Forms
 - a) shall be steel
 - b) dimensions
 - (1) sections not less than 10 ft in length
 - (2) depth equal to pavement thickness at edge
 - (3) base width equal to or greater than depth
 - c) use curved forms of proper radius for < 100 ft radius
 - d) provide with devices to adequately secure in place without
 - (1) visible spring or settlement
 - (a) from consolidating and finishing operations
 - e) Do not forms which
 - (1) have battered top surfaces
 - (2) are bent, twisted or broken
 - (3) are built-up
 - (a) except if approved by the Engineer
 - f) Frames shall have
 - (1) true planes
 - (a) top face: within 1/8-inch in 10 ft
 - (b) upstanding leg: within ¼-inch
 - (2) provisions for locking ends and abutting sections together
 - g) wood forms
 - (1) only in special situations
 - (2) if approved by the Engineer
- 8. Pavers
 - a) shall be
 - (1) fully-energized
 - (2) self-propelled
 - (3) specifically designed to for constructing concrete pavement
 - (a) placing
 - (b) consolidating
 - (c) finishing
 - (d) true to
 - (i) grade
 - (ii) tolerances
 - (iii) cross-section
 - b) shall be of sufficient
 - (1) weight
 - (2) power
 - (3) to construct lane width required
 - (a) with adequate forward speed
 - (b) without

- (i) displacement
 - (ii) instability
 - (4) transverse
 - (a) longitudinal
 - (b) vertical
 - c) equipped with control devices
 - (1) vertical
 - (2) horizontal
- B. FORM SETTING
 - 1. Set sufficiently in advance to allow for continuous placement of concrete
 - 2. After forms set to proper grade
 - a) thoroughly tamp underlying course
 - (1) mechanically, or
 - (2) with hand tampers
 - (3) inside and outside of form
 - b) stake forms sufficiently to maintain in place
 - (1) use minimum of 3 stakes per form side
 - (2) stakes shall extend at least 3 ft into ground
 - (a) or deeper if necessary to maintain grade control
 - c) form sides shall be tightly locked
 - (1) free from play in any direction
 - (2) shall not deviate more than 1/8 inch at any joint
 - (3) to withstand visible spring or movement
 - (a) from consolidating and finishing equipment
 - 3. immediately prior to concrete placement
 - a) clean and oil forms
 - b) check and correct alignment and grade
- C. CONDITIONING OF UNDERLYING SURFACE
 - 1. Widen underlying course minimum 3 feet beyond paving width
 - a) to support paver
 - b) without noticeable displacement
 - 2. Areas to support paver
 - a) shall be trimmed and graded to plan elevation and profile
 - (1) with properly designed machine
 - (2) using positive grade control system utilizing
 - (a) lasers, or
 - (b) stringlines, or
 - (c) guidewires
 - b) if density disturbed by trimming
 - (1) correct and retest prior to concrete placement
 - (a) except for stabilized subbase courses
 - (2) as required by Engineer
 - (3) damage to stabilized subbases
 - (a) correct full depth
 - (b) at Contractor's expense
 - 3. If traffic allowed to use prepared grade
 - a) check and correct immediately before concrete placement
 - 4. Prepared grade
 - a) moisten immediately ahead of paver
 - (1) to prevent rapid loss of concrete moisture
 - (2) do not saturate
 - b) protect from frost

- D. CONDITIONAL OF UNDERLYING SURFACE – SIDE-FORM AND FILL-IN LANE CONSTRUCTION
1. moisten immediately ahead of paver
 - a) to prevent rapid loss of concrete moisture
 - b) do not saturate
 2. correct and retest if damaged
 - a) by hauling or other equipment
 - b) if stabilized subbase damaged
 - (1) Contractor to repair full depth
 3. provide and operate template on forms
 - a) immediately in advance of concrete placement
 - b) template shall be
 - (1) propelled only by hand – not attached to equipment
 - (2) adjustable to accommodate changes to underlying grade
 - (3) shall provide accurate retest of the grade ahead of concrete placement
 - (4) maintain in accurate adjustment
 - (a) check daily
 - c) repair surfaces not meeting template
 - (1) high areas
 - (a) remove and waste all excess material
 - (b) to match surrounding grade
 - (2) low areas
 - (a) fill and compact
 - (b) to match surrounding grade
 4. protect from frost
 - a) use of chemicals not permitted
- E. HANDLING, MEASURING AND BATCHING MATERIAL
1. Plant
 - a) shall provide continuous supply of material
 2. Stockpiles
 - a) Construct and operate to prevent
 - (1) segregation
 - (2) introduction of deleterious materials
 - b) Contaminated or segregated aggregates
 - (1) shall not be used
 - c) Aggregates
 - (1) produced or handled by hydraulic methods, or
 - (2) washed aggregates
 - (a) bin or stockpile for drainage
 - (i) at least 12 hours before being batched
 - (3) aggregates shipped by rail
 - (a) if transit time longer than 12 hours, cars must be free-draining
 3. Batch plants
 - a) shall be equipped to proportion aggregates and bulk cement by weight
 - (1) using automatically interlocked proportioning devices
 - (a) of an approved type
 - b) if bulk cement used
 - (1) use suitable method of handling
 - (a) from weighing hopper to transporting container or batch
 - (i) chute
 - (ii) boot
 - (iii) other approved method
 - (b) to prevent loss of cement

- (c) shall provide positive assurance that specified cement content is present in each batch

F. MIXING CONCRETE

- 1. Unless otherwise specified, mix concrete at:
 - a) work site, or
 - b) central mix plant, or
 - c) truck mixers
 - d) of approved type and capacity
 - e) in accordance with ASTM C94
- 2. Mixing time
 - a) measured from time all materials, except water are emptied into drum
- 3. Transport mixed concrete in
 - a) truck mixers, or
 - b) truck agitators, or
 - c) non-agitating trucks
 - d) time of transit
 - (1) from addition of cementitious materials
 - (2) to deposit of material on grade, shall not exceed
 - (a) 30 minutes for non-agitating trucks
 - (b) 90 minutes for truck mixers or truck agitators
 - e) retempering by adding water or other means is not permitted
 - (1) additional water and mixing permitted for transit mixers if
 - (a) increase if slump required
 - (b) addition made within 45 minutes after initial mixing
 - (c) W/C does not exceed mix design
 - (d) approved by Engineer

G. LIMITATIONS ON MIXING AND PLACING

- 1. Lighting conditions
 - a) Do not mix, place or finish with insufficient natural light
 - (1) unless artificial lighting system provided which is
 - (a) adequate
 - (b) approved by Engineer
- 2. Cold Weather
 - a) discontinue mixing and concreting if temperature
 - (1) is descending in the shade / away from heat source
 - (2) reaches 40 deg F.
 - b) resume when temperature
 - (1) is ascending in shade / away from heat source
 - (2) reaches 35 deg F
 - c) before entering mixer aggregates shall
 - (1) be free of ice, snow and frozen lumps
 - (2) not be frozen
 - d) concrete mix temperature
 - (1) shall not be less than 50 deg F at time of placement
 - (2) shall not be placed on frozen material
 - e) if operating approved in cold weather
 - (1) aggregates may be heated
 - (a) to not more than 150 deg F
 - (b) using apparatus that
 - (i) heats mass uniformly
 - (ii) can be arranged to preclude overheated areas
- 3. Hot Weather

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- a) take hot weather precautions
 - (1) when maximum daily air temperature exceeds 85 deg F
 - b) sprinkle with water immediately before placing concrete
 - (1) forms
 - (2) underlying grade
 - c) place concrete at coolest temperature practicable
 - (1) in no case should mix temperature exceed 90 deg F
 - (2) to maintain mix temperature, cool as necessary
 - (a) aggregates
 - (b) mixing water
 - d) keep surface of newly laid pavement damp
 - (1) by water-fog or mist
 - (2) with approved spraying equipment
 - (3) until covered by curing medium
 - e) protect concrete from evaporation rate > 0.2 psf per hour
 - (1) as determined by
 - (a) ACI 305R, Hot Weather Concreting
 - (i) Figure 2.1.5 – which considers
 - (a) relative humidity
 - (b) wind velocity
 - (c) air temperature
 - (2) provide wind screens
 - f) if conditions indicate likelihood of plastic cracking
 - (1) esp. if plastic cracking occurs
 - (2) Contractor to take additional measures
 - (a) wind screens
 - (b) more effective fog sprays
 - (c) similar measures
 - (d) if not effective
 - (i) paving operations shall be immediately stopped
4. Temperature Management Program
- a) Contractor to provide temperature management program
 - (1) prior to start of paving
 - (2) daily during concreting operations
 - (3) to assure that uncontrolled cracking is avoided
 - b) at a minimum to include:
 - (1) Anticipated tensile strains
 - (a) as related to heating and cooling of the concrete material.
 - (2) Anticipated weather conditions including
 - (a) ambient temperatures
 - (b) wind velocity
 - (c) relative humidity.
 - (3) Anticipated timing of initial sawing of joint.

