

A6.4.5 Title VI List of Pertinent Nondiscrimination Acts and Authorities

Insert this list in every contract or agreement, unless the sponsor has determined and the FAA concurs, that the contract or agreement is not subject to the Nondiscrimination Acts and Authorities. This list can be omitted if the FAA has determined that the contractor or company is already subject to nondiscrimination requirements.

Title VI List of Pertinent Nondiscrimination Acts and Authorities

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the “Contractor”) agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 USC § 2000d *et seq.*, 78 stat. 252) (prohibits discrimination on the basis of race, color, national origin);
- 49 CFR part 21 (Non-discrimination in Federally-assisted programs of the Department of Transportation—Effectuation of Title VI of the Civil Rights Act of 1964);
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 USC § 4601) (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Section 504 of the Rehabilitation Act of 1973 (29 USC § 794 *et seq.*), as amended (prohibits discrimination on the basis of disability); and 49 CFR part 27;
- The Age Discrimination Act of 1975, as amended (42 USC § 6101 *et seq.*) (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982 (49 USC § 471, Section 47123), as amended (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987 (PL 100-209) (broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, the Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms “programs or activities” to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act of 1990, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 USC §§ 12131 – 12189) as implemented by U.S. Department of Transportation regulations at 49 CFR parts 37 and 38;
- The Federal Aviation Administration’s Nondiscrimination statute (49 USC § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures nondiscrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);

- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 USC 1681 et seq).

A7 CLEAN AIR AND WATER POLLUTION CONTROL

A7.1 SOURCE

2 CFR § 200, Appendix II(G)

A7.2 APPLICABILITY

Contract Types – This provision is required for all contracts and lower tier contracts that exceed \$150,000.

Use of Provision – No mandatory language provided. The following language is acceptable to the FAA and meets the intent of this requirement. If the sponsor uses different language, the sponsor's language must fully satisfy the requirements of Appendix II to 2 CFR §200.

A7.3 CONTRACT CLAUSE

CLEAN AIR AND WATER POLLUTION CONTROL

Contractor agrees to comply with all applicable standards, orders, and regulations issued pursuant to the Clean Air Act (42 USC § 740-7671q) and the Federal Water Pollution Control Act as amended (33 USC § 1251-1387). The Contractor agrees to report any violation to the Owner immediately upon discovery. The Owner assumes responsibility for notifying the Environmental Protection Agency (EPA) and the Federal Aviation Administration.

Contractor must include this requirement in all subcontracts that exceeds \$150,000.

A8 CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS

A8.1 SOURCE

2 CFR § 200, Appendix II(E)

A8.2 APPLICABILITY

Contract Workhours and Safety Standards Act Requirements (CWHSSA) requires contractors and subcontractors on covered contracts to pay laborers and mechanics employed in the performance of the contracts one and one-half times their basic rate of pay for all hours worked over 40 in a workweek. CWHSSA prohibits unsanitary, hazardous, or dangerous working conditions on federally assisted projects. The Wage and Hour Division (WHD) within the U.S. Department of Labor (DOL) enforces the compensation requirements of this Act, while DOL's Occupational Safety and Health Administration (OSHA) enforces the safety and health requirements

Contract Types –

Construction – This provision applies to all contracts and lower tier contracts that exceed \$100,000, and employ laborers, mechanics, watchmen, and guards.

Equipment – This provision applies to any equipment project exceeding \$100,000 that involves installation of equipment onsite (e.g. electrical vault equipment). This provision does not apply to equipment acquisition projects where the manufacture of the equipment takes place offsite at the vendor plant (e.g. ARFF and SRE vehicles).

Professional Services – This provision applies to professional service agreements that exceed \$100,000 and employs laborers, mechanics, watchmen, and guards. This includes members of survey crews and exploratory drilling operations.

Property – While most land transactions do not involve employment of laborers, mechanics, watchmen, and guards, under certain circumstances, a property acquisition project could require such employment. Examples include the installation of property fencing or testing for environmental contamination

Use of Provision – MANDATORY TEXT. Sponsors must incorporate this text without modification.

A8.3 CONTRACT CLAUSE

CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS

1. Overtime Requirements.

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic, including watchmen and guards, in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a

rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; Liability for Unpaid Wages; Liquidated Damages.

In the event of any violation of the clause set forth in paragraph (1) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this clause, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this clause.

3. Withholding for Unpaid Wages and Liquidated Damages.

The Federal Aviation Administration (FAA) or the Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this clause.

4. Subcontractors.

The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs (1) through (4) and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this clause.

A9 COPELAND “ANTI-KICKBACK” ACT

A9.1 SOURCE

2 CFR § 200, Appendix II(D)

29 CFR Parts 3 and 5

A9.2 APPLICABILITY and PURPOSE

The Copeland (Anti-Kickback) Act (18 USC 874 and 40 USC 3145) makes it unlawful to induce by force, intimidation, threat of dismissal from employment, or by any other manner, any person employed in the construction or repair of public buildings or public works, financed in whole or in part by the United States, to give up any part of the compensation to which that person is entitled under a contract of employment. The Copeland Act also requires each contractor and subcontractor to furnish weekly a statement of compliance with respect to the wages paid each employee during the preceding week.

Contract Types –

Construction – This provision applies to all construction contracts and subcontracts financed under the AIP that exceed \$2,000.

Equipment – This provision applies to all equipment installation projects (e.g. electrical vault improvements) financed under the AIP that exceed \$2,000. This provision does not apply to equipment acquisitions where the equipment is manufactured at the vendor’s plant (e.g. SRE and ARFF vehicles).

Professional Services –The emergence of different project delivery methods has created situations where Professional Service Agreements (PSAs) include tasks that meet the definition of construction, alteration, or repair as defined in 29 CFR Part 5. If such tasks result in work that qualifies as construction, alteration, or repair and it exceeds \$2,000, the PSA must incorporate the Copeland Anti-kickback provision.

Property –Ordinarily, land acquisition projects would not involve employment of laborers or mechanics and thus the Copeland Anti-Kickback provision would not apply. However, land projects that involve installation of boundary fencing and demolition of structures would involve laborers and mechanics. The sponsor must include this provision if the land acquisition project involves employment of laborers or mechanics for a contract exceeding \$2,000.

Use of Provision – MANDATORY TEXT. 29 CFR Part 5 establishes specific language a sponsor must use in construction contracts. The sponsor may not make any modification to the standard language. Architectural/Engineering (A/E) firms that employ laborers and mechanics on a task that meets the definition of construction, alteration, or repair are acting as a contractor. The sponsor may not substitute the term “contractor” for “consultant” in such instances.

A9.3 CONTRACT CLAUSE

COPELAND “ANTI-KICKBACK” ACT

Contractor must comply with the requirements of the Copeland “Anti-Kickback” Act (18 USC 874 and 40 USC 3145), as supplemented by Department of Labor regulation 29 CFR part 3. Contractor and subcontractors are prohibited from inducing, by any means, any person employed on the project to give up any part of the compensation to which the employee is entitled. The Contractor and each Subcontractor must submit to the Owner, a weekly statement on the wages paid to each employee performing on covered work during the prior week. Owner must report any violations of the Act to the Federal Aviation Administration.

A10 DAVIS-BACON REQUIREMENTS

A10.1 SOURCE

2 CFR § 200, Appendix II(D)

29 CFR Part 5

A10.2 APPLICABILITY

The Davis-Bacon Act ensures that laborers and mechanics employed under the contract receive pay no less than the locally prevailing wages and fringe benefits as determined by the Department of Labor.

Contract Types –

Construction – Incorporate into all construction contracts and subcontracts that exceed \$2,000 and include funding from the AIP.

Equipment – This provision applies to all equipment installation projects (e.g. electrical vault improvements) financed under the AIP that exceed \$ 2, 000. This provision does not apply to equipment acquisitions where the equipment is manufactured at the vendor’s plant (e.g. SRE and ARFF vehicles)

Professional Services – The emergence of different project delivery methods has created situations where Professional Service Agreements (PSAs) includes tasks that meet the definition of construction, alteration, or repair as defined in 29 CFR Part 5. If such tasks result in work that qualifies as construction, alteration, or repair and it exceeds \$2,000, the PSA must incorporate this clause.

Property – Ordinarily, land acquisition projects would not involve employment of laborers or mechanics and thus the provision would not apply. However, land projects that involve installation of boundary fencing and demolition of structures would involve laborers and mechanics. The sponsor must include this provision if the land acquisition project involves employment of laborers or mechanics for a contract exceeding \$2,000.

Fencing Projects – Fencing projects that exceed \$2,000 must include this provision.

Use of Provision – MANDATORY TEXT. 29 CFR part 5 establishes specific language a sponsor must use. The sponsor may not make any modification to the standard language. A/E firms that employ laborers and mechanics on a task that meets the definition of construction, alteration, or repair are acting as a contractor. The sponsor may not substitute the term “Contractor” for “Consultant” in such instances.

A10.3

CONTRACT CLAUSE

DAVIS-BACON REQUIREMENTS

1. Minimum Wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalent thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided* that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can easily be seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

- (1) The work to be performed by the classification requested is not performed by a classification in the wage determination;
- (2) The classification is utilized in the area by the construction industry; and
- (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by

the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the Contractor, the laborers, or mechanics to be employed in the classification, or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii) (B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program: *Provided* that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding.

The Federal Aviation Administration or the sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of work, all or part of the wages required by the contract, the Federal Aviation Administration may, after written notice to the Contractor, Sponsor, Applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and Basic Records.

(i) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 1(b)(2)(B) of the Davis-Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records that show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and that show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit the payrolls to the applicant, Sponsor, or Owner, as the case may be, for transmission to the Federal Aviation Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (*e.g.* the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at www.dol.gov/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker and shall provide them upon request to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit them to the applicant, sponsor, or Owner, as the case may be, for transmission to the Federal Aviation Administration, the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, Sponsor, or Owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) The payroll for the payroll period contains the information required to be provided under 29 CFR § 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR § 5.5 (a)(3)(i), and that such information is correct and complete;

(2) Each laborer and mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations 29 CFR Part 3;

(3) Each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the “Statement of Compliance” required by paragraph (3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The Contractor or subcontractor shall make the records required under paragraph (3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the sponsor, the Federal Aviation Administration, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the Contractor, Sponsor, applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less

than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination that provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate that is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal Employment Opportunity. The utilization of apprentices, trainees, and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act Requirements.

The Contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

6. Subcontracts.

The Contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR Part 5.5(a)(1) through (10) and such other clauses as the Federal Aviation Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR Part 5.5.

7. Contract Termination: Debarment.

A breach of the contract clauses in paragraph 1 through 10 of this section may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements.

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes Concerning Labor Standards.

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of Eligibility.

(i) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 USC 1001.

A11 DEBARMENT AND SUSPENSION

A11.1 SOURCE

2 CFR part 180 (Subpart C)

2 CFR part 1200

DOT Order 4200.5

A11.2 APPLICABILITY

The sponsor must verify that the firm or individual that it is entering into a contract with is not presently suspended, excluded, or debarred by any Federal department or agency from participating in federally assisted projects. The sponsor accomplishes this by:

- 1) Checking the System for Award Management (SAM.gov) to verify that the firm or individual is not listed in SAM.gov as being suspended, debarred, or excluded;
- 2) Collecting a certification from the firm or individual that it is not suspended, debarred, or excluded; and
- 3) Incorporating a clause in the contract that requires lower tier contracts to verify that no suspended, debarred, or excluded firm or individual is included in the project.

Contract Types – This requirement applies to *covered transactions*, which are defined in 2 CFR part 180. AIP funded contracts are non-procurement transactions, as defined by §180.970. Covered transactions include any AIP-funded contract, regardless of tier, that is awarded by a contractor, subcontractor, supplier, consultant, or its agent or representative in any transaction, if the amount of the contract is expected to equal or exceed \$25,000. This includes contracts associated with land acquisition projects.

Use of Provision – No mandatory language provided. The following language is acceptable to the FAA in meeting the intent of this requirement. If the sponsor uses different language, the sponsor's language must fully satisfy the requirements of 2 CFR part 180. For professional service agreements, sponsor may substitute bidder/offeror with consultant.

A11.3 SOLICITATION CLAUSE

A11.3.1 Bidder or Offeror Certification

CERTIFICATION OF OFFERER/BIDDER REGARDING DEBARMENT

By submitting a bid/proposal under this solicitation, the bidder or offeror certifies that neither it nor its principals are presently debarred or suspended by any Federal department or agency from participation in this transaction.

A11.3.2 Lower Tier Contract Certification

CERTIFICATION OF LOWER TIER CONTRACTORS REGARDING DEBARMENT

The successful bidder, by administering each lower tier subcontract that exceeds \$25,000 as a “covered transaction”, must verify each lower tier participant of a “covered transaction” under the project is not presently debarred or otherwise disqualified from participation in this federally assisted project. The successful bidder will accomplish this by:

1. Checking the System for Award Management at website: <http://www.sam.gov>.
2. Collecting a certification statement similar to the Certification of Offerer /Bidder Regarding Debarment, above.
3. Inserting a clause or condition in the covered transaction with the lower tier contract.

If the Federal Aviation Administration later determines that a lower tier participant failed to disclose to a higher tier participant that it was excluded or disqualified at the time it entered the covered transaction, the FAA may pursue any available remedies, including suspension and debarment of the non-compliant participant.

A12 DISADVANTAGED BUSINESS ENTERPRISE

A12.1 SOURCE

49 CFR part 26

A12.2 APPLICABILITY

A sponsor that anticipates awarding \$250,000 or more in AIP funded prime contracts in a federal fiscal year must have an approved Disadvantaged Business Enterprise (DBE) program on file with the FAA Office of Civil Rights (§ 26.21). The approved DBE program will identify a 3-year overall program goal that the sponsor bases on the availability of ready, willing, and able DBEs relative to all businesses ready, willing, and able to participate on the project (§ 26.45).

Contract Types – Sponsors with a DBE program on file with the FAA must include the three following provisions, if applicable:

- 1) Clause in all solicitations for proposals for which a contract goal has been established,
- 2) Clause in each prime contract, and
- 3) Clause in solicitations that are obtaining DBE participation through race/gender neutral means.

Use of Provision –

1. *Solicitations with a DBE Project Goal* – No mandatory language provided. 49 CFR §26.53 requires a sponsor's solicitation to address what a contractor must submit on proposed DBE participation. The language of A12.3.1 is acceptable to the FAA in meeting the intent of this requirement. If the sponsor uses different language, the sponsor's revised language must fully satisfy these requirements. The sponsor may require the contractor's submittal on proposed DBE participation either at bid opening as a matter of responsiveness or within five days of bid opening as a matter of responsibility.
2. *Solicitations Relying on Race-gender Neutral Means* – No mandatory language provided. The language of A12.3.2 is acceptable to the FAA in meeting the intent of this requirement. If the sponsor uses different language, the sponsor's revised language must fully satisfy requirements for a sponsor that is not applying a project specific contract goal but is covered by a DBE program on file with the FAA.
3. *Contracts Covered by DBE Program* – **MANDATORY TEXT PROVIDED**. Sponsors must incorporate this language if they have a DBE program on file with the FAA. This includes projects where DBE participation is obtained through race-gender neutral means (i.e. no project goal). Sections §26.13 and §26.29 establish mandatory language for contractor assurance and prompt payment. The sponsor must not modify the language.
4. Sponsors that are not required to have a DBE program on file with the FAA are not required to include DBE provisions and clauses.

A12.3 REQUIRED PROVISIONS

A12.3.1 Solicitation Language (Solicitations that include a Project Goal)

Information Submitted as a matter of bidder responsiveness:

The Owner's award of this contract is conditioned upon Bidder or Offeror satisfying the good faith effort requirements of 49 CFR §26.53.

As a condition of bid responsiveness, the Bidder or Offeror must submit the following information with its proposal on the forms provided herein:

- 1) The names and addresses of Disadvantaged Business Enterprise (DBE) firms that will participate in the contract;
- 2) A description of the work that each DBE firm will perform;
- 3) The dollar amount of the participation of each DBE firm listed under (1)
- 4) Written statement from Bidder or Offeror that attests their commitment to use the DBE firm(s) listed under (1) to meet the Owner's project goal; and
- 5) If Bidder or Offeror cannot meet the advertised project DBE goal, evidence of good faith efforts undertaken by the Bidder or Offeror as described in appendix A to 49 CFR part 26.

Information submitted as a matter of bidder responsibility:

The Owner's award of this contract is conditioned upon Bidder or Offeror satisfying the good faith effort requirements of 49 CFR §26.53.

The successful Bidder or Offeror must provide written confirmation of participation from each of the DBE firms the Bidder or Offeror lists in its commitment within five days after bid opening.

- 1) The names and addresses of Disadvantaged Business Enterprise (DBE) firms that will participate in the contract;
- 2) A description of the work that each DBE firm will perform;
- 3) The dollar amount of the participation of each DBE firm listed under (1)
- 4) Written statement from Bidder or Offeror that attests their commitment to use the DBE firm(s) listed under (1) to meet the Owner's project goal; and
- 5) If Bidder or Offeror cannot meet the advertised project DBE goal, evidence of good faith efforts undertaken by the Bidder or Offeror as described in appendix A to 49 CFR part 26.

A12.3.2 Solicitation Language (Race/Gender Neutral Means)

The requirements of 49 CFR part 26 apply to this contract. It is the policy of the [Insert Name of Owner] to practice nondiscrimination based on race, color, sex, or national origin in the award or performance of this contract. The Owner encourages participation by all firms qualifying under this solicitation regardless of business size or ownership.

A12.3.3 Prime Contracts (Projects Covered by a DBE Program)

DISADVANTAGED BUSINESS ENTERPRISES

Contract Assurance (§ 26.13) –

The Contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of Department of Transportation-assisted contracts. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the Owner deems appropriate, which may include, but is not limited to:

- 1) Withholding monthly progress payments;
- 2) Assessing sanctions;
- 3) Liquidated damages; and/or
- 4) Disqualifying the Contractor from future bidding as non-responsible.

Prompt Payment (§26.29) – The prime contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of its contract no later than **30** days from the receipt of each payment the prime contractor receives from **Savannah Airport Commission**. The prime contractor agrees further to return retainage payments to each subcontractor within **30** days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of the [Name of Recipient]. This clause applies to both DBE and non-DBE subcontractors.

A13 DISTRACTED DRIVING

A13.1 SOURCE

Executive Order 13513

DOT Order 3902.10

A13.2 APPLICABILITY

The FAA encourages recipients of Federal grant funds to adopt and enforce safety policies that decrease crashes by distracted drivers, including policies to ban text messaging while driving when performing work related to a grant or subgrant.

Contract Types – Sponsors must insert this provision in all AIP funded contracts that exceed the micro-purchase threshold of 2 CFR §200.67 (currently set at \$3,500).

Use of Provision – No mandatory text provided. The following language is acceptable to the FAA in meeting the intent of this requirement. If the sponsor uses different language, the sponsor’s revised language must fully satisfy these requirements.

A13.3 CONTRACT CLAUSE

TEXTING WHEN DRIVING

In accordance with Executive Order 13513, “Federal Leadership on Reducing Text Messaging While Driving”, (10/1/2009) and DOT Order 3902.10, “Text Messaging While Driving”, (12/30/2009), the Federal Aviation Administration encourages recipients of Federal grant funds to adopt and enforce safety policies that decrease crashes by distracted drivers, including policies to ban text messaging while driving when performing work related to a grant or subgrant.