H. PLACING CONCRETE

1. General

- a) Unless otherwise specified, Contractor has option of placement
 - (1) Side-form
 - (2) Slip-form
- b) Free vertical drop of concrete
 - (1) not to exceed 3 feet
- c) Horizontal movement or distribution of concrete from front of paver
 - (1) shall not be done with

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- (a) backhoes
 - (b) grading equipment
 - (c) front-end loaders unless
 - (i) unless Contractor demonstrates
 - (a) concrete will not be contaminated
 - (b) base course will not be disturbed
 - (ii) approved by Engineer
 - d) Construction or other equipment on previously constructed pavement
 - (1) permitted when flexural strength of 550 psi is attained
 - (a) based on average of 4 field-cured specimens
 - (i) per 2,000 cu yds
 - (2) except that
 - (a) subgrade/subbase planers
 - (b) concrete pavers
 - (c) concrete finishing equipment
 - (d) all allowed on edges of previously constructed pavement when
 - (i) flexural strength of 400 psi is attained
2. Slip-form Construction
- a) Distribute Uniformly with self-propelled slip-form paver
 - (1) alignment and elevation controlled from outside reference lines
 - (2) paver shall vibrate for full depth and width of placed material
 - (3) produce concrete which will
 - (a) stand normal to the surface
 - (b) with sharp, defined edges
 - (4) forms shall be rigidly held together laterally to prevent spreading of forms
 - b) Consolidate concrete with internal vibration
 - (1) definition internal vibration:
 - (a) units located within thickness of the pavement section
 - (2) full width transverse vibrating units, and/or
 - (a) @ uniform spacing \leq 18 inches
 - (3) equally placed longitudinal units
 - (a) space from edge of pavement to unit \leq 18 inches
 - (4) vibration of each vibrating unit
 - (a) frequency
 - (i) 8000 to 12,000 cycles per minute
 - (ii) vary proportionally with rate of travel
 - (iii) measured by tachometer or other device
 - (b) amplitude
 - (i) sufficient to be visible at surface
 - (a) for at least one foot
 - (b) along entire length of vibrating unit
 - (c) shall provide uniform
 - (i) density
 - (ii) air content
 - c) Consistency
 - (1) concrete shall be held at uniform consistency
 - (2) maintain paver at nearly continuous forward motion
 - (a) coordinate mixing, delivering and spreading
 - (i) to minimize stopping and starting
 - (b) vibration shall be automatically stopped if forward motion stops
 - (c) no tractive force shall be applied to paver except as controlled by paver

- d) Support of paver by adjacent pavement
 - (1) equipment shall have
 - (a) protective pads on crawler tracks, or
 - (b) rubber-tired wheels offset from edge
 - (i) far enough to avoid breakage
- 3. Side-form Construction
 - a) Forms shall be
 - (1) straight
 - (2) free from
 - (a) warps
 - (b) bends
 - (c) indentations
 - (d) other defects
 - (3) removed from site if defective
 - (4) metal
 - (a) except at
 - (i) end closures
 - (ii) transverse joints
 - (iii) where other materials may be used
 - (5) may be built up by rigidly attaching sections
 - (a) to top, or
 - (i) must also be metal
 - (b) to bottom
 - (c) if approved by Engineer
 - (6) dimensions
 - (a) width of base \geq 80% of pavement thickness
 - (7) rigidity
 - (a) sufficient to prevent
 - (i) springing under weight of
 - (a) subgrading equipment
 - (b) paving equipment
 - (c) pressure of concrete
 - (8) number of forms sufficient
 - (a) to prevent daily in placing concrete
 - b) Condition of underlying surface prior to form placement
 - (1) shall be at
 - (a) proper grade
 - (b) proper alignment
 - (2) level to provide full bearing support for forms
 - (a) throughout length of form
 - (b) throughout wide of base
 - (3) able to firmly support the entire operation
 - (a) placing
 - (b) compacting
 - (c) finishing
 - c) Preparation of Forms
 - (1) shall be drilled in advance to accommodate dowels or tie bars
 - (2) true forms for line and grade
 - (a) immediately in advance of paver
 - (b) for a sufficient distance to prevent delays in placing concrete
 - d) After concrete placement
 - (1) forms remain for

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- (a) at least 12 hours
 - (b) until edge no longer needs protection
 - (2) apply curing compound
 - (a) immediately after removing forms
 - e) Reuse of Forms
 - (1) clean and oil each time
 - f) Placement of Concrete
 - (1) use one or more self-propelled machines
 - (a) to
 - (i) spread
 - (ii) screed
 - (iii) shape
 - (iv) consolidate
 - (b) provide adequate
 - (i) number and of machines
 - (ii) to match concrete delivery rate
 - (2) equipment shall uniformly
 - (a) distribute and consolidate material
 - (i) without segregation
 - (ii) conforming to required cross-section
 - (iii) with minimum of hand work
 - g) Consolidation of concrete
 - (1) consolidate with internal vibrators
 - (a) without segregation
 - (b) rate of vibration (minimum requirements)
 - (i) frequency $\geq 7,000$ cycles per minute
 - (ii) amplitude sufficient
 - (a) perceptible on surface
 - (b) for more than 1 foot from vibrator
 - (c) equipped with tachometer to indicate frequency
 - (d) shall automatically stop when paver motion stops
 - 4. Consolidation Testing
 - a) Vibrator requirements stated are minimum requirements
 - (1) to ensure adequate density in concrete
 - b) If Engineer suspects inadequate consolidation
 - (1) additional referee testing may be required
 - (a) determined by cores
 - (i) cut after minimum 24 hours
 - (ii) density based on water content
 - (iii) per ASTM C642
 - (a) saturated-surface dry condition
 - (b) minimum rate one core per 500 cu yds pavement
 - (i) or fraction thereof
 - (2) acceptable density – measured against original mix design density
 - (a) average density shall $\geq 97\%$
 - (b) no core shall have $<96\%$ density
 - (3) failing density tests
 - (a) evidence that vibration requirements are inadequate for mix
 - (b) provide means to increase consolidation to requirements
 - (i) additional vibration units
 - (ii) other means
- I. STRIKE-OFF OF CONCRETE AND PLACEMENT OF REINFORCEMENT

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1. After placement, strike off to provide
 - a) plan cross-section and elevation
 - (1) after consolidation and finishing
2. For reinforced concrete placed in two layers
 - a) place bottom layer
 - (1) strike off to length and depth so as to allow
 - (a) full length and depth placement of reinforcing steel
 - (b) without further manipulation
 - (2) place reinforcement directly on concrete
 - b) place final layer concrete
 - (1) strike off and screed
 - c) remove and replace bottom layer if
 - (1) more than 30 minutes has elapsed between placement of layers, or
 - (2) if initial set of concrete has occurred
 - (3) at Contractor's expense
3. For reinforced concrete placed in one layer
 - a) position reinforcement in advance, or
 - b) place in plastic concrete
 - (1) by mechanical means, or
 - (2) by vibratory means
4. Reinforcing steel
 - a) shall be free of
 - (1) mud
 - (2) oil
 - (3) other organic matter
 - b) shall be satisfactory with
 - (1) rust, or
 - (2) mill scale, or
 - (3) combination
 - (4) provided hand-brushed specimen has satisfactory
 - (a) minimum dimensions
 - (b) weight
 - (c) tensile properties

J. JOINTS

1. General
 - a) Construct
 - (1) as shown on plans and these requirements
 - (2) faces perpendicular to
 - (a) surface
 - (b) finished edges
 - (3) acceptable tolerances
 - (a) position: +/- ½ inch
 - (b) line and grade: ¼ inch in 10 ft
 - b) Finish
 - (1) test joints
 - (a) before concrete hardens
 - (b) with 10-ft straightedge
 - (c) correct irregularities > ¼ inch
 - (2) provide groove
 - (a) uniform width and depth
 - (b) as shown on plans
2. Construction Joints

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- a) Longitudinal Construction Joints
 - (1) slip-formed, or
 - (2) formed against side forms
 - (3) as shown on plans
- b) Transverse Construction Joints
 - (1) install at end of each days placing operations
 - (2) at other points when concrete placement interrupted
 - (a) for more than 30 minutes, or
 - (b) concrete appears to be obtaining initial set before next delivery
- c) locate at planned construction or expansion joint
 - (1) remove excess concrete back to previous planned joint
- 3. Contraction Joints
 - a) install at locations and spacings shown on plans
 - b) construct by
 - (1) form groove in plastic concrete, or
 - (a) use edging tool, or
 - (i) sides shall be even and smooth
 - (ii) to prevent spalling
 - (b) insert material
 - (i) install per manufacturer's instructions
 - (2) sawcut groove in hardened concrete
 - (3) groove shall be at least
 - (a) 1/8 inch wide
 - (b) to depth shown on plans
- 4. Expansion Joints
 - a) install premolded filler as shown on plans
 - (1) thickness as shown on plans
 - (2) extend full depth and width of slab
 - (a) except for sealant space at top
 - (3) securely stake or fasten
 - (a) perpendicular to FG
 - (4) provide cap
 - (a) to protect the top edge of the filler
 - (b) to permit concrete placement and finishing
 - b) after concrete placement and strike off
 - (1) carefully withdraw cap
 - (2) finish and tool edge of plastic concrete
 - (3) remove concrete bridging joint space
 - (a) for the full width and depth of joint
- 5. ~~Keyways~~
- 6. Tie Bars
 - a) install deformed bars as shown on plans
 - (1) at right angles to centerline
 - (2) spaced at intervals shown on plans
 - b) hold in position horizontally
 - (1) parallel to pavement surface
 - (2) at middle of slab depth
 - c) if bars extend into unpaved lane
 - (1) bend against form at longitudinal construction joints
 - (a) unless threaded bold are other assembled bars are specified
 - (2) do not paint, grease, or enclose in sleeves
- 7. Dowel Bars

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- a) place across joints as shown on plans
 - b) shall be of dimensions and spacings shown on plans
 - c) hold rigidly
 - (1) in middle of slab depth
 - (2) at proper horizontal and vertical alignment
 - (3) with approved assembly device
 - (a) to be left in place
 - d) Install assembly as a unit
 - (1) assembled and ready to be lifted into position
 - e) provide dowel expansion cap or sleeve
 - (1) for each dowel bar used with expansion joints
 - (2) caps shall:
 - (a) be substantial enough to prevent collapse
 - (b) placed on dowel ends as shown on plans
 - (c) fit bar tightly
 - (i) closed end shall be watertight
 - f) Apply debonding lubricant to painted portion of dowel (see II.G)
 - (1) coat with
 - (a) asphalt MC-70, or
 - (b) approved lubricant
 - (2) if free-sliding plastic or epoxy-coated dowels used
 - (a) apply debonding lubricant
 - (i) unless determined to be unnecessary
 - (a) via approved pullout tests
 - (3) for dowels in butt-type joints
 - (a) oil exposed dowel end
 - ~~g) Dowel bars at contraction joints~~
 - ~~(1) may be placed in full thickness of pavement by mechanical device~~
 - ~~(a) capable of producing required alignment tolerances~~
 - h) Dowel bars at longitudinal construction joints
 - (1) shall be bonded in drilled holes
8. Installation
- a) All devices for installation of expansion joints
 - (1) shall be approved by the Engineer
 - b) Assembled joint device
 - (1) set at proper distance below surface
 - (a) check elevation
 - (2) secure in place
 - (a) with stakes
 - (b) by other means
 - (c) to maintain tolerances during concrete placement and finishing
 - c) Premolded joint filler
 - (1) maintain in vertical position
 - (2) no offsets allowed between adjacent units
 - d) Dowel bars and assemblies
 - (1) check for position and alignment
 - (a) per tolerances in V.B.8.g
 - (2) place concrete directly on dowel assemblies immediately ahead of paver
 - (a) to help maintain position and alignment
 - (3) with slip-form paving
 - (a) place dowels and tie bars by bonding into drilled holes
 - (i) shall be 1/8" to 1/4" larger diameter than dowel

- (ii) drill with rotary drills
 - (a) held in position perpendicular to joint face
 - (b) rotary-percussion type acceptable if no spalling occurs
 - (i) damage to be repaired at Contractor's expense
 - (ii) method approved by Engineer
 - (iii) bond with epoxy resin
 - (a) inject into back of hole
 - (b) displace by insertion of dowel
 - (c) insert bar completely into hole
 - (i) do not withdraw or create air pocket
 - (4) Contractor to provide template to check dowel
 - (a) position
 - (b) alignment
 - (5) Place dowels
 - (a) not less than 10 inches from transverse joint
 - (b) so as to not interfere with transverse dowels
- 9. Sawing of Joints
 - a) cut as shown on plans
 - (1) use equipment per IV.A
 - (a) capable of cutting straight line groove
 - (i) at least 1/8 inch wide
 - (ii) to depth shown on plans
 - (2) widen top portion
 - (a) provide adequate space for sealers
 - (i) as shown on plans
 - b) commence sawcut as soon as
 - (1) concrete sufficiently hard
 - (a) to allow cutting without
 - (i) chipping
 - (ii) spalling
 - (iii) tearing
 - (2) before uncontrolled shrinkage cracking occurs
 - c) sawing shall be conducted
 - (1) during both day and night as necessary
 - (2) in same sequence as placement
 - (3) at required spacing
 - d) curing compound
 - (1) apply to sawcut
 - (a) except for faces to receive sealant
 - (2) maintain for remaining cure period
 - e) remove sawcut slurry
 - (1) by vacuuming and washing
- K. FINAL STRIKE-OFF, CONSOLIDATION AND FINISHING
 - 1. Sequence
 - a) sequence shall be
 - (1) strike off
 - (2) floating and removal of laitance
 - (3) straight edging
 - (4) final surface finish
 - b) adding water to assist finishing operations not permitted

2. Finishing at Joints
 - a) compact concrete
 - (1) without
 - (a) voids
 - (b) segregation
 - (2) against joint material
 - (3) under and around
 - (a) load transfer devices
 - (b) joint assembly units
 - (c) other features extending into pavement
 - b) adjacent to joints
 - (1) mechanically vibrate per IV.H.2.b
 - (2) operate finishing machine near joint
 - (a) so as to avoid
 - (i) damage
 - (ii) misalignment
 - (iii) segregation
 - (b) if continuous operation of finisher causes joint damage
 - (i) stop finishing equipment 8 inches from joint
 - (ii) remove segregated concrete from joint
 - (iii) resume forward motion
 - (c) continuous operation over joints, without lifting screed, acceptable if:
 - (i) no segregated concrete results between
 - (a) joint and
 - (b) screed or top of joint
3. Machine Finishing
 - a) spread concrete as soon as placed
 - b) strike off and screed with finishing machine
 - c) repeat finishing as many times and at intervals required to
 - (1) give proper consolidation
 - (2) leave surface with uniform texture
 - d) excessive operation to be avoided
 - e) with side forms
 - (1) keep tops of forms clean
 - (a) by effective device attached to machine
 - (b) to allow continuous travel of paver without
 - (i) lift
 - (ii) wobbling
 - (iii) other variation to finish
 - (2) during first pass of finisher
 - (a) maintain uniform ridge of material ahead of screed
 - (i) for entire length
 - (3) while in operation
 - (a) move with combined longitudinal and transverse shearing motion
 - (b) always maintaining forward motion
 - (c) without raising ends from side forms during strike-off
 - (4) repeat finishing motion as necessary to produce
 - (a) uniform texture
 - (b) proper
 - (i) grade