In support of this initiative, the Owner encourages the Contractor to promote policies and initiatives for its employees and other work personnel that decrease crashes by distracted drivers, including policies that ban text messaging while driving motor vehicles while performing work activities associated with the project. The Contractor must include the substance of this clause in all sub-tier contracts exceeding \$3,500 that involve driving a motor vehicle in performance of work activities associated with the project.

A14 ENERGY CONSERVATION REQUIREMENTS

A14.1 SOURCE

2 CFR § 200, Appendix II(H)

A14.2 APPLICABILITY

The Energy Conservation Requirements of 2 CFR § 200 Appendix II(H) requires this provision on energy efficiency.

Contract Types – The sponsor must include this provision in all AIP funded contracts and lower-tier contracts.

Use of Provision – No mandatory text provided. The following language is acceptable to the FAA and meets the intent of this requirement. If the sponsor uses different language, the sponsor’s revised language must fully satisfy these requirements. Sponsor may substitute “Contractor and subcontractor” with “Consultant and sub-consultant” for professional service agreements.

A14.3 CONTRACT CLAUSE

ENERGY CONSERVATION REQUIREMENTS

Contractor and Subcontractor agree to comply with mandatory standards and policies relating to energy efficiency as contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 USC 6201*et seq*).

A15 DRUG FREE WORKPLACE REQUIREMENTS

A15.1 SOURCE

49 CFR part 32

Drug-Free Workplace Act of 1988 (41 U.S.C. 701 *et seq.*, as amended)

A15.2 APPLICABILITY

The Drug-Free Workplace Act of 1988 requires some Federal contractors and *all* Federal grantees to agree that they will provide drug-free workplaces as a condition of receiving a contract or grant from a Federal agency. The Act does ***not*** apply to contractors, subcontractors, or subgrantees, although the Federal grantees workplace may be where the contractors, subcontractors, or subgrantees are working.

Contract Types – This provision applies to all AIP funded projects, but not to the contracts between the grantee (the sponsor) and a contractor, subcontractors, suppliers, or subgrantees.

Use of Provision – No mandatory or recommended text provided because the requirements do not extend beyond the sponsor level.

A15.3 CONTRACT CLAUSE

None.

A16 EQUAL EMPLOYMENT OPPORTUNITY (EEO)

A16.1 SOURCE

2 CFR 200, Appendix II(C)

41 CFR § 60-1.4

41 CFR § 60-4.3

Executive Order 11246

A16.2 APPLICABILITY

The purpose of this provision is to provide equal opportunity for all persons, without regard to race, color, religion, sex, or national origin who are employed or seeking employment with contractors performing under a federally assisted construction contract. There are two provisions — a construction clause and a specification clause.

The equal opportunity contract clause must be included in any contract or subcontract when the amount exceeds \$10,000. Once the equal opportunity clause is determined to be applicable, the contract or subcontract must include the clause for the remainder of the year, regardless of the amount or the contract.

Contract Types –

Construction – The sponsor must incorporate contract and specification language in all construction contracts and subcontracts as required above.

Equipment – The sponsor must incorporate contract and specification language into all equipment contracts as required above that involves installation of equipment onsite (e.g. electrical vault equipment). This provision does not apply to equipment acquisition projects where the manufacture of the equipment takes place offsite at the vendor plant (e.g. ARFF and SRE vehicles).

Professional Services – The sponsor must include contract and specification language into all professional service agreements as required above.

Property – The sponsor must include contract and specification language into all land acquisition projects that include work that qualifies as construction work as defined by 41 CFR part 60 as required above. An example is installation of boundary fencing.

Use of Provision – MANDATORY TEXT. 41 CFR § 60-1.4 provides the mandatory ***contract*** language. 41 CFR § 60-4.3 provides the mandatory ***specification*** language. The sponsor must incorporate these clauses without modification.

A16.3 MANDATORY CONTRACT CLAUSE

A16.3.1 EEO Contract Clause

EQUAL OPPORTUNITY CLAUSE

During the performance of this contract, the Contractor agrees as follows:

- (1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, sexual orientation, gender identify, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff, or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
- (2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.
- (3) The Contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the Contractor's commitments under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- (4) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
- (5) The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
- (6) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
- (7) The Contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or

vendor. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: *Provided, however*, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

A16.3.2 EEO Specification

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS

1. As used in these specifications:

- a. “Covered area” means the geographical area described in the solicitation from which this contract resulted;
- b. “Director” means Director, Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, or any person to whom the Director delegates authority;
- c. “Employer identification number” means the Federal social security number used on the Employer’s Quarterly Federal Tax Return, U.S. Treasury Department Form 941;
- d. “Minority” includes:
 - (1) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
 - (2) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin regardless of race);
 - (3) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
 - (4) American Indian or Alaskan native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR part 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors shall be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved plan is individually required to comply with its obligations under the EEO clause and to make a good faith effort to achieve each goal

under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through 7p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in a geographical area where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement nor the failure by a union with whom the Contractor has a collective bargaining agreement to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees shall be employed by the Contractor during the training period and the Contractor shall have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees shall be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully and shall implement affirmative action steps at least as extensive as the following:

- a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
- b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
- c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such

individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore along with whatever additional actions the Contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or female sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions, including specific review of these items, with onsite supervisory personnel such as superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other contractors and subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students; and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations, such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a contractor's workforce.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel, for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are non-segregated except that separate or single user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative action obligations (7a through 7p). The efforts of a contractor association, joint contractor union, contractor community, or other similar groups of which the Contractor is a member and participant may be asserted as fulfilling any one or more of its obligations under 7a through 7p of these specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, if the particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally), the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized.

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination, and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR part 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records. Records shall at least include for each employee, the name, address, telephone number, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g. those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

A17 FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE)

A17.1 SOURCE

29 USC § 201, et seq

A17.2 APPLICABILITY

The U.S. Department of Labor (DOL) Wage and Hour Division administers the Fair Labor Standards Act (FLSA). This act prescribes federal standards for basic minimum wage, overtime pay, record keeping, and child labor standards.

Contract Types – Per the Department of Labor, all employees of certain enterprises having workers engaged in interstate commerce; producing goods for interstate commerce; or handling, selling, or otherwise working on goods or materials that have been moved in or produced for such commerce by any person are covered by the FLSA.

All consultants, sub-consultants, contractors, and subcontractors employed under this federally assisted project must comply with the FLSA.

Professional Services – 29 CFR § 213 exempts employees in a bona fide executive, administrative or professional capacity. Because professional firms employ individuals that are not covered by this exemption, the sponsor's agreement with a professional services firm must include the FLSA provision.

Use of Provision – No mandatory text provided. The following language is acceptable to the FAA and meets the intent of this requirement. If the sponsor uses different language, the sponsor's language must fully satisfy the requirements of 29 USC § 201. The sponsor must select *contractor* or *consultant*, as appropriate for the contract.

A17.3 SOLICITATION CLAUSE

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR part 201, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part-time workers.

The [*Contractor / Consultant*] has full responsibility to monitor compliance to the referenced statute or regulation. The [*Contractor / Consultant*] must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division.

A18 LOBBYING AND INFLUENCING FEDERAL EMPLOYEES

A18.1 SOURCE

31 USC § 1352 – Byrd Anti-Lobbying Amendment

2 CFR part 200, Appendix II(J)

49 CFR part 20, Appendix A

A18.2 APPLICABILITY

Consultants and contractors that apply or bid for an award of \$100,000 or more must certify that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant, or another award covered by 31 USC 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award.

Contract Types – The sponsor must incorporate this provision into all contracts exceeding \$100,000.

Use of Provision – MANDATORY TEXT. Appendix A to 49 CFR Part 20 prescribes language the sponsor must use. The sponsor must incorporate this provision without modification.

A18.3 CONTRACT CLAUSE

CERTIFICATION REGARDING LOBBYING

The Bidder or Offeror certifies by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the Bidder or Offeror, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, “Disclosure Form to Report Lobbying,” in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, subgrants, and contracts under

grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

A19 PROHIBITION of SEGREGATED FACILITIES

A19.1 SOURCE

41 CFR § 60

A19.2 APPLICABILITY

The contractor must comply with the requirements of the EEO clause by ensuring that facilities they provide for employees are free of segregation on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin. This clause must be included in all contracts that include the equal opportunity clause, regardless of the amount of the contract.

Contract Types – AIP sponsors must incorporate the Prohibition of Segregated Facilities clause in any contract containing the Equal Employment Opportunity clause of 41 CFR §60.1. This obligation flows down to subcontract and sub-tier purchase orders containing the Equal Employment Opportunity clause.

Construction – Construction work means construction, rehabilitation, alteration, conversion, extension, demolition or repair of buildings, highways, or other changes or improvements to real property, including facilities providing utility services. The term also includes the supervision, inspection, and other onsite functions incidental to the actual construction.

Equipment – On site installation of equipment such as airfield lighting control equipment meets the definition of construction and thus this provision would apply. This provision does not apply to equipment projects involving manufacture of the item at a vendor's manufacturing plant. An example would be the manufacture of a SRE or ARFF vehicle.

Professional Services – Professional services that include tasks that qualify as construction work as defined by 41 CFR part 60. Examples include the installation of noise monitoring equipment.

Property/Land – Land acquisition contracts that include tasks that qualify as construction work as defined by 41 CFR part 60. Examples include demolition of structures or installation of boundary fencing.

Use of Provision – No mandatory text provided. The following language is acceptable to the FAA and meets the intent of this requirement. If the sponsor uses different language, the sponsor's language must fully satisfy the requirements of 41 CFR § 60.

A19.3 CONTRACT CLAUSE

PROHIBITION OF SEGREGATED FACILITIES

(a) The Contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor agrees that a breach of this clause is a violation of the Equal Employment Opportunity clause in this contract.

(b) “Segregated facilities,” as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes.

(c) The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Employment Opportunity clause of this contract.

A20 OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

A20.1 SOURCE

29 CFR part 1910

A20.2 APPLICABILITY

Contract Types – All contracts and subcontracts must comply with the Occupational Safety and Health Act of 1970 (OSH). The U.S. Department of Labor Occupational Safety and Health Administration (OSHA) oversees the workplace health and safety standards wage provisions from OSH.

Use of Provision – No mandatory text provided. The following language is acceptable to the FAA and meets the intent of this requirement. If the sponsor uses different language, the sponsor's language must fully satisfy the requirements of 20 CFR part 1910.

A20.3 CONTRACT CLAUSE

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. The employer must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The employer retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (20 CFR Part 1910). The employer must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.

A21 PROCUREMENT OF RECOVERED MATERIALS

A21.1 SOURCE

2 CFR § 200.322

40 CFR part 247

Solid Waste Disposal Act

A21.2 APPLICABILITY

Sponsors of AIP funded development and equipment projects must comply with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. Section 6002 emphasizes maximizing energy and resource recovery through use of affirmative procurement actions for recovered materials identified in the Environmental Protection Agency (EPA) guidelines codified at 40 CFR part 247. When acquiring items designated in the guidelines, the sponsor must procure items that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition.

Contract Types – This provision applies to any contracts that include procurement of products designated in subpart B of 40 CFR part 247 where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired by the preceding fiscal year exceeded \$10,000.

Construction and Equipment – Include this provision in all construction and equipment projects.

Professional Services and Property – Include this provision if the agreement includes procurement of a product that exceeds \$10,000.

Use of Provision – No mandatory text provided. The following language is acceptable to the FAA and meets the intent of this requirement. If the sponsor uses different language, the sponsor's language must fully satisfy the requirements of 2 CFR § 200.

A21.3 CONTRACT CLAUSE

PROCUREMENT OF RECOVERED MATERIALS

Contractor and subcontractor agree to comply with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, and the regulatory provisions of 40 CFR Part 247. In the performance of this contract and to the extent practicable, the Contractor and subcontractors are to use products containing the highest percentage of recovered materials for items designated by the Environmental Protection Agency (EPA) under 40 CFR Part 247 whenever:

- 1) The contract requires procurement of \$10,000 or more of a designated item during the fiscal year; or
- 2) The contractor has procured \$10,000 or more of a designated item using Federal funding during the previous fiscal year.

The list of EPA-designated items is available at www.epa.gov/smm/comprehensive-procurement-guidelines-construction-products.

Section 6002(c) establishes exceptions to the preference for recovery of EPA-designated products if the contractor can demonstrate the item is:

- a) Not reasonably available within a timeframe providing for compliance with the contract performance schedule;
- b) Fails to meet reasonable contract performance requirements; or
- c) Is only available at an unreasonable price.

A22 RIGHT TO INVENTIONS

A22.1 SOURCE

2 CFR § 200, Appendix II(F)

37 CFR §401

A22.2 APPLICABILITY

Contract Types – This provision applies to all contracts and subcontracts with small business firms or nonprofit organizations that include performance of *experimental, developmental, or research work*. This clause is not applicable to construction, equipment, or professional service contracts unless the contract includes *experimental, developmental, or research work*.

Use of Provision – No mandatory text provided. The following language is acceptable to the FAA and meets the intent of this requirement. If the sponsor uses different language, the sponsor’s language must fully satisfy the requirements of Appendix II to 2 CFR part 200.

A22.3 CONTRACT CLAUSE

RIGHTS TO INVENTIONS

Contracts or agreements that include the performance of experimental, developmental, or research work must provide for the rights of the Federal Government and the Owner in any resulting invention as established by 37 CFR part 401, Rights to Inventions Made by Non-profit Organizations and Small Business Firms under Government Grants, Contracts, and Cooperative Agreements. This contract incorporates by reference the patent and inventions rights as specified within 37 CFR §401.14. Contractor must include this requirement in all sub-tier contracts involving experimental, developmental, or research work.

A23 SEISMIC SAFETY

A23.1 SOURCE

49 CFR part 41

A23.2 APPLICABILITY

Contract Types – This provision applies to construction of new buildings and additions to existing buildings financed in whole or in part through the Airport Improvement Program.

Professional Services– Sponsor must incorporate this clause in any contract involved in the construction of new buildings or structural addition to existing buildings.

Construction – Sponsor must incorporate this clause in any contract involved in the construction of new buildings or structural addition to existing buildings.

Equipment – Sponsor must include the construction provision if the project involves construction or structural addition to a building such as an electrical vault project to accommodate or install equipment.

Land – This provision will not typically apply to a property/land project.

Use of Provision – No mandatory text provided. The following language is acceptable to the FAA and meets the intent of this requirement. If the sponsor uses different language, the sponsor’s language must fully satisfy the requirements of 49 CFR part 41.

A23.3 CONTRACT CLAUSE

A23.3.1 Professional Service Agreements for Design

SEISMIC SAFETY

In the performance of design services, the Consultant agrees to furnish a building design and associated construction specification that conform to a building code standard that provides a level of seismic safety substantially equivalent to standards as established by the National Earthquake Hazards Reduction Program (NEHRP). Local building codes that model their building code after the current version of the International Building Code (IBC) meet the NEHRP equivalency level for seismic safety. At the conclusion of the design services, the Consultant agrees to furnish the Owner a “certification of compliance” that attests conformance of the building design and the construction specifications with the seismic standards of NEHRP or an equivalent building code.

A23.3.2 Construction Contracts

SEISMIC SAFETY

The Contractor agrees to ensure that all work performed under this contract, including work performed by subcontractors, conforms to a building code standard that provides a level of seismic safety substantially equivalent to standards established by the National Earthquake Hazards Reduction

Program (NEHRP). Local building codes that model their code after the current version of the International Building Code (IBC) meet the NEHRP equivalency level for seismic safety.

A24 TAX DELINQUENCY AND FELONY CONVICTIONS

A24.1 SOURCE

Sections 415 and 416 of Title IV, Division L of the Consolidated Appropriations Act, 2014 (Pub. L. 113-76), and similar provisions in subsequent appropriations acts.

DOT Order 4200.6 - Requirements for Procurement and Non-Procurement Regarding Tax Delinquency and Felony Convictions

A24.2 APPLICABILITY

The sponsor must ensure that no funding goes to any contractor who:

- Has been convicted of a Federal felony within the last 24 months; or
- Has any outstanding tax liability for which all judicial and administrative remedies have lapsed or been exhausted.

Contract Types – This provision applies to all contracts funded in whole or part with AIP.

Use of Provision – The following language is acceptable to the FAA and meets the intent of this requirement. If the sponsor uses different language, the sponsor's language must fully satisfy the requirements of DOT Order 4200.6.

A24.3 CONTRACT CLAUSE

CERTIFICATION OF OFFERER/BIDDER REGARDING TAX DELINQUENCY AND FELONY CONVICTIONS

The applicant must complete the following two certification statements. The applicant must indicate its current status as it relates to tax delinquency and felony conviction by inserting a checkmark (✓) in the space following the applicable response. The applicant agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification in all lower tier subcontracts.

Certifications

- 1) The applicant represents that it is (☐) is not (☐) a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.
- 2) The applicant represents that it is (☐) is not (☐) is not a corporation that was convicted of a criminal violation under any Federal law within the preceding 24 months.

Note

If an applicant responds in the affirmative to either of the above representations, the applicant is ineligible to receive an award unless the sponsor has received notification from the agency suspension and debarment official (SDO) that the SDO has considered suspension or debarment and determined that further action is not required to protect the Government's interests. The applicant therefore must

provide information to the owner about its tax liability or conviction to the Owner, who will then notify the FAA Airports District Office, which will then notify the agency's SDO to facilitate completion of the required considerations before award decisions are made.

Term Definitions

Felony conviction: Felony conviction means a conviction within the preceding twentyfour (24) months of a felony criminal violation under any Federal law and includes conviction of an offense defined in a section of the U.S. code that specifically classifies the offense as a felony and conviction of an offense that is classified as a felony under 18 U.S.C. § 3559.

Tax Delinquency: A tax delinquency is any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

A25 TERMINATION OF CONTRACT

A25.1 SOURCE

2 CFR § 200 Appendix II(B)

FAA Advisory Circular 150/5370-10, Section 80-09

A25.2 APPLICABILITY

Contract Types – All contracts and subcontracts in excess of \$10,000 must address *termination for cause* and *termination for convenience* by the sponsor. The provision must address the manner (i.e. notice, opportunity to cure, and effective date) by which the sponsor's contract will be affected and the basis for settlement (i.e. incurred expenses, completed work, profit, etc.).

Use of Provision –

Termination for Default – **MANDATORY TEXT.** Section 80-09 of FAA Advisory Circular 150/5370-10 establishes standard language for Termination for Default under a construction contract. The sponsor must not make any changes to this standard language.

Termination for Convenience – No mandatory text provided. The sponsor must include a clause for termination for convenience. The following language is acceptable to the FAA and meets the intent of this requirement. If the sponsor uses different language, the sponsor's language must fully satisfy the requirements of Appendix II to 2 CFR part 200.

Equipment, Professional Services, and Property – No mandatory text provided. The sponsor may use their established clause language provided that it adequately addresses the intent of Appendix II(B) to Part 200, which addresses termination for fault and for convenience.