(ii) cross-section

4. Hand Finishing
 - a) Not permitted except:
 - (1) mechanical equipment breakdown
 - (a) for material already deposited on grade only
 - (2) areas of
 - (a) narrow width
 - (b) irregular dimensions
 - b) use approved portable screed only
 - c) provide second screed to strike off bottom layer for reinforced concrete
 - d) portable screed shall be
 - (1) at least 2 ft longer than maximum slab width
 - (2) of approved design
 - (3) sufficiently rigid to retain shape
 - (4) constructed of
 - (a) metal, or
 - (b) other suitable material covered with metal
 - e) consolidation shall be by suitable vibrators
5. Floating
 - a) General
 - (1) smooth and true
 - (a) after consolidation
 - (b) using longitudinal float
 - (c) one of following methods
 - b) Hand Method
 - (1) long-handled floats
 - (a) not less than 12 ft in length
 - (b) not less than 6 inches wide
 - (c) stiffened to prevent
 - (i) flexibility
 - (ii) warping
 - (2) operate from foot bridge
 - (a) supported at edge
 - (b) spanning concrete
 - (c) not touching concrete
 - (3) pass float gradually
 - (a) from one side to the other
 - (b) forward motion along centerline
 - (i) by successive advances of not more than ½ float length
 - (c) remove and waste
 - (i) excess water
 - (ii) laitance
 - (iii) in excess of 1/8 inch
 - c) Mechanical Method
 - (1) use machine composed of
 - (a) cutting and smoothing floats
 - (i) suspended from frame
 - (ii) guided by frame
 - (a) constantly in contact with
 - (i) side forms, or
 - (ii) underlying surface
 - (2) long-handled floats may be used if necessary

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- (a) blades not less than
 - (i) 5 ft in length
 - (ii) 6 inches in width
 - (b) to smooth and fill in open-textured areas
 - (3) if crown precludes use of mechanical float
 - (a) float transversely with long-handled float
 - (b) use caution to avoid flattening crown
 - (4) remove and waste
 - (a) excess water
 - (b) laitance
 - (c) in excess of 1/8 inch
 - (5) successive drags may be overlapped
 - (a) ½ length of blade
 - 6. Straight-Edge Testing and Surface Correction
 - a) test for trueness
 - (1) after strike-off
 - (2) while concrete still plastic
 - b) test with straightedge
 - (1) 16-foot
 - (2) Contractor-provided
 - (3) swung from handles
 - (a) 3 ft longer than ½ width of slab
 - (4) hold in contact with surface
 - (a) in successive positions
 - (b) parallel to centerline
 - (c) test full area of slab side-to-side
 - (d) advance in successive stages
 - (i) no more than ½ length of straightedge
 - c) remove and waste
 - (1) excess water
 - (2) laitance
 - (3) in excess of 1/8 inch
 - d) low areas
 - (1) fill immediately with fresh concrete
 - (2) strike-off
 - (3) consolidate
 - (4) refinish
 - e) high areas
 - (1) cut down
 - (2) refinish
 - f) special attention to ensure smoothness across joints
 - (1) must meet requirements of V.B.5.c
 - g) continue testing and surface corrections
 - (1) until entire surface
 - (a) free from observable departures from straightedge
 - (b) slab conforms to plan grade and cross-section
 - h) use of long-handled floats
 - (1) shall be confined to a minimum
 - (2) in areas not accessible to finishing equipment
- L. SURFACE TEXTURE
 - 1. General
 - a) Unless otherwise specified, shall be finished by brush, broom, burlap drag or

- artificial turf
 - b) must not be unduly roughened
 - c) Contractor must correct texturing imperfections to satisfaction of Engineer
 - 2. Brush or Broom Finish
 - a) apply when water sheen has practically disappeared
 - b) operate transversely
 - c) provide corrugations approx 1/16 inch in depth
 - 3. Burlap Drag Finish
 - a) burlap weight at least 15 ounces per sq yd
 - b) remove transverse threads for approx 1 ft from trailing edge
 - c) allow heavy concrete buildup on threads to provide desired result
 - d) corrugations shall be longitudinal striations
 - (1) uniform in appearance
 - (2) approx 1/16 inch in depth
 - 4. Artificial Turf Finish
 - a) drag surface in direction of concrete placement
 - b) use approved full width artificial turf drag
 - c) fasten leading transverse edge to lightweight pole on traveling bridge
 - d) at least 2 ft of turf to be in contact with concrete
 - e) variety of artificial turf types available
 - (1) approval will be given only after field demonstration
 - (2) one historically acceptable type
 - (a) approx 7,200 0 polyethylene turf blades, 0.85" long, per square foot
 - f) corrugations shall be
 - (1) uniform in appearance
 - (2) approx 1/16 inch in depth
 - 5. Skid-Resistant Surfaces – Saw-Cut Grooving
 - a) if required by plans, shall conform to Section 49 – Sawcut Grooves -P-621
- M. CURING
- 1. General
 - a) cure for 7-day period
 - b) apply
 - (1) immediately after finishing
 - (2) as soon as marring will not occur
 - (3) use one of approved methods, below
 - c) operations will be immediately suspended if Contractor
 - (1) fails to provide
 - (a) sufficient curing material
 - (b) in timely manner
 - (c) adequate water
 - d) do not leave concrete exposed
 - (1) for more than ½ hour
 - (2) throughout curing period
 - e) joint sawcuts
 - (1) if 2-cut sawcut method used:
 - (a) apply curing method immediately after initial sawcut
 - (b) do not sawcut sealant reservoir until curing period completed
 - (2) if 1-cut sawcut method used:
 - (a) cure with
 - (i) wet rope, or
 - (ii) wet rags, or

- (iii) wet blankets
 - (b) keep moist for duration of curing period
 - f) set retardants (fly ash or chemical set retarders)
 - (1) may delay occurrence of bleed water
 - (2) apply curing after bleed water gone from surface
- 2. Impervious Membrane Method
 - a) spray entire surface
 - (1) with white pigmented curing compound
 - (2) immediately after the finishing
 - (3) before set of concrete
 - b) do not apply during rainfall
 - c) apply by pressurized mechanical sprayers
 - (1) fully atomizing type
 - (a) equipped with tank agitator
 - (b) material in fully mixed condition at time of application
 - (i) pigment uniformly dispersed throughout
 - (c) mixture to be stirred constantly
 - (i) by mechanical means
 - (ii) throughout application
 - (2) hand-spraying permitted
 - (a) when approved by Engineer
 - (b) for odd widths or shapes
 - (c) for concrete exposed by form removal
 - (3) @ 1 gal to not more than 150 sq ft
 - (a) double-application required for hand-sprayed areas
 - d) material shall form film within 30 minutes of application
 - (1) if film damaged within curing period by any cause, including sawcutting
 - (a) repair immediately
 - (i) with additional curing compound
 - (ii) or other approved means
 - e) upon removal of side forms
 - (1) apply curing treatment
 - (a) immediately
 - (b) equal to that provided for surface and sides of concrete
- 3. Polyethylene Films
 - a) cover entire surface with polyethylene sheeting
 - (1) lapped at least 18 inches
 - (2) place and weight to ensure constant contact with surface
 - (3) sheeting shall
 - (a) extend beyond pavement edge
 - (i) a distance equal to twice the thickness of pavement
 - b) maintain in place for 7 days
 - (1) unless otherwise specified
 - c) **this method will be approved only for special applications**
- 4. Waterproof Paper
 - a) cover top surfaces and sides with waterproof paper
 - (1) lapped at least 18 inches
 - (2) place and weight to ensure constant contact with surface
 - (3) sheeting shall
 - (a) extend beyond pavement edge
 - (i) a distance equal to twice the thickness of pavement
 - (4) fully saturate pavement surface prior to placing paper