A25.3 CONTRACT CLAUSE

A25.3.1 Termination for Convenience

TERMINATION FOR CONVENIENCE (CONSTRUCTION & EQUIPMENT CONTRACTS)

The Owner may terminate this contract in whole or in part at any time by providing written notice to the Contractor. Such action may be without cause and without prejudice to any other right or remedy of Owner. Upon receipt of a written notice of termination, except as explicitly directed by the Owner, the Contractor shall immediately proceed with the following obligations regardless of any delay in determining or adjusting amounts due under this clause:

1. Contractor must immediately discontinue work as specified in the written notice.
2. Terminate all subcontracts to the extent they relate to the work terminated under the notice.
3. Discontinue orders for materials and services except as directed by the written notice.

4. Deliver to the Owner all fabricated and partially fabricated parts, completed and partially completed work, supplies, equipment and materials acquired prior to termination of the work, and as directed in the written notice.
5. Complete performance of the work not terminated by the notice.
6. Take action as directed by the Owner to protect and preserve property and work related to this contract that Owner will take possession.

Owner agrees to pay Contractor for:

- 1) completed and acceptable work executed in accordance with the contract documents prior to the effective date of termination;
- 2) documented expenses sustained prior to the effective date of termination in performing work and furnishing labor, materials, or equipment as required by the contract documents in connection with uncompleted work;
- 3) reasonable and substantiated claims, costs, and damages incurred in settlement of terminated contracts with Subcontractors and Suppliers; and
- 4) reasonable and substantiated expenses to the Contractor directly attributable to Owner's termination action.

Owner will not pay Contractor for loss of anticipated profits or revenue or other economic loss arising out of or resulting from the Owner's termination action.

The rights and remedies this clause provides are in addition to any other rights and remedies provided by law or under this contract.

TERMINATION FOR CONVENIENCE (PROFESSIONAL SERVICES)

The Owner may, by written notice to the Consultant, terminate this Agreement for its convenience and without cause or default on the part of Consultant. Upon receipt of the notice of termination, except as explicitly directed by the Owner, the Contractor must immediately discontinue all services affected.

Upon termination of the Agreement, the Consultant must deliver to the Owner all data, surveys, models, drawings, specifications, reports, maps, photographs, estimates, summaries, and other documents and materials prepared by the Engineer under this contract, whether complete or partially complete.

Owner agrees to make just and equitable compensation to the Consultant for satisfactory work completed up through the date the Consultant receives the termination notice. Compensation will not include anticipated profit on non-performed services.

Owner further agrees to hold Consultant harmless for errors or omissions in documents that are incomplete as a result of the termination action under this clause.

A25.3.2 Termination for Default

TERMINATION FOR DEFAULT (CONSTRUCTION)

Section 80-09 of FAA Advisory Circular 150/5370-10 establishes conditions, rights, and remedies associated with Owner termination of this contract due to default of the Contractor.

TERMINATION FOR DEFAULT (EQUIPMENT)

The Owner may, by written notice of default to the Contractor, terminate all or part of this Contract if the Contractor:

1. Fails to commence the Work under the Contract within the time specified in the Notice- to-Proceed;
2. Fails to make adequate progress as to endanger performance of this Contract in accordance with its terms;
3. Fails to make delivery of the equipment within the time specified in the Contract, including any Owner approved extensions;
4. Fails to comply with material provisions of the Contract;
5. Submits certifications made under the Contract and as part of their proposal that include false or fraudulent statements; or
6. Becomes insolvent or declares bankruptcy.

If one or more of the stated events occur, the Owner will give notice in writing to the Contractor and Surety of its intent to terminate the contract for cause. At the Owner's discretion, the notice may allow the Contractor and Surety an opportunity to cure the breach or default.

If within [10] days of the receipt of notice, the Contractor or Surety fails to remedy the breach or default to the satisfaction of the Owner, the Owner has authority to acquire equipment by other procurement action. The Contractor will be liable to the Owner for any excess costs the Owner incurs for acquiring such similar equipment.

Payment for completed equipment delivered to and accepted by the Owner shall be at the Contract price. The Owner may withhold from amounts otherwise due the Contractor for such completed equipment, such sum as the Owner determines to be necessary to protect the Owner against loss because of Contractor default.

Owner will not terminate the Contractor's right to proceed with the Work under this clause if the delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such acceptable causes include: acts of God, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, and severe weather events that substantially exceed normal conditions for the location.

If, after termination of the Contractor's right to proceed, the Owner determines that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the Owner issued the termination for the convenience the Owner.

The rights and remedies of the Owner in this clause are in addition to any other rights and remedies provided by law or under this contract.

TERMINATION FOR DEFAULT (PROFESSIONAL SERVICES)

Either party may terminate this Agreement for cause if the other party fails to fulfill its obligations that are essential to the completion of the work per the terms and conditions of the Agreement. The party

initiating the termination action must allow the breaching party an opportunity to dispute or cure the breach.

The terminating party must provide the breaching party [7] days advance written notice of its intent to terminate the Agreement. The notice must specify the nature and extent of the breach, the conditions necessary to cure the breach, and the effective date of the termination action. The rights and remedies in this clause are in addition to any other rights and remedies provided by law or under this agreement.

- a) **Termination by Owner:** The Owner may terminate this Agreement in whole or in part, for the failure of the Consultant to:
1. Perform the services within the time specified in this contract or by Owner approved extension;
 2. Make adequate progress so as to endanger satisfactory performance of the Project; or
 3. Fulfill the obligations of the Agreement that are essential to the completion of the Project.

Upon receipt of the notice of termination, the Consultant must immediately discontinue all services affected unless the notice directs otherwise. Upon termination of the Agreement, the Consultant must deliver to the Owner all data, surveys, models, drawings, specifications, reports, maps, photographs, estimates, summaries, and other documents and materials prepared by the Engineer under this contract, whether complete or partially complete.

Owner agrees to make just and equitable compensation to the Consultant for satisfactory work completed up through the date the Consultant receives the termination notice. Compensation will not include anticipated profit on non-performed services.

Owner further agrees to hold Consultant harmless for errors or omissions in documents that are incomplete as a result of the termination action under this clause.

If, after finalization of the termination action, the Owner determines the Consultant was not in default of the Agreement, the rights and obligations of the parties shall be the same as if the Owner issued the termination for the convenience of the Owner.

- b) **Termination by Consultant:** The Consultant may terminate this Agreement in whole or in part, if the Owner:
1. Defaults on its obligations under this Agreement;
 2. Fails to make payment to the Consultant in accordance with the terms of this Agreement;
 3. Suspends the Project for more than [180] days due to reasons beyond the control of the Consultant.

Upon receipt of a notice of termination from the Consultant, Owner agrees to cooperate with Consultant for the purpose of terminating the agreement or portion thereof, by mutual consent. If Owner and Consultant cannot reach mutual agreement on the termination settlement, the Consultant may, without prejudice to any rights and remedies it may have, proceed with terminating all or parts of this Agreement based upon the Owner's breach of the contract.

In the event of termination due to Owner breach, the Engineer is entitled to invoice Owner and to receive full payment for all services performed or furnished in accordance with this Agreement and all justified reimbursable expenses incurred by the Consultant through the effective date of

termination action. Owner agrees to hold Consultant harmless for errors or omissions in documents that are incomplete as a result of the termination action under this clause.

A26 TRADE RESTRICTION CERTIFICATION

A26.1 SOURCE

49 USC § 50104

49 CFR part 30

A26.2 APPLICABILITY

Unless waived by the Secretary of Transportation, sponsors may not use AIP funds on a product or service from a foreign country included in the current list of countries that discriminate against U.S. firms as published by the Office of the United States Trade Representative (USTR).

Contract Types – The trade restriction certification and clause applies to all AIP funded projects.

Use of Provision – MANDATORY TEXT. 49 CFR part 30 prescribes the language for this model clause. The sponsor must include this certification language in all contracts and subcontracts without modification.

A26.3 SOLICITATION CLAUSE

TRADE RESTRICTION CERTIFICATION

By submission of an offer, the Offeror certifies that with respect to this solicitation and any resultant contract, the Offeror –

- 1) is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms as published by the Office of the United States Trade Representative (USTR);
- 2) has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country included on the list of countries that discriminate against U.S. firms as published by the USTR; and
- 3) has not entered into any subcontract for any product to be used on the Federal project that is produced in a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18 USC Section 1001.

The Offeror/Contractor must provide immediate written notice to the Owner if the Offeror/Contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The Contractor must require subcontractors provide immediate written notice to the Contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR 30.17, no contract shall be awarded to an Offeror or subcontractor:

- 1) who is owned or controlled by one or more citizens or nationals of a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR or
- 2) whose subcontractors are owned or controlled by one or more citizens or nationals of a foreign country on such USTR list or
- 3) who incorporates in the public works project any product of a foreign country on such USTR list.

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

The Offeror agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in all lower tier subcontracts. The Contractor may rely on the certification of a prospective subcontractor that it is not a firm from a foreign country included on the list of countries that discriminate against U.S. firms as published by USTR, unless the Offeror has knowledge that the certification is erroneous.

This certification is a material representation of fact upon which reliance was placed when making an award. If it is later determined that the Contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration (FAA) may direct through the Owner cancellation of the contract or subcontract for default at no cost to the Owner or the FAA.

A27 VETERAN'S PREFERENCE

A27.1 SOURCE

49 USC § 47112(c)

A27.2 APPLICABILITY

Contract Types – This provision applies to all AIP funded projects that involve labor to carry out the project. This preference, which excludes executive, administrative, and supervisory positions, applies to covered veterans (as defined under § 47112(c)) only when they are readily available and qualified to accomplish the work required by the project.

Use of Provision – No mandatory text provided. The following language is acceptable to the FAA and meets the intent of this requirement. If the sponsor uses different language, the sponsor's language must fully satisfy the requirements of 49 USC § 47112.

A27.3 CONTRACT CLAUSE

VETERAN'S PREFERENCE

In the employment of labor (excluding executive, administrative, and supervisory positions), the Contractor and all sub-tier contractors must give preference to covered veterans as defined within Title 49 United States Code Section 47112. Covered veterans include Vietnam-era veterans, Persian Gulf veterans, Afghanistan-Iraq war veterans, disabled veterans, and small business concerns (as defined by 15 USC 632) owned and controlled by disabled veterans. This preference only applies when there are covered veterans readily available and qualified to perform the work to which the employment relates.

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**DAVIS-BACON WAGE
RATES
FOR
CHATHAM COUNTY,
GEORGIA**

General Decision Number: GA180241 01/05/2018 GA241

Superseded General Decision Number: GA20170241

State: Georgia

Construction Type: Highway

County: Chatham County in Georgia.

HIGHWAY CONSTRUCTION PROJECTS

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.35 for calendar year 2018 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.35 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2018. The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/05/2018

SUGA2014-063 10/03/2016

	Rates	Fringes
CARPENTER, Includes Form Work....	\$ 17.46	0.00
CEMENT MASON/CONCRETE FINISHER...	\$ 17.62	0.00
HIGHWAY/PARKING LOT STRIPING:		
Operator (Striping Machine).....	\$ 12.39	1.94
IRONWORKER, REINFORCING.....	\$ 15.46	0.00
IRONWORKER, STRUCTURAL.....	\$ 15.13	0.00
LABORER: Grade Checker.....	\$ 11.45	0.00
LABORER: Mason Tender - Cement/Concrete.....	\$ 11.44	0.00
LABORER: Pipelayer.....	\$ 11.09	0.00
LABORER: Asphalt (Includes Distributor, Raker, Screed, Shoveler, and Spreader).....	\$ 11.95	0.00

LABORER: Common or General, Includes Erosion Control.....	\$ 10.97	0.00
OPERATOR:		
Backhoe/Excavator/Trackhoe.....	\$ 17.47	0.00
OPERATOR: Bobcat/Skid		
Steer/Skid Loader.....	\$ 12.22	0.00
OPERATOR: Broom/Sweeper.....	\$ 14.04	1.43
OPERATOR: Bulldozer.....	\$ 17.03	0.00
OPERATOR: Compactor.....	\$ 14.04	0.00
OPERATOR: Concrete Saw.....	\$ 18.47	0.00
OPERATOR: Crane.....	\$ 24.38	0.00
OPERATOR: Grader/Blade.....	\$ 18.18	0.00
OPERATOR: Hydroseeder.....	\$ 13.93	0.00
OPERATOR: Loader.....	\$ 15.16	0.00
OPERATOR: Mechanic.....	\$ 19.85	0.00
OPERATOR: Milling Machine.....	\$ 16.20	1.64
OPERATOR: Paver (Asphalt, Aggregate, and Concrete).....	\$ 14.98	0.00
OPERATOR: Piledriver.....	\$ 16.70	0.00
OPERATOR: Roller.....	\$ 14.57	0.00
OPERATOR: Scraper.....	\$ 12.64	0.00
OPERATOR: Screed.....	\$ 17.53	0.00
PAINTER: Spray.....	\$ 23.30	0.00
TRAFFIC CONTROL: Flagger.....	\$ 12.20	0.00
TRAFFIC CONTROL:		
Laborer-Cones/ Barricades/Barrels - Setter/Mover/Sweeper.....	\$ 12.55	0.00
TRAFFIC SIGNALIZATION:		
Laborer.....	\$ 13.40	0.00
TRAFFIC SIGNALIZATION:		
Electrician.....	\$ 20.20	0.00
TRUCK DRIVER: Dump Truck.....	\$ 13.72	0.00

TRUCK DRIVER: Flatbed Truck.....	\$ 14.96	1.19
TRUCK DRIVER: Hydroseeder Truck.....	\$ 14.92	0.00
TRUCK DRIVER: Lowboy Truck.....	\$ 16.26	0.00
TRUCK DRIVER: Off the Road Truck.....	\$ 12.38	0.00
TRUCK DRIVER: Water Truck.....	\$ 14.00	0.00
TRUCK DRIVER: Semi/Trailer Truck.....	\$ 16.13	0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local, a survey rate (weighted average rate) or a union average rate (weighted union average rate)).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example:

PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

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**SUPPLEMENTAL GENERAL
CONDITIONS**

SAVANNAH AIRPORT COMMISSION

SUPPLEMENTARY GENERAL CONDITIONS

1. **PRECONSTRUCTION CONFERENCE**

A Preconstruction Conference will be scheduled immediately after the award of a construction contract. The successful Contractor shall be required to have key personnel from his staff attend this meeting.

2. **SEQUENCE OF WORK**

If so stated in this Section, the Contractor will follow the sequence of work as outlined. If there is no sequence of work outlined, the Contractor shall submit to the Engineer a sequence of construction prior to commencing work.

3. **CONSTRUCTION SCHEDULE AND MONEY FLOW CHART**

The Contractor will submit to the Owner a construction schedule, either CPM or bar chart, showing dates of commencing construction and each activity as they will be performed, including duration of each activity and completion date. This schedule must be completed and delivered to the Owner prior to issuance of the Notice to Proceed.

4. **COORDINATION OF WORK BY CONTRACTOR**

Contractor will notify the Owner's representative, Project Engineer, Inspector, and Project Manager 24 hours in advance of any material being placed or work being performed that requires testing. If such notification is not made, any material placed or work done will be the responsibility of the Contractor and shall not be accepted by the Owner, unless satisfactory proof can be given to the Owner that such work met the required standard of testing for that item.

The Contractor shall notify the Owner's representative, Project Engineer, Inspector, and Project Manager 48 hours prior to making any change to his predetermined work schedule. Any change that would affect the operation of the airport or require rescheduling of the project must be approved by the Owner; otherwise, the project may be stopped, and any down time would be absorbed by the Contractor and, if applicable, could be charged as liquidated damages if the project exceeds the work days or calendar days stipulated in the contract.

5. **WARRANTIES AND GUARANTEES**

The Contractor will furnish to the Owner written warranties on all equipment and material furnished on this contract. The Contractor will guarantee to the Owner that he will replace, repair, and make good any and all failures of his work, including all labor and material required to repair or replace all failed work for a period of 12 months beginning at the date of written acceptance of the project. If an item fails or has to be replaced within that 12-month period, he will, upon replacement or repair, guarantee that item for an amount of time that will equal 12

months from the date of repair or replacement.

6. AS BUILT PLANS

The Contractor will note on a set of plans any and all changes made to the plans, to include dimensions and reference points of the changes made. Any authorized changes made to the plans will be noted on the plans. All uncharted utilities or structures encountered during construction will be noted and located on the plans. This set of marked up as built plans will be submitted to the Owner prior to final payment being made on the project.

7. ENGINEER'S FIELD OFFICE

NOT USED.

8. INSURANCE REQUIREMENTS

The Contractor shall obtain and maintain with a company or companies authorized to do business in the State of Georgia, and approved by the Savannah Airport Commission, such insurance as will protect the Commission, and Contractor, from claims set forth below which may arise out of or result from Contractor's operations under the contract and for which the Contractor is legally liable, which includes operations by subcontractors, subcontractor's/ subcontractors, or by any persons directly or indirectly employed by Contractor or Subcontractor.

- a. Claims under workers' compensation, disability benefit, and other similar employee benefit acts. Further, Contractor shall relieve the Commission from any costs due to accidents or other liabilities mentioned in workers' compensation act. Contractor or subcontractors with either an insufficient number of employees or in certain excluded occupational classifications are required to maintain WORKERS' compensation coverage on a voluntary basis regardless of the statutory regulations. If the Contractor is from a state other than Georgia, before work begins he shall take whatever measures are necessary to eliminate conflicts regarding which state is responsible for WORKERS' compensation claims.
- b. Claims for damages because of bodily injury, occupational sickness or disease, or death of his employees.
- c. Claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees.
- d. Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by another person.

- e. Claims for damages, other than to the work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom.
 - f. Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle.
1. The insurance required above, shall be written for not less than the following amounts, or greater if required by law:
- a. Workers' Compensation:

Georgia Statutory

Employer's Liability, including all states

\$1,000,000 - each accident
\$1,000,000 - disease - policy limit
\$1,000,000 - disease - each employee
 - b. Comprehensive General Liability: shall include all major divisions of coverage and be on a comprehensive basis including, but not limited to:

Premises, operations, including explosion, collapse and underground; Independent Contractors' Protective; Products and Completed Operations; Broad Form Property Damage including completed operations; Contractual Liability; Personal Injury Liability with employment exclusion deleted. Must include projects at airports.

Bodily Injury and Property Damage Limits: \$1,000,000 combined single limit, each occurrence

Products and Completed Operations:
Insurance to be maintained for three (3) years after issuance of the final certificate for payment.
 - c. Mobile Equip/Comprehensive Vehicle Liability:

(Owned, non-owned, and hired.)

Bodily Injury/Property Damage Combined:

\$1,000,000 combined single limit, each occurrence
 - d. Umbrella/Excess Liability:

Umbrella/Excess Liability insurance covering all liability lines excess of the primary limits. The total limits of liability for each coverage including primary and umbrella coverages shall be no less than \$5,000,000 combined single limit – each occurrence.

e. Builders Risk (Property Insurance):
(IF APPLICABLE TO THE TYPE OF CONSTRUCTION)

Shall be purchased and maintained by the Contractor covering the entire Work at the site to the full insurable value thereof, including stockpiled material at the construction site intended for incorporation into the project.

Also, such insurance shall be in a company or companies against which Commission has no reasonable objection, and shall include the interest of the Commission, the Contractor, and Subcontractors in the Work. Such insurance shall insure against the perils of Fire, Extended Coverage, Theft, Vandalism and Malicious Mischief, and all other risks. If the Commission is damaged by the failure of the Contractor to maintain such insurance and to so notify the Commission, then the Contractor shall bear all reasonable costs properly attributable thereto. If not covered under such insurance or otherwise provided in the contract documents applicable to constructions, the Contractor shall effect and maintain similar Property Insurance on the Work stored off the site or in transit when such portions of the work are to be included in an application for payment under the contract.

2. The insurance required above should include contractual liability insurance applicable to the Contractor's obligations.

3. Detailed Information Relating to Insurance:

a. The Savannah Airport Commission requires that ALL LIABILITY POLICIES must be **ENDORSED** to include **the Mayor and Aldermen of the City of Savannah and the Savannah Airport Commission, its officers, directors, agents and employees as ADDITIONAL INSURED**. This must be reflected on the Certificate of Insurance which shall be furnished to the Commission. The Certificate of Insurance shall evidence proper limits of coverage as set forth herein and that the policy or policies will not be cancelled or modified without thirty (30) days prior written notice thereof is given to the Savannah Airport Commission. The Certificate shall also reflect that all policies have been endorsed to include waivers of any and all subrogation. The Contractor shall also require its subcontractors and subcontractors/subcontractors to endorse their policies to include **the Mayor and Aldermen of the City of Savannah and the Savannah Airport Commission, its officers, directors, agents and employees as ADDITIONAL INSURED**.

b. The extent of coverage or limits of liability provided under the policies procured by the Contractor and/or Subcontractors shall not be construed to be a limitation on the nature or extent of the Contractor's obligations or to relieve the Contractor of any such obligations or representation by the Savannah Airport Commission as to the adequacy of

the insurance to protect the Contractor against the obligations imposed on him by law or by this or any other contract. All policies shall be primary and non contributory.

c. Immediate notification must be given to the Savannah Airport Commission and/or its agent upon receiving any knowledge or notification of claim or litigation on which the Savannah Airport Commission may be named.

d. The Contractor shall indemnify, protect, defend, and hold completely harmless the Commission, and its officers, agents and employees from and against any and all liabilities, losses, suits, claims, judgments, fines, or demands arising by reason of injury or death of any person or damage to any property, including all reasonable costs for investigation and defense thereof (including but not limited to attorney fees, court costs, and expert fees), of any nature whatsoever arising out of or incident to this contract and/or the use of occupancy of the leased premises or the acts or omissions of Contractor's officers, agents, employees, contractors, subcontractors, licensees, or invitees, regardless of where the injury, death, or damage may occur, unless such injury, death or damage is caused by the sole negligence of the Commission. The Commission shall give to Contractor reasonable notice of any such claims or actions. The Contractor shall also use counsel reasonably acceptable to Commission in carrying out its obligations hereunder.

All policies shall be endorsed to include waivers of any and all subrogation.

9. AFFIDAVIT/FINAL PAYMENT

Before the final payment under this contract is made, the Contractor shall submit to the Owner a Contractor's Affidavit of Payment of Debts, Claims and Release of Liens. Forms will be furnished by the Owner.

10. PREVAILING WAGE RATES

The Construction wage rates have been furnished and compiled by the City of Savannah as those prevailing for construction of projects in the Chatham County area. In accordance with the terms of the Proposal, the Contractor agrees to pay to each employee of the corresponding craft at least the wage rate listed.

In addition to the basic hourly rates shown, certain crafts, trades, or industries indicate health, welfare, pension and other fringe benefits which are given employees pursuant to a bona fide Collective Bargaining Agreement for the respective craft, trade, or industry. In the absence of any such Agreement, the basic hourly rates plus the monetary equivalent for the fringe benefit payments indicated, less any legal deductions, shall be paid directly to the employees.

If the wage rate determination of the U. S. Department of Labor incorporated in the following page does not include rates for requested classifications, the Bidder is responsible for ascertaining the rates payable for such classifications and whether area practice requires their use in accomplishing the work. No inference

concerning area practice is to be drawn from this omission. Further, the omission will not, per se, establish any liability for increased labor cost resulting from the use of such classifications.

The Contractor and Subcontractors at any tier shall make and submit a copy of, to the Savannah Airport Commission, within seven (7) days, a record of all payments for labor with an affidavit that the weekly wages paid are not less than the applicable wage rates contained in the wage determination incorporated into the contract and that the classifications set forth therein for each laborer and mechanic conforms with the work he/she performed. Such records shall contain the name of the individual, his/her classification, the hourly rate, the number of hours worked, and the total amount paid including any and all deductions/withholdings for all individuals who provided and were paid via any means for labor on this project. Records shall be made, and copies provided to the Owner with each pay request, of all payments of any kind (including cash, check, voucher, or any other type of remuneration) to any individual (including employees, subcontractors, independent contractors, day laborers, or anybody else) who performed labor on this project for any kind of compensation whatsoever. Every pay request shall also include a copy of a record of Workers' compensation paid for any and all persons paid in any manner for labor of any type on this project.

The Contractor shall post and maintain a copy of the wage determination at the Contractor's field office or any other location as directed by the Savannah Airport Commission.

The Contractor and all Subcontractors, at any tier, shall maintain for a period of not less than three (3) years from the date of final payment all books, records, documents, and papers pertaining to the contract.

The Contractor and all Subcontractors, at any tier, shall provide to the City of Savannah, the Savannah Airport Commission, the FAA or any other Federal or State agency, the Comptroller General of the United States, or any of their duly authorized representatives access to all such books, documents, papers and records, pertaining to the contract for the purpose of examining, auditing and copying them.

11. SAFETY

a. Airport safety is an extremely important element of managing and operating today's airport. Specific rules, regulations, advisory circulars and guidelines are placed upon the airport owner/operator to improve safety on airports and to protect its users, tenants, and neighbors.

- (1) Entry Into the Air Operations Area - Entry shall be by gate(s) designated by the Executive Director or his representative. The Contractor shall be responsible for gate security. No personal

vehicles owned by Contractor's employees or subcontractors shall be allowed on the airfield at any time.

- (2) Communications - Radio contact with the control tower must be maintained by all Contractor vehicles on the airfield. Vehicles must contact the control tower upon entering active runway, taxiway, or apron area where aircraft are moving or are subject to move; and if working within five hundred (500) feet of the centerline of any active runway or two hundred (200) feet of the centerline of any (active) taxiway, the Contractor shall maintain radio contact with the control tower at all times. If the Contractor has vehicles with no radio, then such vehicles shall form a convoy and follow a vehicle having two-way radio contact with the control tower. Contractors working in runway clear zones shall maintain constant radio contact with the control tower. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SUPPLYING HIS OWN RADIOS.

The Contractor shall reimburse the Airport Commission for the full amount of any fines placed on the Airport Commission due to an unauthorized crossing of an active runway or taxiway by the Contractor or any of his subcontractors.

- (3) Flags - All vehicles, upon entering the Air Operations Area shall display an orange and white checkered flag, staff mounted, of not less than three (3) feet square displayed on the vehicle. Cranes, backhoes, and similar equipment working within five hundred (500) feet of the centerline or runways and two hundred (200) feet of taxiways and in clear zones, shall display the same size and type of flag specified for vehicles attached to the boom. Crane booms shall be lowered when not in use.
- (4) Airport Rules and Regulations - Contractor(s) shall be responsible for informing all employees concerning pertinent airport and Federal Aviation Administration rules and regulations. Contractor(s) shall conform with all rules and regulations and directives issued either orally or in writing by the Executive Director or his representative. All pertinent local, state and federal safety requirements shall be observed by the Contractor(s) and Contractor(s)' personnel.
- (5) Storage Area
 - (a) Material or personal vehicular storage area shall be assigned by the Executive Director or his representative.
 - (b) Materials to be stored on airport property shall not create an obstruction to air navigation nor shall they interfere with the

free unobstructed movement of aircraft.

- (c) Loose materials capable of causing damage to aircraft landing gears, propellers, or being ingested in jet engines, shall not be stored on or around active aircraft movement areas.
- (d) Stockpiled material will be constrained in a manner to prevent movement resulting from aircraft blast or wind conditions in excess of 10 knots. Stockpiled material shall be prominently marked with orange flags and lighted with flashing yellow lights during hours of restricted visibility. No materials will be stockpiled in the Object Free Area or Object Free Zone.

(6) Open Trenches

- (a) No open trenches are allowed within the runway or taxiway safety areas. Any open trenches or excavations within other areas of the Air Operations Area, shall be marked by lighted and weighted barricades. Barricades shall be alternate orange and white markings with flashing yellow lights and a maximum of 18 inches in height. Barricades adjacent to runways or taxiway pavement areas shall be required to be secured in such manner to prevent tipping over. Flags shall be orange and white, staff mounted, and not less than 20" x 20". All barricades shall be subject to approval by the Executive Director. The Contractor shall provide the name and phone number of three individuals to be on call 24 hours per day for emergency maintenance of barricade lighting. The Contractor is responsible for maintaining the flags and lights on the barricades.
- (b) All construction work closer than two hundred fifty (250) feet of the edge of a runway or eighty-five (85) feet from the edge of a taxiway will require temporary closing of the runway or taxiway. Temporarily closed taxiways shall be marked by lighted and flagged barricades as stated in Paragraph (6)a. Temporarily closed runways shall be marked with a cross placed on the runway numbers. Minimum dimensions of the areas of the cross shall be a length of sixty (60) feet and a width of eight (8) feet. Crosses are to be painted yellow and secured in such a manner to prevent damage from high winds. Frames may be constructed of fabric or plywood. Material used for the construction is subject to approval by the Executive Director.
- (c) Prior to beginning any excavation within two hundred (200) feet of the centerline of any runway or taxiway, the Contractor

shall notify the Executive Director or his representative. All trench excavation within the Air Operations Area shall be backfilled and compacted at the end of each work day.

- (d) Construction equipment or material shall not be stored within the Air Operations Area during hours of restricted visibility or darkness without the approval of the Executive Director or his representative.
- (e) Open flame welding or torch cutting operations are prohibited unless fire and safety precautions are provided in accordance with NFPA codes and approved by the Owner.

(7) Motorized Vehicles

- (a) Vehicular traffic crossing active aircraft movement areas (runways, taxiways or aircraft parking aprons) shall be controlled either by two-way radio contact with the control tower, by escort, flagman, signal lights, or other appropriate means as approved by the FAA Control Tower Chief. After receiving clearance from the Control Tower, the driver's personal observation that no aircraft is approaching his position will be made before he makes any crossing of active taxiway or runway. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SUPPLYING HIS OWN RADIOS.
- (b) Contractor(s) shall post two (2) crossing guards, one (1) on each side of all active aircraft movement areas (runways, taxiways and aircraft movement areas (runways, taxiways and aircraft parking aprons). Each crossing guard shall be equipped with a portable two-way radio (121.90 MHz) and maintain constant radio contact with the control tower. All vehicular traffic shall come to a complete stop at all active aircraft movement areas and shall not proceed into active aircraft movement areas without authorization from the control tower. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SUPPLYING HIS OWN RADIOS.
- (c) If it is desirable to clearly identify the vehicles for control purposes by either assigned initials or numbers, then the identifying symbol shall be of eight- (8) inch minimum, block-style character of a color easily read. Symbols may be applied by use of tape or water-soluble paint.
- (d) Motorized vehicles and equipment operating in the AOA shall not exceed fifteen (15) miles per hour.

- (e) Aircraft shall have priority over all motorized vehicles and equipment.
- (8) Debris
 - (a) Waste and loose material capable of causing damage to aircraft shall not be placed on active aircraft movement areas. Material tracked on these areas shall be removed continuously during the work project. (A/C 150/5370-2F)
 - (b) Debris shall be disposed of in the manner designated by the Executive Director or his representative.
- (9) NOTAMS - Construction NOTAMS shall be issued by the Executive Director or his representative. Construction causing runway or taxiway closures shall be kept to a minimum and scheduled closures shall be discussed with the Executive Director or his representative as far in advance as possible, but not less than forty-eight (48) hours in advance. Landing and taking off of scheduled airlines shall have priority.
- (10) Burning - Burning is permitted on airport property by obtaining a permit from local governmental agencies and Airport Fire Department.
- (11) Erosion - Contractor(s) shall consider permanent means of control or prevention of soil erosion not only to preserve and protect the slopes, pavement and other facilities, but also to reduce potential sources of water pollution.
- (12) Accidents - All accidents causing personal injury or property damage shall be reported to the Executive Director or his representative immediately. The contractor(s) shall provide, at the site, such equipment and medical facilities as are necessary to supply first aid service to anyone who may be injured in connection with the performance of the work, whether on or adjacent to the site, which causes death, personal injury, or property damage, giving full details and statements of witnesses. In addition, if death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone to the Executive Director or his representative and the Project Engineer.
- (13) All electrical and Control cables shall be buried a minimum of thirty-six (36) inches below the surface of the ground.

12. SECURITY

Contractor shall be responsible for the security of his equipment and materials. He shall be responsible for the security of all perimeter security gates, terminal doors and hatches leading to secure areas utilized by him. As directed by the Executive Director, locks shall be placed on each gate used by the Contractor. The locks must be marked in a manner showing company ownership and a key or combination provided to the Airport Public Safety Department. The gates shall be locked at all times or guards posted at the gates to control access through them. Gate guards shall have a radio or cellular phone which will enable them to call the Police to report security problems or the contractor to verify identities, etc. For joint use gates, if a lock is found unsecured, the company owning the lock is in violation of Airport Rules and Regulations. In addition, unauthorized entry to the Air Operations Area through the gates may result in the responsible party being cited for violating Airport Regulations.

- a. The Transportation Security Administration Act 2002, 49 USC, 67FR8355, gives the Transportation Security Administration (TSA) authority to place a fine on any airport found to be in breach of a security requirement.
- b. The Contractor shall reimburse the Airport Commission for the full amount of any fines placed on the Airport Commission due to negligence on the part of the Contractor. Fines may be placed on the Airport Commission for such things as security gates being unlocked, terminal doors not secure, fences torn down, and Air Operations Area not being properly secured. These are only examples of items causing fines and not limitations. There could be other related items.
- c. It is the Contractor's responsibility to prevent any breach of security within his area of construction or any route of entry to area of construction.
- d. Security Clearances - All personnel having unescorted access to any security area shall wear valid Savannah International Airport identification badges so they are visible on their outer garments in such areas at all times to permit ready recognition by Airport Public Safety Officers. Contractors' employees may be issued any one of the below listed Security Identification, etc. badges.
 1. The Airport Identification Badges are issued to approved personnel in several colors:
 - a. **Brown/Black** – Issued to personnel requiring unlimited access inside secured the SIDA.
 1. Effective December 6, 2002, the TSA requires anyone requesting unescorted access to the secured SIDA shall be

fingerprinted, a background check performed, and results returned prior to ID Badge being issued. **No exceptions.** This process takes 3-14 days. Anyone applying for badges shall submit application as soon as possible to ensure fingerprints / criminal history records are returned prior to start date of project.

2. The cost for processing is \$30.00 per person. Everyone receiving a SIDA ID Badge must be fingerprinted.
 - b. Yellow – Issued to contractors working in the vicinity of the aircraft movement area in order to perform their required duties. Persons with yellow badges may NOT enter the secured SIDA.
 - c.. Red – Issued to contractors working in the 1542.203 area who do not need access in the vicinity of the aircraft movement area or taxiways to perform their required duties. Persons with red badges may NOT enter the secured SIDA.
 - d. **Pink/Blue** – Issued to general aviation and tenants who require incidental access to the 1542.203 areas. Persons with **Blue** and/or **Pink** badges may NOT enter the secured SIDA.
2. The color of the badge signifies the area on the airport where the badge holder may operate.
 - a. Identification badges must be controlled at all times. When personnel are terminated, upon completion of the construction project, and when badges expire, the Contractor is responsible for returning identification badges to the Airport Public Safety Department. Before a new badge is issued to any person, their expired or invalid badge must be returned to the Airport Public Safety Department.

Upon completion of a project, it will be the responsibility of the General Contractor to collect all badges issued under his contract. Subcontractors are responsible for collecting their badges. Before final payment is made on the project, a written notification from the Airport Public Safety Department will be given to the Director of Engineering. The written notice will state the number of badges issued and the number of badges returned.

- b. A fee of **\$20.00** (without reader), **\$27.00** (with reader), payable in advance, is charged for each badge issued. Each Contractor and subcontractor shall make a cash deposit of \$100 prior to receiving any badges. This deposit is refundable providing all badges have been returned. For each badge not returned by the Contractor or subcontractor, \$100.00 will be

deducted from any monies due the Contractor or his surety. All costs, i.e., ID Badge, fingerprint requirements, and deposit(s) shall be paid in advance.

- c. The Contractor shall be required to comply with the Transportation Security Administration Amendment to Part 1542.209 prior to commencing work. All personnel hired after December 6, 2002, who have unescorted access to any area on the airport controlled for security reasons shall have background checks to the extent allowable by law, including at a minimum, references and prior employment histories to the extent necessary to verify representations made by the employee/applicant relative to employment in the preceding ten (10) years. If there are significant periods of unaccountable time, the background period is extended to ten years if the Contractor is to work in the SIDA. The Contractor shall certify to the Commission by using SAC Form 513 that such checks were conducted and are on file in the Contractor's office for inspection by the Transportation Security Administration (TSA) or Savannah Airport Commission representatives.
- d. The Contractor shall designate a Signatory Authority and provide the name of the signatory to the Savannah Airport Commission. The Signatory Authority functions as the certification officer for the company and is required to fulfill the following additional requirements associated with Signatory Authority.
 - 1. Initial Signatory Training.
 - 11. Annual recurrent signatory training.
 - 111. SIDA Training.
 - IV. Failure to designate a Signatory or failure of this Signatory to complete the training requirement will be cause for the SAC to cease issuing badges for the contractor.
- e. SAC Form 513 shall be used by the Contractor whenever certifying identification badges. Only the Contractor Signatory Authority, who shall be designated in writing, shall sign SAC Form 513.
- f. All badge requests and background forms shall be turned in forty-eight (48) hours in advance. Once approved, all badge holders shall attend SIDA Contractor's badge and/or airfield drivers training classes.

- g. Any person found within any security restricted area without proper identification shall be in violation of Federal law and the Airport Rules and Regulations. All such persons shall be escorted off the Air Operations Area and may be cited by the Airport Public Safety Department. In addition, the person may have their identification badge revoked.
- h. Any delay in construction of project due to violations of Federal or Airport Regulations shall be absorbed by the Contractor and not the Airport Commission.

13. PROTECTION OF AIRPORT, CABLES, CONTROLS, NAVAIDS, AND WEATHER BUREAU FACILITIES

- a. The Contractor is hereby informed that there are installed on the airport FAA Navaids, including, without limitation, ASR, UHF and VHF receivers and transmitters; U. S. Weather Bureau facilities; airfield lighting systems; electric cables and controls relating to such Navaids and facilities. Such Navaids, Weather Bureau and other facilities, and electric cables must be fully protected during the entire construction time. Work under this contract can be accomplished in the vicinity of these facilities and cables only at approved periods of time.

Approval is subject to withdrawal at any time because of changes in the weather, emergency conditions on the existing airfield areas, anticipation of emergency conditions, and for any other reason determined by the Engineer acting under the orders and instructions of the airport management and the designated FAA representative. Any instructions to this Contractor to clear any given area, at any time, by the Engineer, the Airport Management, or the FAA Control Tower (by radio or other means) shall be immediately executed. Construction work will be commenced in the cleared areas only when additional instructions are issued by the Engineer.