- b) maintain in place for 7 days
 - (1) unless otherwise specified
 - c) this method will be approved only for special applications
 - 5. White Burlap-Polyethylene Sheets
 - a) cover entire surface with sheeting
 - b) sheeting shall
 - (1) extend beyond pavement edge
 - (a) a distance equal to twice the thickness of pavement
 - (2) cover surface and both edges
 - c) place and weight to maintain constant contact with surface
 - d) saturate and maintain for 7-day cure period
 - e) this method will be approved only for special applications
 - 6. Water Method
 - a) cover entire surface with
 - (1) burlap, or
 - (2) other water absorbing material
 - b) material shall
 - (1) be of sufficient thickness
 - (a) to retain water
 - (b) without excessive runoff
 - c) maintain in wet condition for 7-day cure period
 - d) when forms stripped
 - (1) keep vertical walls moist
 - e) do not allow ponding of water on subbase
 - f) this method will be approved only for special applications
- N. REMOVING FORMS
- 1. do not remove forms until concrete hardened sufficiently
 - a) to permit removal without
 - (1) chipping
 - (2) spalling
 - (3) tearing
 - 2. cure sides of slabs by approved method per IV.M
- O. SEALING JOINTS
- 1. Seal joints in accordance with Section 42 – Joint Filling Sealer
- P. PROTECTION OF PAVEMENT
- 1. Protect pavement and appurtenances against all traffic
 - a) public
 - b) construction
 - 2. Provide watchmen if required to
 - a) direct traffic
 - b) erect and maintain
 - (1) signs
 - (2) lights
 - (3) pavement bridges
 - (4) cross-overs
 - 3. protect unsealed joints from foreign material
 - 4. damage occurring prior to final acceptance
 - a) repaired, or
 - b) replaced
 - c) at Contractor's expense
 - 5. Maintain on site
 - a) materials for protection of edges and surface, including

- (1) rolled polyethylene sheeting
 - (a) at least 4 mils thick
 - (b) of sufficient length and width
 - (i) to cover slab and edges
 - b) mount sheeting on
 - (1) paver, or
 - (2) moveable bridge
 - (3) which permits unrolling
 - (a) without dragging over plastic concrete
 - c) if rain appears imminent
 - (1) stop paving operations
 - (2) all available personnel shall be assigned to unroll plastic
- Q. OPENING TO TRAFFIC
- 1. Do not open to traffic until
 - a) flexural strength of 550 psi has been attained
 - (1) based on cores
 - (a) molded and cured per ASTM C31
 - (b) tested per ASTM C78
 - 2. if tests not performed, open to construction traffic
 - a) after 14 days
 - b) after all joints
 - (1) have been sealed, or
 - (2) are protected from
 - (a) damage
 - (b) intrusion of foreign material
 - (c) minimum protection
 - (i) backer rod
 - (ii) backer tape
 - 3. clean pavement prior to opening for normal operations
- R. REPAIR, REMOVAL, REPLACEMENT OF SLABS
- 1. See Section 38 – Concrete Pavement Removal, Repair and Replacement
- V. MATERIAL ACCEPTANCE
- A. ACCEPTANCE SAMPLING AND TESTING
- 1. General
 - a) All testing for acceptance shall be done by the Engineer
 - (1) with the exception of coring for thickness determination
 - b) Concrete will be accepted on a lot basis
 - (1) Lot = 3,600 sq yds
 - c) Testing organizations
 - (1) shall conform to ASTM C1077
 - (a) including accreditation
 - (i) accreditation shall include ASTM C78
 - d) Testing facilities
 - (1) Contractor to provide
 - (a) curing facilities for strength specimens per V.A.2.c
 - (b) coring and filling operations per V.A.2.a
 - 2. Flexural Strength
 - a) Sampling
 - (1) each lot divided into 4 equal sublots
 - (a) one sample per subplot to be taken from concrete delivered to jobsite

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- (b) sample locations shall be determined by procedures in ASTM D3665
 - (2) sample concrete in accordance with ASTM C172
 - b) Testing
 - (1) Two (2) specimens will be made from each sample
 - (a) make specimens per ASTM C31
 - (2) Test for flexural strength
 - (a) per ASTM C78
 - (b) Flexural strength computation
 - (i) flex strength of subplot = average of two test specimens from subplot
 - (3) Prior to testing
 - (a) determine sample unit weight
 - (i) weigh and measure beam
 - (a) measure at midpoint
 - (b) to nearest 0.1 inch
 - (ii) report weight to nearest 0.1 pound
 - (iii) unit weight = weight / calculated volume
 - (b) report unit weight as companion information to flexural strength
 - (4) transport specimens while still in molds
 - (5) cure by saturated lime immersion
 - (a) except for initial cure period
 - (6) Conduct for each set of strength samples - per ASTM C31:
 - (a) slump
 - (b) air content
 - (c) temperature
 - c) Curing
 - (1) Contractor shall provide curing facilities for initial curing of test beams
 - (2) First 24-hours after molding
 - (a) maintain temperature adjacent to molds at 60 – 80 deg F
 - (b) prevent loss of moisture
 - (c) store in
 - (i) tightly constructed wooden boxes, or
 - (ii) damp sandpits, or
 - (iii) temporary buildings, or
 - (iv) under wet burlap, or
 - (v) other suitable methods
 - (a) to provide temperature and moisture conditions
 - d) Acceptance
 - (1) will be determined per V.B.2
3. Pavement Thickness
 - a) Sampling
 - (1) Each lot divided into 4 equal sublots
 - (2) One core taken for each subplot
 - (a) location determined by Engineer
 - (i) per procedures in ASTM D 3665
 - (b) non-standard areas shall be excluded
 - (i) thickened edges
 - (ii) areas of variable thickness
 - (3) Contractor to cut with core drill
 - (a) furnish all labor, tools and materials

- (i) to cut and fill sample cores
 - (4) Contractor to fill
 - (a) with non-shrink grout
 - (b) approved by the Engineer
 - (c) within one day of sampling
 - b) Testing
 - (1) Thickness determined by Engineer
 - (a) based on caliper measurements
 - (b) using procedures in ASTM C174
 - (2) Acceptance
 - (a) determined by Engineer
 - (b) per V.B.3
 - 4. Partial Lots
 - a) Partial lots used
 - (1) if operational conditions cause lot to be terminated
 - (2) if agreed in writing between Contractor and Engineer
 - (a) for minor overages, or
 - (b) for minor placements
 - (c) use following procedure
 - b) Where 3 sublots have been produced
 - (1) they shall constitute a lot
 - c) Where 1 or 2 sublots have been produced
 - (1) they shall be incorporated into previous lot
 - (2) total number of sublots in acceptance criteria calculation shall be modified accordingly
 - 5. Outliers
 - a) check all flexural strength test results for outliers
 - (1) procedures per ASTM C178
 - (a) @ significance level of 5%
 - b) discard outlier sample results
 - (1) base PWL on remaining test values
- B. ACCEPTANCE CRITERIA
- 1. General
 - a) Acceptance will be based on
 - (1) Flexural strength
 - (2) Thickness
 - (3) Smoothness
 - (4) Grade
 - (5) Edge slump
 - (6) Dowel bar alignment
 - b) Acceptance on a lot basis for
 - (1) flexural strength
 - (2) thickness
 - (3) using Percentage within Specification Limits (PWL) method
 - (a) considers test result
 - (i) variability of the material (standard deviation)
 - (ii) mean value (average)
 - (b) calculates percentage of material above lower specification tolerance level (L)
 - c) Acceptance for
 - (1) flexural strength: acceptance criteria per V.B.5.a
 - (2) thickness: acceptance criteria per V.B.5.b