- b. Power and control cables leading to and from any FAA Navaids, Weather Bureau and other facilities, will be marked in the field by the local FAA Airway Facilities Sector personnel or the Engineer for the information of the Contractor, before any work in their general vicinity is started. Thereafter, through the entire time of this construction, the Contractor shall not allow any construction equipment to cross these cables without first protecting the cable with steel boiler plate, or similar structural devices, on three feet either side of the marked cable route. All excavation within three feet of existing cables shall be accomplished by hand digging only. The Contractor will be penalized an amount of \$1,000 per instance if during his work he cuts a marked cable.

- c. The Contractor shall immediately repair, at this own expense with identical material by skilled workmen, any underground cables serving FAA Nav aids, Weather Bureau and other airport facilities which are damaged by his workmen, equipment, or work. Prior approval of the Engineer must be obtained for the materials, temporary or permanent repairs the Contractor proposed to make to any other airport facilities and cables damaged by this Contractor. Should the repair require splicing, it shall be spliced at the discretion of the local FAA Airway Facilities Sector Manager as to who shall perform the work. Where the FAA performs the work, it shall be at the Contractor's expense. No work shall be backfilled or covered prior to approval by the Airway Facilities Sector Manager.

14. CONSTRUCTION TIME AND LIQUIDATED DAMAGES

- a. The construction plans describe the scope of work.
- b. All construction shall be completed within the contract time of **134** calendar days.
- c. When given contract is incomplete at the expiration of the number of calendar days allowed, liquidated damages will be applied per calendar day until the day and date the phase is complete. Liquidated damages will be deducted from any money due or to become due to the Contractor or his Surety.

CONSTRUCTION TIME FRAME AND LIQUIDATED DAMAGES

<u>Phase</u>	<u>Calendar Days Allowed Per Phase</u>	<u>Liquidated Damages Per Calendar Day</u>
Phase 1	120 Days	\$1,000.00
Phase 2	120 Days	\$1,000.00
Substantial Completion	14 Days	\$1,000.00
Entire Project	134 Days	\$2,000.00

TOTAL CONTRACT TIME IS **134** CALENDAR DAYS

15. PERMITS

The Contractor shall be responsible for obtaining any and all licenses and permits to conduct the work as may be prescribed by the federal government, State of Georgia, Chatham County or the City of Savannah. Any fee or expenses associated in obtaining any license or permit shall be paid by the Contractor.

16. GOVERNING LAW

This Agreement shall be deemed to be made in and construed in accordance with the laws of the State of Georgia.

17. INDEMNIFICATION

Contractor shall protect, defend, and indemnify Commission and its officers, agents and employees from and against any and all liabilities, losses, suits, claims, judgments, fines or demands arising by reasons of injury or death of any person, or damage to any property, including all reasonable costs for investigation and defense thereof (including but not limited to attorney fees, court costs, and expert fees), of any nature whatsoever arising out of or incident to this Agreement and/or the use or occupancy of the Premises or the acts or omissions of contractor's officers, agents, employees, contractors, subcontractors, licensees, or invitees, regardless of where the injury, death or damage may occur, unless such injury, death, or damage is caused by the sole negligence of the Commission. The Commission shall give to contractor reasonable notice of any such claims or actions. The Contractor shall also use counsel reasonably acceptable to Commission in carrying out its obligations hereunder. The provisions of this section shall survive the expiration or early termination of this Agreement.

18. NONDISCRIMINATION

(As required by Title VI of the Civil Rights Act of 1964; Department of Transportation 49 CFR Part 21; and Section 520 of the Airport and Airway Improvement Act of 1982).

Contractor shall comply with and shall ensure that the following Non-Discrimination clause is inserted in all subcontracts, subleases, and other agreements at all tiers:

"The Contractor assures that it will comply with pertinent statutes, Executive Orders and such rules as are promulgated to assure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or handicap be excluded from participating in any activity conducted with or benefiting from Federal assistance."

TECHNICAL SPECIFICATIONS

ITEM P-101 SURFACE PREPARATION

DESCRIPTION

101-1.1 This item shall consist of preparation of existing pavement surfaces for overlay, surface treatments, removal of existing pavement, and other miscellaneous items (*including removal of airfield electrical cables, light fixtures, base cans, etc.*). The work shall be accomplished in accordance with these specifications and the applicable drawings.

EQUIPMENT

101-2.1 All equipment shall be specified here and in the following paragraphs or approved by the Engineer. The equipment shall not cause damage to the pavement to remain in place.

CONSTRUCTION

101-3.1 Removal of existing pavement.

a. Concrete pavement. The existing concrete pavement to be removed shall be freed from the pavement to remain by sawing through the complete depth of the slab one foot (30 cm) inside the perimeter of the final removal limits or outside the dowels, whichever is greater when the limits of removal are located on the joints. The pavement between the perimeter of the pavement removal and the saw cut shall be carefully broken up and removed using hand-held jackhammers, weighing 30 pounds (14 kg) or less, or other light-duty equipment which will not cause distress in the pavement which is to remain in place. The Contractor shall have the option of sawing through the dowels at the joint, removing the pavement and installing new dowels. Where the perimeter of the removal limits is not located on the joint and there are no dowels present, then the perimeter shall be saw cut the full depth of the pavement. The pavement inside the saw cut shall be removed by methods suitable to the Engineer which will not cause distress in the pavement which is to remain in place. If the material is to be wasted on the airport site, it shall be reduced to a maximum size designated by the Engineer. The Contractor's removal operation shall not cause damage to cables, utility ducts, pipelines, or drainage structures under the pavement. Concrete slabs that are damaged by under breaking shall be removed. Any damage shall be repaired at the Contractor's expense.

b. Asphalt concrete pavement. Asphalt concrete pavement to be removed shall be cut to the full depth of the bituminous material around the perimeter of the area to be removed. The pavement shall be removed so the joint for each layer of pavement replacement is offset 1 foot (30 cm) from the joint in the preceding layer. This does not apply if the removed pavement is to be replaced with concrete or soil. ~~If the material is to be wasted on the airport site, it shall be [] broken to a maximum size of [] inches (mm). [] [] meet the following gradation: [] [].~~

101-3.2 Preparation of joints and cracks. Remove all vegetation and debris from cracks to a minimum depth of 1 inch (25 mm). If extensive vegetation exists treat the specific area with a concentrated solution of a water-based herbicide approved by the Engineer. Fill all cracks, ignoring hairline cracks (< 1/4 inch (6 mm) wide) with a crack sealant per ASTM D6690. Wider cracks (over 1-1/2 inch wide (38 mm)), along with soft or sunken spots, indicate that the pavement or the pavement base should be repaired or replaced as stated below. Any excess joint or crack sealer on the surface of the pavement shall also be removed from the pavement surface.

Cracks and joints may be filled with a mixture of emulsified asphalt and aggregate. The aggregate shall consist of limestone, volcanic ash, sand, or other material that will cure to form a hard substance. The combined gradation shall be as shown in the following table.

Gradation

Sieve Size	Percent Passing
No. 4	100
No. 8	90-100

Sieve Size	Percent Passing
No. 16	65-90
No. 30	40-60
No. 50	25-42
No. 100	15-30
No. 200	10-20

Up to 3% cement can be added to accelerate the set time. The mixture shall not contain more than 20% natural sand without approval in writing from the Engineer.

The proportions of asphalt emulsion and aggregate shall be determined in the field and may be varied to facilitate construction requirements. Normally, these proportions will be approximately one part asphalt emulsion to five parts aggregate by volume. The material shall be poured or placed into the joints or cracks and compacted to form a voidless mass. The joint or crack shall be filled within 0 to 1/8 inches (0-3 mm) of the surface. Any material spilled outside the width of the joint shall be removed from the pavement surface prior to constructing the overlay. Where concrete overlays are to be constructed, only the excess joint material on the pavement surface and vegetation in the joints need to be removed.

101-3.3 Removal of paint and rubber. All paint and rubber over 1 foot (30 cm) wide that will affect the bond of the new overlay shall be removed from the surface of the existing pavement. Chemicals, high-pressure water, heater scarifier (asphaltic concrete only), cold milling, or sandblasting may be used. Any methods used shall not cause major damage to the pavement. Major damage is defined as changing the properties of the pavement or removing pavement over 1/8 inch (3 mm) deep. If chemicals are used, they shall comply with the state's environmental protection regulations. No material shall be deposited on the runway shoulders. All wastes shall be disposed of in areas indicated in this specification or shown on the plans.

101-3.4 Concrete spall or failed asphaltic concrete pavement repair.

a. Repair of concrete spalls in areas to be overlaid with asphalt. The Contractors shall repair all spalled concrete as shown on the plans or as directed by the Engineer. The perimeter of the repair shall be saw cut a minimum of 2 inches (50 mm) outside the affected area and 2 inches (50 mm) deep. The deteriorated material shall be removed to a depth where the existing material is firm or cannot be easily removed with a geologist pick. The removed area shall be filled with asphaltic concrete with a minimum Marshall stability of 1,200 lbs (544 kg) and maximum flow of 20 (units of 0.01 in). The material shall be compacted with equipment approved by the Engineer until the material is dense and no movement or marks are visible. The material shall not be placed in lifts over 4 inches (100 mm) in depth. This method of repair applies only to pavement to be overlaid.

b. Asphaltic concrete pavement repair. The failed areas shall be removed as specified in paragraph 101-3.1b. All failed material including surface, base course, subbase course, and subgrade shall be removed. The base course and subbase shall be replaced if it has been infiltrated with clay, silt, or other material affecting the load-bearing capacity. Materials and methods of construction shall comply with the other applicable sections of this specification.

101-3.5 Cold milling. Milling shall be performed with a power-operated milling machine or grinder, capable of producing a finished surface that provides a good bond to the new overlay. The milling machine or grinder shall operate without tearing or gouging the under laying surface. The milling machine or grinder shall be equipped with automatic grade and slope controls. All millings shall be removed and disposed off Airport property, unless otherwise specified. If the Contractor mills or grinds deeper or wider than the plans specify, the Contractor shall replace the material that was removed with new material at no additional cost to the Owner.

a. Patching. The milling machine shall be capable of cutting a vertical edge without chipping or spalling the edges of the remaining pavement and it shall have a positive method of controlling the depth of cut. The Engineer shall layout the area to be milled with a straightedge in increments of 1 foot (30 cm) widths. The area to be milled shall cover only the failed area. Any excessive area that is milled because the Contractor doesn't have the appropriate milling machine, or areas that are damaged because of his negligence, shall not be included in the measurement for payment.

b. Profiling, grade correction, or surface correction. The milling machine shall have a minimum width of 7 feet (~~2 m~~) and it shall be equipped with electronic grade control devices that will cut the surface to the grade and

tolerances specified. The machine shall cut vertical edges. A positive method of dust control shall be provided. The machine shall have the ability to ~~windrow the millings or cuttings~~ remove the millings or cuttings from the pavement and load them into a truck.

c. Clean-up. The Contractor shall sweep the milled surface daily and immediately after the milling until all residual aggregate and fines are removed from the pavement surface. Prior to paving, the Contractor shall wet down the milled pavement and thoroughly sweep and/or blow the surface to remove any remaining aggregate or fines.

101-3.6. Preparation of asphalt pavement surfaces. Existing asphalt pavements indicated to be treated with a surface treatment shall be prepared as follows:

a. Patch asphalt pavement surfaces that have been softened by petroleum derivatives or have failed due to any other cause. Remove damaged pavement to the full depth of the damage and replace with new asphalt concrete similar to that of the existing pavement in accordance with paragraph 101-3.4.

b. Repair joints and cracks in accordance with paragraph 101-3.2.

c. Remove oil or grease that has not penetrated the asphalt pavement by scraping or by scrubbing with a detergent, then wash thoroughly with clean water. After cleaning, treat these areas with an oil spot primer.

d. Clean pavement surface immediately prior to placing the surface treatment by sweeping, flushing well with water leaving no standing water, or a combination of both, so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film.

101-3.7 Maintenance. The Contractor shall perform all maintenance work necessary to keep the pavement in a satisfactory condition until the full section is complete and accepted by the Engineer. The surface shall be kept clean and free from foreign material. The pavement shall be properly drained at all times. If cleaning is necessary or if the pavement becomes disturbed, any work repairs necessary shall be performed at the Contractor's expense.

101-3.8 Preparation of Joints in Rigid Pavement.

101-3.8.1 Removal of Existing Joint Sealant. All existing joint sealants will be removed by plowing or use of hand tools. Any remaining sealant and or debris will be removed by use of wire brushes or other tools as necessary. Resaw joints removing no more than 1/16 inch (2 mm) from each joint face. Immediately after sawing, flush out joint with water and other tools as necessary to completely remove the slurry. Allow sufficient time to dry out joints prior to sealing.

101-3.8.2 Cleaning prior to sealing. Immediately before sealing, joints shall be cleaned by removing any remaining laitance and other foreign material. Clean joints by sandblasting, or other method approved by the Engineer, on each joint face with nozzle held at an angle and not more than three inches (75 mm) from face. Following sandblasting, clean joints with air free of oil and water. Joint surfaces will be surface-dry prior to installation of sealant.

101-3.9 Preparation of Cracks in Flexible Pavement.

101-3.9.1 Preparation of Crack. Widen crack with router ~~random crack saw~~ by removing a minimum of 1/16 inch (~~2 mm~~) from each side of crack. Immediately before sealing, joints will be blown out with a hot air lance combined with oil and water-free compressed air.

101-3.9.2 Removal of Existing Sealant. Existing sealants will be removed by routing ~~random crack saw~~. Following routing ~~sawing~~ any remaining debris will be removed by use of a hot lance combined with oil and water-free compressed air.

METHOD OF MEASUREMENT

101-4.1 Lump sum. No separate measurement for payment will be made. The work covered by this section shall be considered as a subsidiary obligation of the Contractor and covered under the other contract items.

101-4.1 Pavement removal. The unit of measurement for pavement removal shall be the number of square yards (~~square meters~~) removed by the Contractor. Any pavement removed outside the limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment.

~~**101-4.2 Joint and crack repair.** The unit of measurement for joint and crack repair shall be the linear foot (meter) of joint.~~

~~**101-4.3 Paint and rubber removal.** The unit of measurement for paint and rubber removal shall be the square foot (meter).~~

~~**101-4.4 Spalled and failed asphaltic concrete pavement repair:**~~

~~**a.** The unit of measure for concrete spall repair shall be the number of square feet (square meter). The location and average depth of the patch shall be determined and agreed upon by the Engineer and the Contractor.~~

~~**b.** The unit of measure for failed asphaltic concrete pavement shall be square feet (square meter).~~

~~**101-4.5 Cold milling.** The unit of measure for cold milling shall be ____ inches of milling per square yard (square meter). The location and average depth of the cold milling shall be determined and agreed to by the Engineer and the Contractor prior to beginning the work. If the initial cut doesn't correct the condition and surface correction is required, the Contractor shall re-mill the area and will be paid only once for the total depth of milling.~~

BASIS OF PAYMENT

101-5.1 Payment. Payment shall be made at contract unit price for the unit of measurement as specified above. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and placing of the material and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item P-101-5.1 Pavement Demolition (Concrete, Asphalt & Gutter) – per lump sum

Item P-101-5.2 Drainage Demolition – per lump sum

Item P-101-5.3 Electrical Demolition and Removal – per lump sum

~~Item P 101 5.3 Paint and Rubber Removal~~

~~Item P 101 5.4 Spalled and Failed Asphaltic Concrete Pavement Repair:~~

~~(1) Concrete Spall Repair~~

~~(2) Failed asphaltic concrete pavement:~~

~~Item P 101 5.5 Cold Milling~~

MATERIAL REQUIREMENTS

ASTM D6690 Standard Specification For Joint And Crack Sealants, Hot Applied, For Concrete And Asphalt Pavements

END OF ITEM P-101

ITEM P-105 MOBILIZATION

105-1 Description. This item shall consist of work and operations, but is not limited to, work and operations necessary for the movement of personnel, equipment, material and supplies to and from the project site for work on the project except as provided in the contract as separate pay items.

105-1.1 Posted notices. Prior to commencement of construction activities the Contractor must post the following documents in a prominent and accessible place where they may be easily viewed by all employees of the prime Contractor and by all employees of subcontractors engaged by the prime Contractor: Equal Employment Opportunity (EEO) Poster "Equal Employment Opportunity is the Law" in accordance with the Office of Federal Contract Compliance Programs Executive Order 11246, as amended; Davis Bacon Wage Poster (WH 1321) - DOL "Notice to All Employees" Poster; and Applicable Davis-Bacon Wage Rate Determination. These notices must remain posted until final acceptance of the work by the Owner.

105-2 Basis of measurement and payment. Based upon the contract lump sum price for "Mobilization" partial payments will be as noted in paragraph 105-2.1.

BASIS OF PAYMENT

105-2.1 The work and incidental costs covered under this item will be paid for at the Contract lump sum price for the item of Mobilization. The total amount bid for Mobilization **shall not exceed 10%** of the sum of the individual item extended totals (excluding mobilization) within the bid schedule. No additional payment will be made for demobilization and/or remobilization due to project shutdowns or suspensions of the work identified in the Bid Schedule.

Payment shall be made under:

Item P-105-2.1 Mobilization -- per lump sum

Partial payments for Mobilization will be made therefore in accordance with the following:

PERCENT OF ORIGINAL CONTRACT AMOUNT EARNED	ALLOWABLE PERCENT OF LUMP SUM PRICE FOR THE ITEM
5%	10%
10%	25%
25%	50%
50%	75%
75%	90%
100%	100%

~~* Partial payments for any project will be limited to ten percent (10%) of the original Contract amount for that project. Any remaining amount will be paid upon completion of all work on the Project.~~

The standard retainage, as herein specified will be applied to these allowances. Partial payments made on this item shall in no way act to preclude or limit any of the provisions for partial payments otherwise provided for by the Contract.

END OF SECTION 105

ITEM P-152 EXCAVATION, SUBGRADE, AND EMBANKMENT

DESCRIPTION

152-1.1 This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate areas as well as other areas for drainage, building construction, parking, or other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the plans.

152-1.2 Classification. All material excavated shall be classified as defined below:

a. Unclassified excavation. Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature which is not otherwise classified and paid for under one of the following items.

b. Rock excavation. Rock excavation shall include all solid rock in ledges, in bedded deposits, in unstratified masses, and conglomerate deposits which are so firmly cemented they cannot be removed without blasting or using rippers. All boulders containing a volume of more than 1/2 cubic yard (~~0.4 m³~~) will be classified as “rock excavation.”

c. Muck excavation. Muck excavation shall consist of the removal and disposal of deposits or mixtures of soils and organic matter not suitable for foundation material. Muck shall include materials that will decay or produce subsidence in the embankment. It may consist of decaying stumps, roots, logs, humus, or other material not satisfactory for incorporation in the embankment.

d. Drainage excavation. Drainage excavation shall consist of all excavation made for the primary purpose of drainage and includes drainage ditches, such as intercepting, inlet or outlet ditches; temporary levee construction; or any other type as shown on the plans.

e. Borrow excavation. Borrow excavation shall consist of approved material required for the construction of embankments or for other portions of the work in excess of the quantity of usable material available from required excavations. Borrow material shall be obtained from areas designated by the Engineer within the limits of the airport property but outside the normal limits of necessary grading, or from areas outside the airport boundaries.

152-1.3 Unsuitable excavation. Any material containing vegetable or organic matter, such as muck, peat, organic silt, or sod shall be considered unsuitable for use in embankment construction. Material, suitable for topsoil may be used on the embankment slope when approved by the Engineer.

CONSTRUCTION METHODS

152-2.1 General. Before beginning excavation, grading, and embankment operations in any area, the area shall be completely cleared and grubbed in accordance with Item P-151.

The suitability of material to be placed in embankments shall be subject to approval by the Engineer. All unsuitable material shall be disposed of in waste areas shown on the plans. All waste areas shall be graded to allow positive drainage of the area and of adjacent areas. The surface elevation of waste areas shall not extend above the surface elevation of adjacent usable areas of the airport, unless specified on the plans or approved by the Engineer.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the Engineer notified per subsection 70-20. At the direction of the Engineer, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Those areas outside of the limits of the pavement areas where the top layer of soil material has become compacted by hauling or other Contractor activities shall be scarified and disked to a depth of 4 inches (100 mm), to loosen and pulverize the soil.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the Engineer,

who shall arrange for their removal if necessary. The Contractor, at his or her expense, shall satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract.

152-2.2 Excavation. No excavation shall be started until the work has been staked out by the Contractor and the Engineer has obtained from the Contractor, the survey notes of the elevations and measurements of the ground surface. All areas to be excavated shall be stripped of vegetation and topsoil. Topsoil shall be stockpiled for future use in areas designated on the plans or by the Engineer. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes shown on the plans. All unsuitable material shall be disposed of as shown on the plans.

When the volume of the excavation exceeds that required to construct the embankments to the grades indicated, the excess shall be used to grade the areas of ultimate development or disposed as directed by the Engineer. When the volume of excavation is not sufficient for constructing the embankments to the grades indicated, the deficiency shall be obtained from borrow areas.

The grade shall be maintained so that the surface is well drained at all times. When necessary, temporary drains and drainage ditches shall be installed to intercept or divert surface water that may affect the work.

a. Selective grading. When selective grading is indicated on the plans, the more suitable material designated by the Engineer shall be used in constructing the embankment or in capping the pavement subgrade. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas so that it can be measured for payment as specified in paragraph 152-3.3.

b. Undercutting. Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turf shall be excavated to a minimum depth of 12 inches (300 mm) below the subgrade or to the depth specified by the Engineer. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified. Unsuitable materials shall be ~~disposed of at locations shown on the plans.~~ disposed off the airport. The cost is incidental to this item. This excavated material shall be paid for at the contract unit price per cubic yard (~~per cubic meter~~) for **unclassified excavation**. The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary backfill will constitute a part of the embankment. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained in accordance with the details shown on the plans.

c. Overbreak. Overbreak, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the Engineer. All overbreak shall be graded or removed by the Contractor and disposed of as directed by the Engineer. The Engineer shall determine if the displacement of such material was unavoidable and his or her decision shall be final. Payment will not be made for the removal and disposal of overbreak that the Engineer determines as avoidable. Unavoidable overbreak will be classified as "Unclassified Excavation."

d. Removal of utilities. The removal of existing structures and utilities required to permit the orderly progress of work will be accomplished by someone other than the Contractor; for example, the utility unless otherwise shown on the plans. All existing foundations shall be excavated at least 2 feet (~~60 cm~~) below the top of subgrade or as indicated on the plans, and the material disposed of as directed by the Engineer. All foundations thus excavated shall be backfilled with suitable material and compacted as specified.

e. Compaction requirements. The subgrade under areas to be paved shall be compacted to a depth of 12" and to a density of not less than 100 percent of the maximum density as determined by ASTM D1557 *or as shown on the project plans*. The material to be compacted shall be within $\pm 2\%$ of optimum moisture content before being rolled to obtain the prescribed compaction (except for expansive soils).

The in-place field density shall be determined in accordance with ~~ASTM D1556—ASTM D2167~~ ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. Stones or rock fragments larger than 4 inches (~~100 mm~~) in their greatest dimension will not be permitted in the top 6 inches (~~150 mm~~) of the subgrade. The finished grading operations, conforming to the typical cross-section, shall be completed and maintained at least 1,000 feet (~~300 m~~) ahead of the paving operations or as directed by the Engineer.

All loose or protruding rocks on the back slopes of cuts shall be pried loose or otherwise removed to the slope finished grade line. All cut-and-fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the plans or as directed by the Engineer.

Blasting shall not be allowed. ~~Blasting will be permitted as directed by the Engineer and in accordance with the following:~~

~~Blasting will be permitted only when proper precautions are taken for the safety of all persons, the work, and the property. All damage done to the work or property shall be repaired by the Contractor. The cost of repair is incidental to this item. All operations of the Contractor in connection with the transportation, storage, and use of explosives shall conform to all Federal, state and local regulations and explosive manufacturers' instructions, with applicable approved permits reviewed by the Engineer. Any approval will not relieve the Contractor of his or her responsibility in blasting operations.~~

~~Where blasting is approved, the Contractor shall employ a vibration consultant, approved by the Engineer, to advise on explosive charge weights per delay and to analyze records from seismograph recordings. The seismograph shall be capable of producing a permanent record of the three components of the motion in terms of particle velocity, and in addition shall be capable of internal dynamic calibration.~~

~~In each distinct blasting area, where pertinent factors affecting blast vibrations and their effects in the area remain the same, the Contractor shall submit a blasting plan of the initial blasts to the Engineer for approval. This plan must consist of hole size, depth, spacing, burden, type of explosives, type of delay sequence, maximum amount of explosive on any one delay period, depth of rock, and depth of overburden if any. The maximum explosive charge weights per delay included in the plan shall not be increased without the approval of the Engineer.~~

~~The Contractor shall keep a record of each blast: its date, time and location; the amount of explosives used, maximum explosive charge weight per delay period, and, where necessary, seismograph records identified by instrument number and location.~~

~~These records shall be made available to the Engineer on a monthly basis or in tabulated form at other times as required.~~

f. Proof rolling. After compaction is completed, the subgrade area shall be proof rolled with a heavy pneumatic-tired roller having four or more tires abreast, each tire loaded to a minimum of 30,000 pounds (13.6 metric tons) and inflated to a minimum of 125 psi (0.861 MPa) in the presence of the Engineer. Apply a minimum of 3 coverage, or as specified by the Engineer, to all paved areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1 inch (25 mm) or show permanent deformation greater than 1 inch (25 mm) shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications.

152-2.3 Borrow excavation. Borrow areas within the airport property are indicated on the plans. Borrow excavation shall be made only at these designated locations and within the horizontal and vertical limits as staked or as directed by the Engineer.

When borrow sources are outside the boundaries of the airport property, it shall be the Contractor's responsibility to locate and obtain the borrow sources, subject to the approval of the Engineer. The Contractor shall notify the Engineer at least 15 days prior to beginning the excavation so necessary measurements and tests can be made. All borrow pits shall be opened up to expose the various strata of acceptable material to allow obtaining a uniform product. All unsuitable material shall be disposed of by the Contractor. Borrow pits shall be excavated to regular lines to permit accurate measurements, and they shall be drained and left in a neat, presentable condition with all slopes dressed uniformly.

152-2.4 Drainage excavation. Drainage excavation shall consist of excavating for drainage ditches such as intercepting; inlet or outlet ditches; for temporary levee construction; or for any other type as designed or as shown on the plans. The work shall be performed in sequence with the other construction. Intercepting ditches shall be constructed prior to starting adjacent excavation operations. All satisfactory material shall be placed in embankment fills; unsuitable material shall be placed in designated waste areas or as directed by the Engineer. All necessary work shall be performed true to final line, elevation, and cross-section. The Contractor shall maintain ditches constructed on the project to the required cross-section and shall keep them free of debris or obstructions until the project is accepted.

152-2.5 Preparation of embankment area. Where an embankment is to be constructed to a height of 4 feet (~~1.2 m~~) or less, all sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6 inches (~~150 mm~~) and shall then be compacted as indicated in paragraph 152-2.6. When the height of fill is greater than 4 feet (~~1.2 m~~), sod not required to be removed shall be thoroughly disked and recompacted to the density of the surrounding ground before construction of embankment.

Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches (~~300 mm~~) and compacted as specified for the adjacent fill.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

152-2.6 Formation of embankments. Embankments shall be formed in successive horizontal layers of not more than 8 inches (~~200 mm~~) in loose depth for the full width of the cross-section, unless otherwise approved by the Engineer.

The layers shall be placed, to produce a soil structure as shown on the typical cross-section or as directed by the Engineer. Materials such as brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing, or other unsatisfactory weather conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. The Contractor shall drag, blade, or slope the embankment to provide surface drainage at all times.

The material in each layer shall be within $\pm 2\%$ of optimum moisture content before rolling to obtain the prescribed compaction. To achieve a uniform moisture content throughout the layer, the material shall be moistened or aerated as necessary. Samples of all embankment materials for testing, both before and after placement and compaction, will be taken for each **1,000 cubic yards of material placed per layer**. Based on these tests, the Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

Rolling operations shall be continued until the embankment is compacted to not less than 95% of maximum density for noncohesive soils, and 90% of maximum density for cohesive soils as determined by ASTM **D1557**. Under all areas to be paved, the embankments shall be compacted to a depth of **12 inches** and to a density of not less than **95** percent of the maximum density as determined by ASTM **D 1557** *or as shown on the project plans*.

On all areas outside of the pavement areas, no compaction will be required on the top 4 inches (~~100 mm~~).

The in-place field density shall be determined in accordance with ASTM D1556 **or** ASTM D2167, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. The Contractor's laboratory shall perform all density tests in the Engineer's presence and provide the test results upon completion to the Engineer for acceptance.

Compaction areas shall be kept separate, and no layer shall be covered by another layer until the proper density is obtained.

During construction of the embankment, the Contractor shall route all construction equipment evenly over the entire width of the embankment as each layer is placed. Layer placement shall begin in the deepest portion of the embankment fill. As placement progresses, the layers shall be constructed approximately parallel to the finished pavement grade line.

When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portion of the embankment and the other material shall be incorporated under the future paved areas. Stones or fragmentary rock larger than 4 inches (~~100 mm~~) in their greatest dimensions will not be allowed in the top 6 inches (~~150 mm~~) of the subgrade. Rockfill shall be brought up in layers as specified or as directed by the Engineer and the finer material shall be used to fill the voids with forming a dense, compact mass.

Rock or boulders shall not be disposed of outside the excavation or embankment areas, except at places and in the manner designated on the plans or by the Engineer.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in layers of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in layers not exceeding 2 feet (~~60 cm~~) in thickness. Each layer shall be leveled and smoothed with suitable equipment by distribution of spalls and finer fragments of rock. The layer shall not be constructed above an elevation 4 feet (~~1.2 m~~) below the finished subgrade.

There will be no separate measurement of payment for compacted embankment. All costs incidental to placing in layers, compacting, discing, watering, mixing, sloping, and other operations necessary for construction of embankments will be included in the contract price for excavation, borrow, or other items. ~~Payment for compacted embankment will be made under embankment in place and no payment will be made for excavation, borrow, or other items.~~

152-2.7 Finishing and protection of subgrade. After the subgrade is substantially complete, the Contractor shall remove any soft or other unstable material over the full width of the subgrade that will not compact properly. All low areas, holes or depressions in the subgrade shall be brought to grade with suitable select material. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans.

Grading of the subgrade shall be performed so that it will drain readily. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes. All ruts or rough places that develop in the completed subgrade shall be graded and recompacted.

No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been approved by the Engineer.

152-2.8 Haul. All hauling will be considered a necessary and incidental part of the work. The Contractor shall include the cost in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

152-2.9 Tolerances. In those areas upon which a subbase or base course is to be placed, the top of the subgrade shall be of such smoothness that, when tested with a 12-foot (~~3.7 m~~) straightedge applied parallel and at right angles to the centerline, it shall not show any deviation in excess of 1/2 inch (~~12 mm~~), or shall not be more than 0.05 feet (~~15 mm~~) from true grade as established by grade hubs. Any deviation in excess of these amounts shall be corrected by loosening, adding, or removing materials; reshaping; and recompacting.

On safety areas, intermediate and other designated areas, the surface shall be of such smoothness that it will not vary more than 0.10 feet (~~3 mm~~) from true grade as established by grade hubs. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

152-2.10 Topsoil. When topsoil is specified or required as shown on the plans or under Item T-905, it shall be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. If, at the time of excavation or stripping, the topsoil cannot be placed in its final section of finished construction, the material shall be stockpiled at approved locations. Stockpiles shall not be placed within **200** feet of runway pavement or **100** feet of taxiway pavement and shall not be placed on areas that subsequently will require any excavation or embankment fill. If, in the judgment of the Engineer, it is practical to place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its final position without stockpiling or further rehandling.

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as directed, or as required in Item T-905.

No direct payment will be made for topsoil under Item P-152. The quantity removed and placed directly or stockpiled shall be paid for at the contract unit price per cubic yard (~~cubic meter~~) for "Unclassified Excavation."

When stockpiling of topsoil and later rehandling of such material is directed by the Engineer, the material so rehandled shall be paid for at the contract unit price per cubic yard (~~cubic meter~~) for "topsoiling," as provided in Item T-905.

METHOD OF MEASUREMENT

152-3.1 The quantity of excavation to be paid for shall be the number of cubic yards (cubic meters) measured in its original position. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed.

152-3.2 Borrow material shall be paid for on the basis of the number of cubic yards (~~cubic meters~~) measured in its original position at the borrow pit.

152-3.3 ~~Stockpiled material shall be paid for on the basis of the number of cubic yards (cubic meters) measured in the stockpiled position.~~

152-3.4 For payment specified by the cubic yard (cubic meter), measurement for all excavation shall be computed by the average end area method. The end area is that bound by the original ground line established by field cross-sections and the final theoretical pay line established by excavation cross-sections shown on the plans, subject to verification by the Engineer. After completion of all excavation operations and prior to the placing of base or subbase material, the final excavation shall be verified by the Engineer by means of field cross-sections taken randomly *by the Contractor* at intervals not exceeding 500 linear feet (~~150 m~~).

152-3.5 ~~The quantity of embankment in place shall be the number of cubic yards (cubic meters) measured in its final position.~~

BASIS OF PAYMENT

152-4.1 “Unclassified excavation” payment shall be made at the contract unit price per cubic yard (~~cubic meter~~). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

152-4.2 “Offsite Borrow” payment shall be made at the contract unit price per cubic yard (~~cubic meter~~). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

152-4.3 “Unsuitable Excavation” payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

152-4.4 ~~“Drainage Excavation” payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

152-4.5 ~~“Borrow Excavation” payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

152-4.6 ~~“Stockpiled Material” payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

152-4.7 ~~For embankment in place, payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.~~

152-4.8 “Select Sand” payment shall be made at the contract unit price per cubic yard as calculated based on compacted in place. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

- | | |
|----------------|--|
| Item P-152-4.1 | Unclassified Excavation - per cubic yard |
| Item P-152-4.2 | Offsite Borrow - per cubic yard |

Item P-152-4.3	Select Sand - per cubic yard
Item P-152-4.4	Unsuitable Excavation - per cubic yard
[Item P 152 4.3	Muck Excavation per cubic yard (cubic meter)]
[Item P 152 4.4	Drainage Excavation per cubic yard (cubic meter)]
[Item P 152 4.5	Borrow Excavation per cubic yard (cubic meter)]
[Item P 152 4.6	Stockpiled material per cubic yard (cubic meter)]
[Item P 152 4.7	Embankment in place per cubic yard (cubic meter)]

TESTING REQUIREMENTS

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600 kN-m/m ³))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³ (2700 kN-m/m ³))
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

END OF ITEM P-152

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ITEM P-156 TEMPORARY AIR AND WATER POLLUTION, SOIL EROSION, AND SILTATION CONTROL

DESCRIPTION

156-1.1 This item shall consist of temporary control measures as shown on the plans or as ordered by the Engineer during the life of a contract to control water pollution, soil erosion, and siltation through the use of silt fences, berms, dikes, dams, sediment basins, fiber mats, gravel, mulches, grasses, slope drains, and other erosion control devices or methods.

The temporary erosion control measures contained herein shall be coordinated with the permanent erosion control measures specified as part of this contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction period.

Temporary control may include work outside the construction limits such as borrow pit operations, equipment and material storage sites, waste areas, and temporary plant sites.

Temporary control measures shall be design, installed and maintained to minimize the creation of wildlife attractants that have the potential to attract hazardous wildlife on or near public-use airports.

MATERIALS

156-2.1 Grass. Grass that will not compete with the grasses sown later for permanent cover per Item T-901 shall be a quick-growing species (such as ryegrass, Italian ryegrass, or cereal grasses) suitable to the area providing a temporary cover. Selected grass species shall not create a wildlife attractant.

156-2.2 Mulches. Mulches may be hay, straw, fiber mats, netting, bark, wood chips, or other suitable material reasonably clean and free of noxious weeds and deleterious materials per Item T-908. Mulches shall not create a wildlife attractant.

156-2.3 Fertilizer. Fertilizer shall be a standard commercial grade and shall conform to all Federal and state regulations and to the standards of the Association of Official Agricultural Chemists.

156-2.4 Slope drains. Slope drains may be constructed of pipe, fiber mats, rubble, Portland cement concrete, bituminous concrete, or other materials that will adequately control erosion.

156-2.5 Silt fence. The silt fence shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life. Silt fence shall meet the requirements of ASTM D6461.

156-2.6 Other. All other materials shall meet commercial grade standards and shall be approved by the Engineer before being incorporated into the project.

CONSTRUCTION REQUIREMENTS

156-3.1 General. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

The Engineer shall be responsible for assuring compliance to the extent that construction practices, construction operations, and construction work are involved.

156-3.2 Schedule. Prior to the start of construction, the Contractor shall submit schedules for accomplishment of temporary and permanent erosion control work for clearing and grubbing; grading; construction; paving; and structures at watercourses. The Contractor shall also submit a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of waste materials. Work shall not be started until the erosion control schedules and methods of operation for the applicable construction have been accepted by the Engineer.

156-3.3 Construction details. The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the accepted schedule. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. Temporary erosion and pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

Where erosion may be a problem, clearing and grubbing operations should be scheduled and performed so that grading operations and permanent erosion control features can follow immediately if project conditions permit; otherwise, temporary erosion control measures may be required.

The Engineer shall limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent control measures current with the accepted schedule. If seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified as directed by the Engineer.

The Contractor shall provide immediate permanent or temporary pollution control measures to minimize contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water impoundment as directed by the Engineer. If temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or directed by the Engineer, the work shall be performed by the Contractor and the cost shall be incidental to this item.

The Engineer may increase or decrease the area of erodible earth material that can be exposed at any time based on an analysis of project conditions.

The erosion control features installed by the Contractor shall be acceptably maintained by the Contractor during the construction period.

Whenever construction equipment must cross watercourses at frequent intervals, temporary structures should be provided.

Pollutants such as fuels, lubricants, bitumen, raw sewage, wash water from concrete mixing operations, and other harmful materials shall not be discharged into any waterways, impoundments or into natural or manmade channels.