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- (3) smoothness: acceptance criteria per V.B.5.c
 - (4) grade: acceptance criteria per V.B.5.e
 - d) Engineer may reject batch of concrete material and require disposal
 - (1) which is rendered unfit due to
 - (a) contamination
 - (b) segregation
 - (c) improper slump
 - (2) notwithstanding any previous plant acceptance
 - (3) rejection may be based on only visual inspection
 - (4) Contractor may take representative sample in the presence of the Engineer
 - (a) if subsequent laboratory testing, in the presence of the Engineer, demonstrates that material was erroneously rejected
 - (i) will be paid at contract unit price
2. Flexural Strength
- a) acceptance based on PWL
 - b) PWL shall be 90 or higher to be accepted
3. Pavement Thickness
- (1) acceptance based on PWL
 - (2) PWL shall be 90 or higher to be accepted
4. Percentage of Material Within Limits (PWL)
- a) PWL to be determined per Section 13 - Method of Determining Percentage Within Limits
 - b) Lower Specification Tolerance Limit (L)
 - (1) Flexural Strength: $0.93 \times$ strength specified in paragraph III.A
 - (2) Thickness: Lot Plan Thickness in inches – 0.50 inches
5. Acceptance Criteria
- a) Flexural Strength
 - (1) If $PWL \geq 90\%$, lot is acceptable
 - (2) Acceptance and payment per IX.A
 - b) Thickness
 - (1) If $PWL \geq 90\%$, lot is acceptable
 - (2) Acceptance and payment per IX.A
 - c) Smoothness
 - (1) After concrete hardened sufficiently, test with
 - (a) 16-ft straightedge, or
 - (b) other approved device
 - (2) Surface deviations shall not exceed $\frac{1}{4}$ inch in 16 feet
 - (a) straightedge placed in any direction
 - (b) including along and spanning joints
 - (3) High spots
 - (a) $> \frac{1}{4}$ inch but $\leq \frac{1}{2}$ inch
 - (i) mark and grind
 - (a) with approved grinding machine
 - (b) until within $\frac{1}{4}$ -inch tolerance
 - (b) $> \frac{1}{2}$ inch
 - (i) remove and replace pavement at Contractor's expense
 - d) [OPTIONAL: PROFILOGRAPH

NOTES TO ENGINEER: REQUIRES CASE-BY-CASE APPROVAL FROM FAA – RECOMMENDED ONLY FOR NEW CONSTRUCTION OR OVERLAYS DESIGNED TO CORRECT GRADE AND SMOOTHNESS DEFICIENCIES – IF ALLOWED

STRAIGHTEDGE REQUIREMENTS WILL APPLY ONLY IN TRANSVERSE DIRECTION – REPLACE PARAGRAPH C) ABOVE, WITH THE FOLLOWING IF PROFILOGRAPH IS TO BE ALLOWED

- (1) After concrete hardened sufficiently, test in the transverse direction with
 - (a) 16-ft straightedge, or
 - (b) other approved device
- (2) Surface deviations shall not exceed $\frac{1}{4}$ inch in 16 feet
 - (a) straightedge placed in any direction
 - (b) including along and spanning joints
- (3) High spots
 - (a) $> \frac{1}{4}$ inch but $\leq \frac{1}{2}$ inch
 - (i) mark and grind
 - (a) with approved grinding machine
 - (b) until within $\frac{1}{4}$ -inch tolerance
 - (b) $> \frac{1}{2}$ inch
 - (i) remove and replace pavement at Contractor's expense
- (4) In addition to 16-ft straightedge, Contractor to furnish 25-ft wheel base California-type profilograph
 - (a) with competent operator
 - (b) calibrate before testing
- (5) operate per manufacturer's instructions
 - (a) at speed ≤ 3 mph
 - (b) maintain all original test measurements
- (6) interpret profilographs per ASTM E 1274
 - (a) at scale
 - (i) 1"=25 ft longitudinally
 - (ii) 1"=1" vertically
- (7) test
 - (a) for paving lanes greater than 20 ft wide
 - (i) two passes along centerline of each paving lane greater than 20 ft wide
 - (ii) each pass 6 ft from centerline of paving lane
 - (iii) average of two passes = profilograph result for lane
 - (b) for paving lanes less than 20 ft wide
 - (i) one pass along centerline required
 - (c) run test next working day after concrete placement
 - (d) label each trace showing paving lane and stationing
 - (e) provide to Engineer
- (8) acceptance
 - (a) pavement shall be constructed to provide average profile index
 - (i) per IX.C
 - (ii) subsection shall be
 - (a) one paving lane width
 - (b) 1/10 mile long
 - (iii) Profile Index (PI) per ASTM E 1274
 - (a) use blanking band 0.2 inches
 - (b) within each subsection repair:
 - (i) areas with > 0.4 inch deviation in 25 ft
 - (a) grind with approved grinding device, or
 - (b) device consisting of multiple diamond blades
 - (c) use of bush-hammer or other impact device not permitted
 - (c) after grinding may require further corrective action to correct

- ride quality
- (d) complete corrective work prior to thickness determination
- (e) do second profilograph run after corrections made
 - (i) if average PI < 15, retest only areas with > 0.4 inch deviation
- (f) payment adjustment for Profile Index
 - (i) if average PF < 10 inches per mile, payment will be made at contract unit price
 - (ii) see Table 4 for price adjustment when PF exceeds 10 inches per mile
 - (iii) if average is > 10 but < 15, Contractor may accept pay reduction per Table 4
 - (iv) areas with PI > 15 shall be removed and replaced at Contractor's expense
- (9) Non-Standard Sections
 - (a) shorter than 50 ft
 - (b) last 15 ft of any section where contractor not responsible for adjoining section
 - (c) straightedge per V.B.5.c
- (10) shorter than 250 ft
 - (a) include profilograph reading with previous section
- (11) independent section 50 ft to 250 ft in length
 - (a) calculate pay factor per Table 4
- (12) complete corrective work before
 - (a) joint sealing
 - (b) grooving
- (13) All costs associated with profilograph shall be borne by Contractor]
- e) Grade
 - (1) Evaluate grade as follows
 - (a) Lateral Deviation
 - (i) shall not exceed +/- 0.10 ft in any lane
 - (b) Vertical Deviation
 - (i) shall not exceed +/- 0.04 ft at any point
 - (2) Records shall be maintained showing all grade measurements
- f) Edge Slump (for slip form paving)
 - (1) Definition: Free Edge
 - (a) cumulative linear measurement of pavement edge constructed as nonadjacent to existing pavement
 - (b) area affected by downward movement shall extend no more than 18 inches in from edge
 - (2) for each 500 ft pavement section
 - (a) not more than 15% of free edge shall exceed ¼ inch from plan
 - (b) none of free edge shall exceed 3/8 inch from plan
 - (c) if not corrected while concrete is plastic, slab shall be removed and replaced at Contractor's expense
- g) Dowel Bar Alignment
 - (1) check for position and alignment
 - (2) maximum allowable tolerances
 - (a) alignment: 2% (or ¼ inch per foot of dowel bar)
 - (i) in both planes (horizontal and vertical)
 - (a) vertical alignment measure parallel to designed top surface

- (i) except at crown or grade change joints
 - (ii) these measured relative to level surface
 - (b) horizontal alignment measure perpendicular to joint edge
 - (b) position tolerance from plans
 - (i) +/- 2 inches horizontal direction
 - (ii) +/- 3/8 inch vertical direction
- 6. Removal and Replacement of Concrete
 - a) always remove back to planned joints
 - b) dowel requirements for longitudinal construction joints in IV.J shall apply to all dowels exposed by concrete removal operations
 - c) remove and replace per Section 38 – Concrete Removal, Repair and Replacement

VI. CONTRACTOR QUALITY CONTROL

A. QUALITY CONTROL PROGRAM

1. General

- a) develop Contractor Quality Control Program per Section 12 – Contractor Quality Control Program
- b) Include as a minimum:
 - (1) Mix Design
 - (2) Aggregate Gradation
 - (3) Quality of Materials
 - (4) Stockpile Management
 - (5) Proportioning
 - (6) Mixing and Transportation
 - (7) Placing and Consolidation
 - (8) Joints
 - (9) Dowel Placement and Alignment
 - (10) Flexural or Compressive Strength
 - (11) Finishing and Curing
 - (12) Surface Smoothness

NOTES TO ENGINEER: THIS REQUIREMENT MAY BE MODIFIED IF PROJECT < 600 SQ YDS

B. QUALITY CONTROL TESTING

1. General

- a) Contractor shall perform all tests necessary to control production and processes
 - (1) as set forth in Section 12 – Contractor Quality Control Program (CQCP)
- b) Test shall include, as a minimum, tests for
 - (1) aggregate gradation
 - (2) aggregate moisture content
 - (3) slump
 - (4) air content
- c) Testing Plan shall be part of CQCP

2. Fine Aggregate

- a) Gradation
 - (1) perform sieve analysis twice daily
 - (2) per ASTM C136
 - (3) from randomly sampled material taken from
 - (a) discharge gate of storage bins, or