156-3.4 Installation, maintenance and removal of silt fences. Silt fences shall extend a minimum of 16 inches (~~41 cm~~) and a maximum of 34 inches (~~86 cm~~) above the ground surface. Posts shall be set no more than 10 feet (~~3-m~~) on center. Filter fabric shall be cut from a continuous roll to the length required minimizing joints where possible. When joints are necessary, the fabric shall be spliced at a support post with a minimum 12-inch (~~300-mm~~) overlap and securely sealed. A trench shall be excavated approximately 4 inches (~~100-mm~~) deep by 4 inches (~~100-mm~~) wide on the upslope side of the silt fence. The trench shall be backfilled and the soil compacted over the silt fence fabric. The Contractor shall remove and dispose of silt that accumulates during construction and prior to establishment of permanent erosion control. The fence shall be maintained in good working condition until permanent erosion control is established. Silt fence shall be removed upon approval of the Engineer.

METHOD OF MEASUREMENT

156-4.1 Temporary erosion and pollution control work required will be performed as scheduled or directed by the Engineer. Completed and accepted work will be measured as follows:

- a. Temporary seeding and mulching will be measured by the square yard (~~square meter~~).
- b. Temporary slope drains will be measured by the linear foot (~~meter~~).
- c. Temporary benches, dikes, dams, and sediment basins will be measured by the cubic yard (~~cubic meter~~) of excavation performed, including necessary cleaning of sediment basins, and the cubic yard (~~cubic meter~~) of embankment placed as directed by the Engineer.
- d. All fertilizing will be measured by the ton (kg).

e. Installation and removal of silt fence will be measured by the linear foot (~~meter~~).

156-4.2 Control work performed for protection of construction areas outside the construction limits, such as borrow and waste areas, haul roads, equipment and material storage sites, and temporary plant sites, will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor.

BASIS OF PAYMENT

156-5.1 Accepted quantities of temporary water pollution, soil erosion, and siltation control work ordered by the Engineer and measured as provided in paragraph 156-4.1 will be paid for under:

Item P-156-5.1 Staked Silt Fence - per linear foot

~~Item P 156 5.1b Temporary slope drains - per linear foot (meter)~~

~~Item P 156 5.1c Temporary benches, dikes, dams and sediment basins - per cubic yard (cubic meter)~~

~~Item P 156 5.1d Fertilizing - per ton (kg)~~

~~Item P 156 5.1e Installation and removal of silt fence [- per linear feet (meter) -] [- lump sum -]~~

Where other directed work falls within the specifications for a work item that has a contract price, the units of work shall be measured and paid for at the contract unit price bid for the various items.

Temporary control features not covered by contract items that are ordered by the Engineer will be paid for in accordance with Section 90-05 Payment for Extra work.

MATERIAL REQUIREMENTS

ASTM D6461 Standard Specification for Silt Fence Materials

AC 150/5200-33 Hazardous Wildlife Attractants

END OF ITEM P-156

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ITEM P-209 CRUSHED AGGREGATE BASE COURSE

DESCRIPTION

209-1.1 This item consists of a base course composed of crushed aggregate base constructed on a prepared course in accordance with these specifications and in conformity to the dimensions and typical cross-sections shown on the plans.

MATERIALS

209-2.1 Crushed aggregate base. Crushed aggregate shall consist of clean, sound, durable particles of crushed stone or crushed gravel and shall be free from coatings of clay, silt, organic material, or other objectionable materials. Aggregates shall contain no clay lumps or balls. Fine aggregate passing the No. 4 (4.75 mm) sieve shall consist of fines from the coarse aggregate crushing operation. If necessary, fine aggregate may be added to produce the correct gradation. The fine aggregate shall be produced by crushing stone or gravel that meet the coarse aggregate requirements for wear and soundness.

The coarse aggregate portion, defined as the material retained on the No. 4 (4.75 mm) sieve, shall not have a loss of greater than 45% when tested per ASTM C131. The sodium sulfate soundness loss shall not exceed 12%, or the magnesium sulfate soundness loss shall not exceed 18%, after five cycles, when tested in accordance with ASTM C88. The aggregate shall contain no more than 15%, by weight, of flat, elongated, or flat and elongated particles per ASTM D4791. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than three (3). The aggregate shall have at least 90% by weight of particles with at least two fractured faces and 100% with at least one fractured face per ASTM D5821. The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

a. Sampling and testing for initial aggregate base requirements. Samples shall be taken by the Contractor in the presence of the Engineer. Material shall meet the requirements in paragraph 209-2.1 and 209-2.2. This sampling and testing will be the basis for approval of the aggregate base quality requirements.

209-2.2 Gradation requirements. The gradation of the aggregate base material shall meet the requirements of the gradation given in the following table when tested per ASTM C117 and ASTM C136. The gradation shall be well graded from coarse to fine as defined by ASTM D2487 and shall not vary from the lower limit on one sieve to the high limit on an adjacent sieve or vice versa. The fraction of material passing the No. 200 (0.075 mm) sieve shall not exceed one-half the fraction passing the No. 40 (0.45 mm) sieve.

Requirements For Gradation Of Aggregate Base

Sieve Size	Design Range Percentage by Weight	Contractor's Final Gradation	Job Control Grading Band Tolerances for Contractor's Final Gradation Percent
2 inch (50 mm)	100		0
1-1/2 inch (38 mm)	95-100		±5
1 inch (25 mm)	70-95		±8
3/4 inch (19 mm)	55-85		±8
No. 4 (4.75 mm)	30-60		±8
No. 40 (0.45 mm)	10-30		±5
No. 200 (0.075 mm)	0-8		±3

The “Job Control Grading Band Tolerances for Contractor’s Final Gradation” in the table shall be applied to “Contractor’s Final Gradation” to establish a job control grading band. The full tolerance still applies if application of the tolerances results in a job control grading band outside the design range.

a. Sampling and testing for gradation. Gradation tests shall be performed by the Contractor per ASTM C136 and sieve analysis on material passing the No. 200 sieve (75 mm) per ASTM C117. The Contractor shall take at least two aggregate base samples per lot to check the final gradation. Sampling shall be per ASTM D75. The lot will be consistent with the lot size used for density. The samples shall be taken from the in-place, un-compacted material in the presence of the Engineer. Sampling points and intervals will be designated by the Engineer.

CONSTRUCTION METHODS

209-3.1 Preparing underlying subgrade and/or subbase. The underlying subgrade and/or subbase shall be checked and accepted by the Engineer before base course placing and spreading operations begin. Re-proof rolling of the subgrade or proof rolling of the subbase in accordance with P-152, at the Contractor’s expense, may be required by the Engineer if the Contractor fails to ensure proper drainage or protect the subgrade and/or subbase. Any ruts or soft, yielding areas due to improper drainage conditions, hauling, or any other cause, shall be corrected before the base course is placed. To ensure proper drainage, the spreading of the base shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one-way slope.

209-3.2 Production. The aggregate shall be uniformly blended and, when at a satisfactory moisture content per paragraph 209-3.4, the approved material may be transported directly to the spreading equipment.

209-3.3 Placing. The aggregate base material shall be placed on the prepared underlying subgrade and/or subbase and compacted in layers to the thickness shown on the plans. Work shall progress without interruption. The material shall be deposited and spread in lanes in a uniform layer without segregation to such loose depth that, when compacted, the layer shall have the specified thickness. The aggregate base course shall be constructed in layers of uniform thickness of not less than 3 inches (~~75 mm~~) nor more than 6 inches (~~150 mm~~) of compacted thickness. The aggregate as spread shall be of uniform grading with no pockets of fine or coarse materials. The aggregate, unless otherwise permitted by the Engineer, shall not be spread more than 2,000 square yards (~~1700 sq m~~) in advance of the rolling. Any necessary sprinkling shall be kept within these limits. Care shall be taken to prevent cutting into the underlying layer during spreading. No material shall be placed in snow or on a soft, muddy, or frozen course. The aggregate base material shall be spread by spreader boxes or other approved devices. This equipment shall have positive thickness controls that spread the aggregate in the required amount to avoid or minimize the need for hand manipulation. Dumping from vehicles that require re-handling shall not be permitted. Hauling over the uncompacted base course shall not be permitted.

When more than one layer is required, the construction procedure described herein shall apply similarly to each layer.

209-3.4 Compaction. Immediately after completion of the spreading operations, compact each layer of the base course, as specified, with approved compaction equipment. The number, type, and weight of rollers shall be sufficient to compact the material to the required density within the same day that the aggregate is placed on the subgrade. The moisture content of the material during placing operations shall be within ± 2 percentage points of the optimum moisture content as determined by ASTM D1557.

209-3.5 Acceptance sampling and testing for density. Aggregate base course shall be accepted for density on a lot basis. A lot will consist of one day’s production if it does not exceed 2,400 square yards (~~2000 sq m~~). A lot will consist of one-half day’s production if a day’s production consists of between 2,400 and 4,800 square yards (~~2000 and 4000 sq m~~). The Engineer shall perform all density tests for acceptance **and payment. The Contractor shall conduct his own QA/QC testing before acceptance testing is called for.**

Each lot shall be divided into two equal sublots. One test shall be made for each subplot and shall consist of the average of two random locations for density determination. Sampling locations will be determined by the Engineer on a random basis per ASTM D3665.

Each lot will be accepted for density when the field density is at least 100% of the maximum density of laboratory specimens. The specimens shall be compacted and tested per ASTM D1557. The in-place field density shall be

determined per ASTM D1556. If the specified density is not attained, the entire lot shall be reworked and/or recompacted and two additional random tests made at the Contractor's expense. This procedure shall be followed until the specified density is reached.

209-3.6 Surface tolerances. After the course has been compacted, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches (~~75 mm~~), reshaped and recompacted to grade. until the required smoothness and accuracy are obtained and approved by the Engineer. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense. The smoothness and accuracy requirements specified here apply only to the top layer when base course is constructed in more than one layer.

a. Smoothness. The finished surface shall not vary more than 3/8 inch (9 mm) when tested with a 12-foot (~~3.7 m~~) straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously at half the length of the 12-foot (~~3.7 m~~) straightedge for the full length of each line on a 50-foot (~~15 m~~) grid.

b. Accuracy. The grade and crown shall be measured on a 50-foot (~~15 m~~) grid and shall be within +0 and -1/2 inch (~~12 mm~~) of the specified grade.

209-3.7 Thickness control. The thickness of the base course shall be within +0 and -1/2 inch (12 mm) of the specified thickness as determined by depth tests taken by the Contractor in the presence of the Engineer. Tests shall be taken at intervals representing no more than 300 square yards (~~250 sq m~~) per test. Sampling locations will be determined by the Engineer per ASTM D3665. Where the thickness is deficient by more than 1/2 inch (~~12 mm~~), the Contractor shall correct such areas at no additional cost by scarifying to a depth of at least 3 inches (~~75 mm~~), adding new material of proper gradation, and the material shall be blended and recompacted to grade. Additional test holes may be required to identify the limits of deficient areas. The Contractor shall replace, at his expense, base material where depth tests have been taken.

209-3.8 Protection. Perform construction when the atmospheric temperature is above 35°F (~~2°C~~). When the temperature falls below 35°F (~~2°C~~), protect all completed areas by approved methods against detrimental effects of freezing. Correct completed areas damaged by freezing, rainfall, or other weather conditions to meet specified requirements. When the aggregates contain frozen materials or when the underlying course is frozen or wet, the construction shall be stopped. Hauling equipment may be routed over completed portions of the base course, provided no damage results. Equipment shall be routed over the full width of the base course to avoid rutting or uneven compaction. The Engineer will stop all hauling over completed or partially completed base course when, in the Engineer's opinion, such hauling is causing damage. Any damage to the base course shall be repaired by the Contractor at the Contractor's expense.

209-3.9 Maintenance. The Contractor shall maintain the base course in a satisfactory condition until the full pavement section is completed and accepted by the Engineer. The surface shall be kept clean and free from foreign material and properly drained at all times. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact. Any base course that is not paved over prior to the onset of winter shall be retested to verify that it still complies with the requirements of this specification. Any area of base course that is damaged shall be reworked or replaced as necessary to comply with this specification.

Equipment used in the construction of an adjoining section may be routed over completed base course, if no damage results and the equipment is routed over the full width of the base course to avoid rutting or uneven compaction.

The Contractor shall remove all survey and grade hubs from the base courses prior to placing any bituminous surface course.

METHOD OF MEASUREMENT

209-4.1 The quantity of crushed aggregate base course will be determined by measurement of the number of square yards (~~square meters~~) of material actually constructed and accepted by the Engineer as complying with the plans and specifications. Base materials shall not be included in any other excavation quantities.

BASIS OF PAYMENT

209-5.1 Payment shall be made at the contract unit price per square yard (~~square meter~~) for crushed aggregate base course. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-209-5.1	Crushed Aggregate Base (6" Thick) (For 20' Wide Asphalt Apron Shoulders) - per square yard (square meter)
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TESTING REQUIREMENTS

ASTM C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D422	Standard Test Method for Particle-Size Analysis of Soils
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600 kN-m/m ³))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³ (2700 kN-m/m ³))
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4718	Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D5821	Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

END OF ITEM P-209

ITEM P-306 LEAN CONCRETE BASE COURSE

DESCRIPTION

306-1.1 This item shall consist of a subbase material, herein termed lean concrete, that is composed of aggregate and cement uniformly blended together and mixed with water. The mixture may also include approved cementitious additives, in the form of fly ash or slag, and chemical admixtures. The mixed material shall be spread, shaped, and consolidated using concrete paving equipment in accordance with these specifications and in conformity to the lines, grades, dimensions, and typical cross-sections shown on the plans.

MATERIALS

306-2.1 Aggregate. The coarse aggregate fraction shall be crushed stone, crushed or uncrushed gravel, crushed and adequately seasoned, air-cooled, iron blast furnace slag, crushed recycled concrete, or a combination thereof. The fine aggregate fraction may be part of the natural aggregate blend as obtained from the borrow source or it may be natural sand that is added at the time of mixing.

The aggregate shall consist of hard, durable particles, free from an excess of flat, elongated, soft, or disintegrated pieces, or objectionable matter such as roots, sod, weeds, organic impurities, etc. A flat particle is one having a ratio of width to thickness greater than five; an elongated particle is one having a ratio of length to width greater than five.

The design aggregate blend shall conform to the gradation(s) shown in the table below, when tested in accordance with ASTM C136. The aggregates shall be within the limits for deleterious material contained in ASTM C33 Table 3 type 4S. Aggregates shall not contain any substance which may be deleteriously reactive with the alkalies in the cement, except as permitted in ASTM C33.

Aggregate Gradation For Lean Concrete

Sieve (square openings)	Size	Percentage by Weight Passing Sieves	
		Gradation A	Gradation B
2 inch (50 mm)	—	—	--
1-1/2 inch (38 mm)	100	100	--
1 inch (25 mm)	70—95	100	100
3/4 inch (19 mm)	55—85	70 - 100	70 - 100
No. 4 (4.75 mm)	30—60	35 - 65	35 - 65
No. 40 (425 µm)	10—30	15 - 30	15 - 30
No. 200 (75 µm)	0—15	0 - 15	0 - 15

306-2.2 Cement. Cement shall conform to the requirements of ASTM C150 – Type 1.

306-2.3 Cementitious additives. Pozzolanic and slag cement may be added to the lean concrete mix. If used, each material must meet the following requirements:

a. Pozzolan. Pozzolanic materials must meet the requirements of ASTM C618, Class N, F, or C Fly Ash, except the loss on ignition shall be 6% for Class N and F.

b. Ground granulated blast furnace slag (slag cement). Slag shall conform to ASTM C989, Grade 120.

306-2.4 Chemical admixtures. The Contractor shall submit certificates indicating that the material to be furnished meets all the requirements listed below. In addition, the Engineer may require the Contractor to submit complete test data showing that the material to be furnished meets all the requirements of the cited specification.

a. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260.

b. Water-reducing admixtures. Water-reducing, set-controlling admixtures shall meet the requirements of ASTM C494, Type A, D, E, F, or G. Water-reducing admixtures shall be added at the mixer separately from air-

entraining admixtures in accordance with the manufacturer's printed instructions. The air entrainment agent and the water-reducing admixture shall be compatible.

c. Retarding admixtures. Retarding admixtures shall meet the requirements of ASTM C494, Type B or D.

d. Accelerating admixtures. Accelerating admixtures shall meet the requirements of ASTM C494, Type C.

306-2.5 Water. Water used in mixing or curing shall be potable, clean and free of oil, salt, acid, alkali, sugar, vegetable, or other deleterious substances injurious to the finished product.

306-2.6 Curing materials. For curing lean concrete, use white-pigmented, liquid membrane-forming compound conforming to ASTM C309, Type 2, Class B, or clear or translucent Type 1-D, Class B with white fugitive dye.

COMPOSITION OF MIXTURE

306-3.1 Mix design. The lean concrete mix design shall be based on trial batch results conducted in the laboratory. The lean concrete shall be designed to meet the criteria in this section.

306-3.1.1 Compressive strength. Compressive strength shall not be less than 500 pounds per square inch (~~3,445 kPa~~) nor greater than 800 pounds per square inch (~~5,516 kPa~~) at seven (7) days. Three-day and seven-day strengths shall be taken as the average of two compressive strength test results. All compressive strength specimens shall be prepared and tested in accordance with ASTM C192 and ASTM C39, respectively.

If the 3-day strength is greater than 500 pounds per square inch (~~3,447 kPa~~), the Contractor shall construct transverse joints in the lean concrete layer in accordance with paragraph 306-5.10.2.

If there is a change in aggregate sources, type of cement used, or pozzolanic materials, a new mix design must be submitted.

306-3.1.2 Air content. The percentage of air entrainment shall be 6%, $\pm 1/2\%$. Air content shall be determined by testing in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag and other highly porous coarse aggregate.

306-3.2 Submittals. At least 30 days prior to the placement of the lean concrete, the Contractor shall submit certified test reports to the Engineer for those materials proposed for use during construction, as well as the mix design information for the lean concrete material. Tests older than six (6) months shall not be used. The certification shall show the appropriate ASTM or AASHTO specifications or tests for the material, the name of the company performing the tests, the date of the tests, the test results, and a statement that the material did or did not comply with the applicable specifications. The submittal package shall include the following:

a. Sources of materials, including aggregate, cement, admixtures, and curing and bond breaking materials.

b. Physical properties of the aggregates, cement, admixtures, curing and bond breaking materials.

c. Mix design:

- Mix identification number
- Weight of saturated surface-dry aggregates (fine and coarse)
- Combined aggregate gradation
- Cement factor
- Water content
- Water-cementitious material ratio (by weight)
- Volume of admixtures and yield for one cubic yard (cubic meter) of lean concrete

d. Laboratory test results:

- Slump
- Air content
- Compressive strength at 3, 7, and 28 days (average values)

- Freeze-thaw weight loss (when applicable)

In addition, where applicable, the Contractor shall submit for approval by the Engineer a jointing plan for transverse joints in the lean concrete layer.

During production, the Contractor shall submit batch tickets for each delivered load.

EQUIPMENT

306-4.1 All equipment necessary to mix, transport, place, compact, and finish the lean concrete material shall be furnished by the Contractor. The equipment shall be subject to inspection and approval by the Engineer.