- (b) conveyor belt
 - b) Moisture Content
 - (1) if electronic moisture meter used
 - (a) two direct moisture measurements per week shall also be taken for calibration
 - (2) if direct moisture tests made
 - (a) two direct moisture tests per day
 - (b) test per
 - (i) ASTM C70, or
 - (ii) ASTM C566
 - 3. Coarse Aggregate
 - a) Gradation
 - (1) perform sieve analysis twice daily
 - (2) per ASTM C136
 - (3) from randomly sampled material taken from
 - (a) discharge gate of storage bins, or
 - (b) conveyor belt
 - b) Moisture Content
 - (1) if electronic moisture meter used
 - (a) two direct moisture measurements per week shall also be taken for calibration
 - (2) if direct moisture tests made
 - (a) two direct moisture tests per day
 - (b) test per ASTM C566
 - 4. Slump
 - a) Four (4) slump tests for each lot produced
 - (1) lot size as defined in V.A
 - (2) one test for each subplot
 - b) test per ASTM C143
 - c) select random sampling locations from material discharged from trucks on grade
 - d) sample per ASTM C172
 - 5. Air Content
 - a) Four (4) air content tests for each lot produced
 - (1) lot size as defined in V.A
 - (2) one test for each subplot
 - b) test per
 - (1) ASTM C231 for gravel or stone
 - (2) ASTM C173 for slag or porous aggregate
 - c) select random sampling locations from material discharged from trucks on grade
 - d) sample per ASTM C172
 - 6. Unit Weight and Yield Tests
 - a) Four (4) unit weight and yield tests
 - (1) per ASTM C172
 - (2) at same time as air content tests
- C. CONTROL CHARTS
- 1. General
 - a) Contractor shall maintain linear control charts for
 - (1) fine aggregate gradation
 - (2) coarse aggregate gradation
 - (3) slump
 - (4) air content
 - b) Post in location satisfactory to Engineer

- c) Keep up to date at all times
 - d) As minimum show:
 - (1) project number
 - (2) contract item number
 - (3) test number
 - (4) each test parameter
 - (5) Action and suspension Limits, or
 - (6) Specification limits
 - (a) applicable to each test parameter
 - (7) Contractor's test results.
 - e) Contractor shall use charts as part of process control system
 - (1) to identify potential problems
 - (2) assign causes
 - (a) before they occur
 - f) If projected data indicates potential problem
 - (1) Contractor does not take satisfactory corrective action
 - (a) Engineer may
 - (i) halt production
 - (ii) reject placed material
2. Fine and Coarse Aggregate Gradation
- a) record
 - (1) running average of last five gradation tests for each control sieve
 - (2) on linear control chart
 - (3) superimpose specification limits from Tables 1 and 2 onto chart for job control
3. Slump and Air Content
- a) record
 - (1) individual measurements
 - (2) range (difference between high and low)
 - (3) plot Action and Suspension Limits per Table 3

TABLE 3. CONTROL CHART LIMITS			
Control Parameter	Individual Measurements		Range Suspension Limit
	Action Limit	Suspension Limit	
Slip Form:			
Slump	+0 to -1 inch	+0.5 to -1.5 inch	+/- 1.5 inch
Air Content	+/- 1.2%	+/- 1.8%	+/- 2.5%
Fixed Form:			
Slump	+ 0.5 to -1 inch	+1 to -1.5 inch	+/- 1.5 inch
Air Content	+/- 1.2%	+/- 1.8%	+/- 2.5%

- b) use mix design target values in individual measurement control charts as indicators of central tendency
- D. CORRECTIVE ACTION
1. Contractor Quality Control Program shall indicate appropriate action when process is believed to be out of control
 - a) include what action is to be taken to bring process back into control
 - b) include set of rules to gauge when process out of control

2. process considered out of control, as a minimum, if:
 - a) Fine and Coarse Aggregate Gradation
 - b) When two consecutive averages of five tests are outside of the Tables 1 or 2 specification limits,
 - (1) take immediate steps to correct grading,
 - (a) including halting production
 - c) Fine and Coarse Aggregate Moisture Content
 - (1) Whenever moisture content of fine or coarse aggregate changes by more than 0.5 percent
 - (a) adjust scale settings for
 - (i) aggregate batcher(s) and
 - (ii) water batcher
 - d) Slump
 - (1) halt production and make adjustments if:
 - (a) one point falls outside the Suspension Limit line for individual measurements or range; or
 - (b) two points in a row fall outside the Action Limit line for individual measurements.
 - e) Air Content
 - (1) halt production and adjust air-entraining admixtures if:
 - (a) one point falls outside the Suspension Limit line for individual measurements or range; or
 - (b) two points in a row fall outside the Action Limit line for individual measurements.
 - (2) when point falls outside Action Limits line
 - (a) calibrate admixture dispenser to ensure
 - (i) accuracy
 - (ii) good reproducibility

VII. SUBMITTAL REQUIREMENTS

- A. AGGREGATE SUBMITTALS
- B. OTHER MIX COMPONENTS
 1. Cement, Fly Ash, Admixtures
- C. MIX DESIGN
- D. LABORATORY CERTIFICATIONS
- E. EQUIPMENT AND PLANT INFORMATION

VIII. METHOD OF MEASUREMENT

- A. _____-INCH UNREINFORCED PCC PAVEMENT – PER SQ YD
 1. Measured by XX
 2. no separate measurement will be made in areas of variable thickness such as thickened edges
- B. _____-INCH REINFORCED PCC PAVEMENT – PER SQ YD
 1. no separate measurement will be made in areas of variable thickness such as thickened edges

IX. BASIS OF PAYMENT

- A. GENERAL
 1. Payment will be at contract unit price
 2. Adjusted in accordance with 501-8.1.a
 - a) subject to limitation that
 - (1) total payment for concrete pavement shall not exceed [] percent of product of

- (a) contract unit price
- (b) total number of sq yds of pavement accepted

NOTE TO ENGINEER: INSERT VALUE BETWEEN 100 AND 106 PERCENT. REVIEW WITH LAWA. AIP OR PFC FUNDS USED TO PAY EXCESS OF 100% MAY REQUIRE GRANT AMENDMENT.

- B. BASIS OF ADJUSTED PAYMENT
1. Calculate Adjustment per Table 4
 - a) calculate separate factor for
 - (1) flexural strength
 - (2) thickness
 2. If both > 100
 - a) Price Adjustment = higher of the two
 3. If one greater and one less than 100
 - a) Price Adjustment = product of two
 4. If neither is greater than 100
 - a) Price Adjust = lower of two

TABLE 4. PRICE ADJUSTMENT SCHEDULE ¹	
Percentage of Material Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)
96 – 100	106
90 – 95	PWL + 10
75 – 90	0.5PWL + 55
55 – 74	1.4PWL – 12
Below 55	Reject ²

5. Notes
 - a) ¹ Theoretically possible to achieve pay factor of 106%
 - (1) Actual payment in excess of 100% subject to limitation in IX.A
 - b) ² Remove and replace lot
 - (1) Engineer may allow to remain
 - (a) Contractor and Engineer will agree in writing
 - (i) pavement shall not be removed
 - (ii) Contractor will be paid 50% of contract price
 - (iii) total project limitation will be reduced by the amount so withheld
6. for each lot, accepted price is product of
 - a) lot pay factor and
 - b) contract unit price
7. payment in excess of 100% for accepted lots shall be used to offset payment for lots with pay factors less than 100%

C. [OPTIONAL IF PROFILOGRAPH IS USED FOR SMOOTHNESS ACCEPTANCE:

BASIS OF ADJUSTED PAYEMENT FOR SMOOTHNESS

1. Price shall be adjusted for smoothness in accordance with

- a) the following equation, and
 - (1) (Sq yds in section) x (original unit price per sq yds) x PFM = reduction in payment for area within section
- b) Table 5:

TABLE 5 – PRICE ADJUSTMENT FOR SMOOTHNESS			
Average Profile Index (Inches per mile)			CONTRACT UNIT PRICE ADJUSTMENT
PAVEMENT STRENGTH RATING			
OVER 30,000#	30,000# OR LESS	SHORT SECTIONS	PFM
0 - 7	0 - 10	0 - 15	0.00
7.1 - 9	10.1 - 11	15.1 - 16	.02
9.1 - 11	11.1 - 12	16.1 - 17	0.04
11.1 - 13	12.1 - 13	17.1 - 18	0.06
13.1 - 14	13.1 - 14	18.1 - 20	0.08
14.1 - 15	14.1 - 15	20.1 - 22	0.10
15.1 & up	15.1 & up	22.1 & up	corrective work required

- D. PAYMENT
 - 1. Paid at contract unit price under Item Number
 - a) 37.1 _____-INCH UNREINFORCED PCC PAVEMENT – PER SQ YD
 - b) 37.2 _____-INCH REINFORCED PCC PAVEMENT – PER SQ YD
 - 2. Payment is full compensation for all materials, labor, equipment, tools and incidentals.
 - 3. [No separate payment for work in areas of night or limited-time construction area](#)

X. TESTING REQUIREMENTS

- A. ASTM C 31 MAKING AND CURING CONCRETE TEST SPECIMENS IN THE FIELD
- B. ASTM C 39 COMPRESSIVE STRENGTH OF CYLINDRICAL CONCRETE SPECIMENS
- C. ASTM C 70 SURFACE MOISTURE IN FINE AGGREGATE
- D. ASTM C 78 TEST FOR FLEXURAL STRENGTH OF CONCRETE (USING SIMPLE BEAM WITH THIRD-POINT LOADING)
- E. ASTM C 88 TEST FOR SOUNDNESS OF AGGREGATES BY USE OF SODIUM SULFATE OR MAGNESIUM SULFATE
- F. ASTM C 131 TEST FOR RESISTANCE TO ABRASION OF SMALL SIZE COARSE AGGREGATE BY USE OF THE LOS ANGELES MACHINE
- G. ASTM C 136 SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES
- H. ASTM C 138 TEST FOR DENSITY (UNIT WEIGHT), YIELD, AND AIR CONTENT (GRAVIMETRIC) OF CONCRETE
- I. ASTM C 143 TEST FOR SLUMP OF HYDRAULIC CEMENT CONCRETE

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- J. ASTM C 172 SAMPLING FRESHLY MIXED CONCRETE
 - K. ASTM C 173 TEST FOR AIR CONTENT OF FRESHLY MIXED CONCRETE BY THE VOLUMETRIC METHOD
 - L. ASTM C 174 MEASURING THICKNESS OF CONCRETE ELEMENTS USING DRILLED CONCRETE CORES
 - M. ASTM C 227 POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS (MORTAR-BAR METHOD)
 - N. ASTM C 231 TEST FOR AIR CONTENT OF FRESHLY MIXED CONCRETE BY THE PRESSURE METHOD
 - O. ASTM C 289 POTENTIAL ALKALI-SILICA REACTIVITY OF AGGREGATES (CHEMICAL METHOD)
 - P. ASTM C 295 PETROGRAPHIC EXAMINATION OF AGGREGATES FOR CONCRETE
 - Q. ASTM C 114 CHEMICAL ANALYSIS OF HYDRAULIC CEMENT
 - R. ASTM C 535 TEST FOR RESISTANCE TO DEGRADATION OF LARGE-SIZE COARSE AGGREGATE BY ABRASION AND IMPACT IN THE LOS ANGELES MACHINE
 - S. ASTM C 566 TOTAL EVAPORABLE MOISTURE CONTENT OF AGGREGATES BY DRYING
 - T. ASTM C 642 TEST FOR DENSITY, ABSORPTION, AND VOIDS IN HARDENED CONCRETE
 - U. ASTM C 666 RESISTANCE OF CONCRETE TO RAPID FREEZING AND THAWING
 - V. ASTM C 1077 STANDARD PRACTICE FOR LABORATORIES TESTING CONCRETE AND CONCRETE AGGREGATES FOR USE IN CONSTRUCTION AND CRITERIA FOR LABORATORY EVALUATION
 - W. ASTM C 1260 POTENTIAL ALKALI REACTIVITY OF AGGREGATES (MORTAR-BAR METHOD)
 - X. ASTM D 3665 RANDOM SAMPLING OF PAVING MATERIALS
 - Y. ASTM D 4791 TEST METHOD FOR FLAT OR ELONGATED PARTICLES IN COARSE AGGREGATE
 - Z. ASTM E 178 DEALING WITH OUTLYING OBSERVATIONS
 - AA. ASTM E 1274 TEST FOR MEASURING PAVEMENT ROUGHNESS USING A PROFILOGRAPH
 - BB. AASHTO T 26 QUALITY OF WATER TO BE USED IN CONCRETE
- XI. MATERIAL REQUIREMENTS**
- A. ASTM A 184 SPECIFICATION FOR FABRICATED DEFORMED STEEL BAR MATS FOR CONCRETE REINFORCEMENT

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B.	ASTM A 185	SPECIFICATION FOR STEEL WELDED WIRE FABRIC, PLAIN, FOR CONCRETE REINFORCEMENT
C.	ASTM A 497	SPECIFICATION FOR STEEL WELDED WIRE FABRIC, DEFORMED, FOR CONCRETE REINFORCEMENT
D.	ASTM A 615	SPECIFICATION FOR DEFORMED AND PLAIN BILLET-STEEL BARS FOR CONCRETE REINFORCEMENT
E.	ASTM A 704	SPECIFICATION FOR WELDED STEEL PLAIN BAR OR ROD MATS FOR CONCRETE REINFORCEMENT
F.	ASTM A 714	SPECIFICATION FOR HIGH-STRENGTH LOW-ALLOY WELDED AND SEAMLESS STEEL PIPE
G.	ASTM A 996	SPECIFICATION FOR RAIL-STEEL AND AXLE STEEL DEFORMED BARS FOR CONCRETE REINFORCEMENT
H.	ASTM C 33	SPECIFICATION FOR CONCRETE AGGREGATES
I.	ASTM C 94	SPECIFICATION FOR READY-MIXED CONCRETE
J.	ASTM C 150	SPECIFICATION FOR PORTLAND CEMENT
K.	ASTM C 171	SPECIFICATION FOR SHEET MATERIALS FOR CURING CONCRETE
L.	ASTM C 260	SPECIFICATION FOR AIR-ENTRAINING ADMIXTURES FOR CONCRETE
M.	ASTM C 309	SPECIFICATION FOR LIQUID MEMBRANE-FORMING COMPOUNDS FOR CURING CONCRETE
N.	ASTM C 494	SPECIFICATION FOR CHEMICAL ADMIXTURES FOR CONCRETE
O.	ASTM C 595	SPECIFICATION FOR BLENDED HYDRAULIC CEMENTS
P.	ASTM C 618	SPECIFICATION FOR COAL FLY ASH AND RAW OR CALCINED NATURAL POZZOLAN FOR USE AS A MINERAL ADMIXTURE IN CONCRETE
Q.	ASTM C 881	SPECIFICATION FOR EPOXY-RESIN BASE BONDING SYSTEM FOR CONCRETE
R.	ASTM C 989	SPECIFICATION FOR GROUND GRANULATED BLAST-FURNACE SLAG FOR USE IN CONCRETE AND MORTARS
S.	ASTM D 1751	SPECIFICATION FOR PREFORMED EXPANSION JOINT FILLER FOR CONCRETE PAVING AND STRUCTURAL CONSTRUCTION (NONEXTRUDING AND RESILIENT BITUMINOUS TYPES)
T.	ASTM D 1752	SPECIFICATION FOR PREFORMED SPONGE RUBBER AND CORK EXPANSION JOINT FILLERS FOR CONCRETE PAVING AND STRUCTURAL CONSTRUCTION
U.	ACI 305R	HOT WEATHER CONCRETING

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- V. ACI 306R COLD WEATHER CONCRETING
- W. ACI 309 GUIDE FOR CONSOLIDATION OF CONCRETE
- X. MIL-DTL-24441/2(1999)
PAINT, EPOXY-POLYAMIDE, GREEN PRIMER, FORMULA 150, TYPE III
DEPARTMENT OF DEFENSE

XII. END OF SECTION