306-4.2 Mixing. Lean concrete may be mixed in a stationary mixer (central batch plant or at the site), or in a truck mixer. The mixer type and capacity shall be inspected and approved by the Engineer before production begins. Each mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.

306-4.2.1 Stationary plant mixer. The batch plant and equipment shall conform to the requirements of ASTM C94. The Engineer shall have unrestricted access to the plant at all times for inspection of the plant's equipment and operation and for sampling the lean concrete mixture and its components.

The mixers shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades.

306-4.2.2 Truck mixers. Truck mixers used for mixing lean concrete shall conform to the requirements of ASTM C94. Lean concrete may be entirely mixed in a truck mixer or partially mixed in a stationary mixer with mixing completed in a truck mixer. Truck mixers shall be equipped with an accurate continuous registering electronically or mechanically activated revolution counter, to verify the number of drum revolutions.

306-4.3 Hauling. Mixed lean concrete shall be hauled from the stationary plant to the job site in a truck agitator, a truck mixer operating at agitating speed, or a non-agitating truck. All equipment shall conform to the requirements of ASTM C94. When truck mixers are used to mix lean concrete, they may be transported to the job site in the same truck operating at agitating speeds, truck agitators, or a non-agitating truck. The bodies of non-agitating trucks shall be smooth, metal containers and shall be capable of discharging the concrete at a controlled rate without segregation.

306-4.4 Placing and finishing.

306-4.4.1 Forms. Straight side forms shall be made of steel and shall be furnished in sections not less than 10 feet (3 m) in length. Forms shall have a depth equal to the pavement thickness at the edge. Flexible or curved forms of proper radius shall be used for curves of 100 feet (30 m) radius or less. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms with battered top surfaces and bent, twisted or broken forms shall not be used. Built-up forms shall not be used, except as approved by the Engineer.

The top face of the form shall not vary from a true plane more than 1/8 inch (3 mm) in 10 feet (3 m), and the upstanding leg shall not vary more than 1/4 inch (6 mm). The forms shall contain provisions for locking the ends of abutting sections together tightly for secure setting. Wood forms may be used under special conditions, when accepted by the Engineer.

306-4.4.2 Fixed form or slip-form pavers. Lean concrete can be placed using fixed form or slip-form pavers. The paver shall be fully energized, self-propelled and capable of spreading, consolidating, and finishing the lean concrete material, true to grade, tolerances, and cross-sections. The paver shall be capable of finishing the surface so that hand finishing is not required. The paver shall be of sufficient weight and power to construct the maximum specified concrete paving lane width, at adequate forward speed, without transverse, longitudinal or vertical instability or without displacement. The slip-form paver shall be equipped with electronic or hydraulic horizontal and vertical control devices using guide wires or stringlines on both sides of the machine. Slope control will not be allowed.

a. Concrete pavers. Concrete pavers are approved as paver-finishing machines for lean concrete, providing they are capable of handling the amount of lean concrete required for the full-lane width specified, and consolidating the lean concrete full depth. A concrete paver is a power-driven machine with augers, strike-off and tamper bars ahead of a pan screed, with at least one trailing oscillating screed or belt finisher.

b. Bridge deck pavers. Bridge deck pavers are approved as paver-finishing machines for lean concrete, providing they are capable of handling the amount of lean concrete required for the full-lane width specified, and consolidating the lean concrete full depth. A bridge deck paver is an automatic truss paving machine, with paving carriage that strikes off, vibrates, paves, and textures the lean concrete with augers, internal vibration, paving rollers, and drag pan.

306-4.5 Consolidation. For side-form construction, vibrators may be either the surface pan type for pavements less than 8 inches (~~200-mm~~) thick or the internal type with either immersed tube or multiple spuds for the full width of the slab. They may be attached to the spreader or the finishing machine, or they may be mounted on a separate carriage. They shall not come in contact with the joint, subgrade, or side forms.

For slip-form construction, the paver shall vibrate the lean concrete for the full width and depth of the strip of pavement being placed. Vibration shall be accomplished by internal vibrators.

The number, spacing, frequency, and eccentric weights of vibrators shall be provided to achieve acceptable consolidation without segregation and finishing quality. Adequate power to operate all vibrators at the weight and frequency required for a satisfactory finish shall be available on the paver. The internal vibrators may be supplemented by vibrating screeds operating on the surface of the lean concrete. The Contractor shall constantly monitor the frequency of each of the individual vibrators and shall provide constant monitoring of the consolidation process to avoid honeycombing or segregation. Areas that are visually determined to be honeycombed or segregated shall be corrected at the Contractor's expense.

The vibrators and tamping elements shall be automatically controlled so that they stop operation as forward motion ceases. Any override switch shall be of the spring-loaded, momentary-contact type.

Hand held vibrators may be used in irregular areas.

306-4.6 Jointing. The Contractor shall provide sawing equipment adequate in number of units and power to produce contraction or construction joints of the required dimensions as shown on the plans. The Contractor shall provide at least one standby saw in good working order and a supply of saw blades at the site of the work at all times during sawing operations.

CONSTRUCTION METHODS

306-5.1 Weather limitations.

306-5.1.1 Cold weather. Unless authorized by the Engineer, the temperature of the mixed lean concrete shall not be less than 50°F (10°C) at the time of placement. In addition, the lean concrete shall not be placed when the ambient temperature is below 40°F (4°C) or when conditions indicate that the temperature may fall below 35°F (2°C) within 24 hours. Under no circumstances shall the lean concrete be placed on frozen underlying courses or mixed when the aggregate is frozen.

When mixing and placing is authorized during cold weather, the Engineer may require the water and/or the aggregates to be heated to not less than 70°F (21°C) nor more than 150°F (66°C). The aggregates may be heated by either steam or dry heat prior to being placed in the mixer. The apparatus used shall heat the mass uniformly and shall be arranged to preclude the possible occurrence of overheated areas which might be detrimental to the materials. The Contractor shall adhere to the practices recommended in American Concrete Institute (ACI) 306R, Guide to Cold Weather Concreting.

306-5.1.2 Hot weather. To prevent rapid drying of newly constructed lean concrete, the lean concrete temperature from initial mixing through final cure shall not exceed 90°F (32°C). The aggregates and/or mixing water shall be cooled as necessary to maintain the lean concrete temperature at or not more than the specified maximum. Ice or ice water may be substituted for the mixing water for this purpose. The Contractor shall adhere to the practices recommended in ACI 305R.

In addition, during periods of warm weather when the maximum daily air temperature exceeds 85°F (30°C), the forms and/or the underlying material shall be sprinkled with water immediately before placing the lean concrete.

306-5.1.3 Rain. All mixing and batching operations should be halted during rain showers and any plastic lean concrete placed should be covered immediately. The lean concrete shall be kept covered with plastic sheeting or

other waterproof material until such time that the rain does not make any surface indentation on the lean concrete layer. Areas damaged by rain shall be refinished or replaced.

306-5.2 Form setting. Forms shall be set sufficiently in advance of the lean concrete placement to ensure continuous paving operation. After the forms have been set to correct grade, the grade shall be thoroughly tamped, either mechanically or by hand, at both the inside and outside edges of the base of the forms. Forms shall be staked into place with not less than three (3) pins for each 10 feet (~~3-m~~) section. A pin shall be placed at each side of every joint.

Form sections shall be tightly locked and shall be free from play or movement in any direction. The forms shall not deviate from true line by more than 1/4 inch (~~6-mm~~) at any joint. Forms shall be so set that they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the placing of lean concrete.

The alignment and grade elevations of the forms shall be checked and corrections made by the Contractor immediately before placing the lean concrete. When any form has been disturbed or any grade has become unstable, the form shall be reset and rechecked.

306-5.3 Preparation of underlying course. The underlying course shall be checked by the Engineer before placing and spreading operations are started, to ensure it is free of any ruts, depressions, or bumps and is finished to the correct grade. Any ruts or soft yielding places in the underlying course shall be corrected at the Contractor's expense before the lean concrete mixture is placed. The underlying course should be wetted down in advance of placing the lean concrete to ensure a firm, moist condition at the time of lean concrete placement. The underlying course shall be protected from frost. Usage of chemicals to eliminate frost is not permissible.

306-5.4 Grade control. Grade control between the edges of the pavement shall be accomplished at intervals of 50 feet (~~15-m~~) or less on the longitudinal grade and at 25 feet (~~7.5-m~~) or less on the transverse grade. To protect the underlying course and ensure proper drainage, the lean concrete paving shall begin along the centerline of the pavement on a crowned section or on the greatest contour elevation of a pavement with variable cross slope.

306-5.5 Handling, measuring, and batching material. The batch plant site, layout, equipment, and provisions for transporting material shall assure a continuous supply of material to the work. Stockpiles shall be constructed in a manner that prevents segregation and intermixing of deleterious materials.

Aggregates that have become segregated or mixed with earth or foreign material shall not be used. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall be stockpiled or binned for draining at least 12 hours before being batched. Rail shipments requiring more than 12 hours transit will be accepted as adequate binning if the car bodies permit free drainage.

Batching plants shall be equipped to proportion aggregates and bulk cement, by weight, automatically using approved interlocked proportioning devices. When bulk cement is used, the Contractor shall use a suitable method such as a chute, boot or other device approved by the Engineer to handle the cement between the weighing hopper and the transporting container or into the batch itself for transportation to the mixer, to prevent loss of cement. The device shall provide positive assurance that each batch has the specified cement content.

306-5.6 Mixing. All lean concrete shall be mixed and delivered to the site per the requirements of ASTM C94. The mixing time should be adequate to produce lean concrete that is uniform in appearance, with all ingredients evenly distributed. Mixing time shall be measured from the time all materials are emptied into the drum (provided all the water is added before one-fourth the preset mixing time has elapsed) and continues until the time the discharge chute is opened to deliver the lean concrete.

If mixing in a plant, the mixing time shall not be less than 50 or greater than 90 seconds. If mixing in a truck, the mixing time shall not be less than 70 or more than 125 truck-drum revolutions at a mixing speed of not less than six (6) or more than 18 truck-drum revolutions per minute.

Re-tempering lean concrete by adding water or by other means will not be permitted, except when lean concrete is delivered in truck mixers. With truck mixers, additional water may be added to the batch materials and additional mixing performed to allow proper placement of the material, provided (a) the addition of water is performed within 45 minutes after the initial mixing operations and (b) the slump and water/cementitious ratio specified in the mix design is not exceeded.

306-5.7 Hauling. The elapsed time from the addition of cementitious material to the mix until the lean concrete is deposited in place at the work site shall not exceed 45 minutes when the concrete is hauled in nonagitating trucks, or 90 minutes when it is hauled in truck mixers or truck agitators.

306-5.8 Placing, consolidating, and finishing. Prior to placement of the lean concrete layer, the prepared underlying course shall be moistened with water, without saturating, to prevent rapid loss of moisture from the lean concrete. In cold weather, the underlying course shall be protected so that it will be entirely free of frost when lean concrete is placed.

The Contractor has the option of side-form or slip-form paving. Either option shall require the hauled lean concrete material to be discharged onto the prepared underlying course such that segregation of the mix is minimized and minimum handling of the mix is needed. The lean concrete shall be placed continuously at a uniform rate without unscheduled stops except for equipment failure or other emergencies. Avoid contamination of plastic lean concrete with foreign material on construction equipment, workman's footwear, or any other sources. Lean concrete shall not be mixed, placed, or finished when the natural light is insufficient, unless an adequate artificial lighting system is provided.

306-5.8.1 Side-form construction. For side-form placement, the Contractor shall verify the elevations of the fixed forms so the thickness and finished grade of the lean concrete layer will be in accordance with the requirements of the project plans and specifications. The lean concrete shall be spread uniformly between the forms immediately after it is placed using a spreading machine. Necessary hand spreading shall be done with shovels. Rakes shall not be allowed for spreading lean concrete.

The spreading shall be followed immediately by thorough consolidation using vibrating screeds or spud vibrators. Vibrators may be external or internal type, depending on the thickness of the lean concrete layer. The surface vibrators may be attached to the spreader or they may be mounted on a separate carriage. They shall not come in contact with the joint, subgrade, or side forms. When spud vibrators are used, the lean concrete shall be thoroughly consolidated against and along the faces of all forms and previously placed lean concrete. Vibrators shall not be permitted to come in contact with a joint assembly, the grade, or a side form. In no case shall the vibrator be operated longer than 20 seconds in any one location, nor shall the vibrators be used to move the lean concrete.

Hand finishing will not be permitted except in areas where the mechanical finisher cannot operate.

306-5.8.2 Slip-form construction. For slip-form construction, the Contractor shall verify the elevations of the guide wires controlling slip-form pavers such that the thickness and finished grade of the lean concrete will be in accordance with the requirements of the project plans and specifications. The slip-form paver should spread, consolidate, and shape the freshly placed lean concrete in one complete pass of the machine. The machine shall vibrate and finish the lean concrete for the full width and depth of the layer.

306-5.9 Final finishing. Final finishing shall be accomplished while the lean concrete is still in the plastic state. Limited surface refinishing by hand is acceptable to meet the grade and surface tolerance established in paragraphs 306-6.2.3 and 306-6.2.4, after strike off and consolidation.

If the overlying layer is to be PCC pavement, the surface of the lean concrete shall not be textured. If the overlying layer is to be HMA pavement, and if the bond between the HMA layer and the lean concrete is considered important for pavement performance, tining or scarifying the surface to provide a coarse texture may be permitted.

306-5.10 Joints. Joints shall be constructed as shown on the plans.

306-5.10.1 Construction joints. Locate all longitudinal and transverse construction joints as shown on the plans. If longitudinal joints are not shown, locate longitudinal joints within 6 inches (150 mm) from planned joints in the PCC to be placed over the lean concrete.

306-5.10.2 Contraction joints. If required by paragraph 306-3.1.1 or if shown on the plans, transverse contraction joints shall be constructed by sawing the hardened lean concrete to a depth of at least one-third the thickness of the lean concrete base. These joints shall match within 3 inches (~~75 mm~~) the planned joints of the overlying concrete surface.

306-5.10.3 Concrete saws. When sawing of joints are specified, the Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions and at the required rate. The Contractor shall provide at least one standby saw in good working order. An ample supply of saw blades shall be maintained at the site of the work at all times during sawing operations. The Contractor shall provide adequate

artificial lighting facilities for night sawing. All equipment shall be on the job at all times during lean concrete placement.

306-5.11 Curing. Immediately after the finishing operations are complete and within two (2) hours of placement of the lean concrete, the entire surface and edges of the newly placed lean concrete shall be sprayed uniformly with white pigmented, liquid membrane forming curing compound. The layer should be kept moist using a moisture-retaining cover or a light application of water until the curing material is applied. The curing compound shall not be applied during rainfall.

The curing material shall be applied at a maximum rate of 200 square feet per gallon (~~5.0 m²~~/4) using pressurized mechanical sprayers. The spraying equipment shall be a fully atomizing type equipped with a tank agitator. At the time of use, the curing compound in the tank shall be thoroughly and uniformly mixed with the pigment. During application the curing compound shall be continuously stirred by mechanical means.

Hand spraying of odd widths or shapes and lean concrete surfaces exposed by the removal of forms is permitted.

If the film of curing material becomes damaged from any cause, including sawing operations, within the required 7-day curing period or until the overlying course is constructed, the damaged portions shall be repaired immediately with additional compound or other approved means as quickly as practical.

Edges of the lean concrete layer shall be sprayed with curing compound immediately following placement with slip-form pavers or when side-forms are removed.

306-5.11.1 Curing in cold weather. The lean concrete shall be maintained at a temperature of at least 50°F (40°C) during curing. Cover lean concrete and provide with a source of heat sufficient to maintain 50°F (40°C) minimum while curing. The Contractor shall adhere to the practices recommended in ACI 306R. The Contractor shall be responsible for the quality and strength of the lean concrete placed during cold weather, and any lean concrete injured by frost action shall be removed and replaced at the Contractor's expense.

306-5.11.2 Curing in hot weather. Lean concrete temperature from initial mixing through final cure shall not exceed 90°F (32°C). Shade the fresh lean concrete and start curing as soon as the surface is sufficiently hard to permit curing without damage. The Contractor shall adhere to the practices recommended in ACI 305R.

306-5.12 Protection. The Contractor shall protect the lean concrete from injurious action by sun, rain, flowing water, frost, or mechanical injury. Protect lean concrete surfaces from foot and vehicular traffic and other sources of abrasion for a minimum of 72 hours. The Engineer shall decide when the pavement shall be opened to traffic. Traffic shall not be allowed on the pavement until test specimens made per ASTM C31 have attained a compressive strength of 350 psi (~~2,413 kPa~~) when tested per ASTM C39. The Contractor shall maintain continuity of applied curing method for the entire curing period.

306-5.13 Bond-breaker. When the lean concrete is placed directly beneath PCC pavement, a bond-breaker shall be used. The entire surface of the lean concrete shall be coated with a de-bonding compound applied in a sufficient quantity to prevent bonding between the PCC pavement and the lean concrete. The Contractor shall be responsible for selecting the de-bonding compound and determining the appropriate application rate. This application shall be made at least eight (8) hours and not more than 24 hours before placement of the PCC pavement. If an impervious membrane is used as a bond breaker, a second application of curing materials is required and shall be placed no more than 24 hours prior to placement of the PCC pavement. After application of the bond-breaker coat, traffic will be limited to that required for placement of the PCC pavement.

MATERIAL ACCEPTANCE

306-6.1 Acceptance sampling and testing. All acceptance sampling and testing, with the exception of coring for thickness determination, necessary to determine conformance with the requirements specified in this section will be performed by the Engineer. The Contractor shall provide the required lean concrete samples during construction for acceptance testing purposes. The samples shall be taken in the presence of the Engineer.

The lean concrete layer shall be tested for air content, strength, thickness, grade, and surface tolerance. Sampling and testing for air shall be as specified in paragraph 306-6.1.1. Sampling and testing for strength, thickness, grade, and surface tolerance shall be on a lot basis, with a lot consisting of either: (1) one day's production not to exceed

2,000 square yards (~~1700-sq-m~~), or (2) a half day's production, where a day's production is expected to consist of between 2,000 and 4,000 square yards (~~1675 and 3350 m²~~).

Each lot will be divided into four equal sublots. In the event that only three sublots are produced, the three sublots shall constitute a complete lot. If only one or two sublots are produced, they shall be incorporated into the next lot, and the total number of sublots shall be used in the acceptance plan calculation.

End-of-production sublots (sublots associated with the final placement of lean concrete for the project which are less than a complete lot) shall be handled as (1) three sublots shall constitute a lot, or (2) one or sublots shall be incorporated into the previous lot.

306-6.1.1 Air content testing. Air content tests shall be performed on the first three truckloads of lean concrete produced at the start of operations each day and the first three truckloads produced after any scheduled or non-scheduled shutdown. Additional tests shall be performed each time a sample is taken for a strength test and when requested by the Engineer.

Air content tests shall be made in accordance with ASTM C231. Air content test results shall be between 4% and 8%.

If the first test on a truckload of lean concrete is not within the specification limits, a second test on the same truckload shall be made. If the second test is within the specification limits, the lean concrete will be accepted with respect to entrained air content. If the second test is not within the specification limits, the truckload shall be rejected.

306-6.1.2 Compressive strength testing. One sample of freshly delivered lean concrete shall be taken from each subplot for compressive strength testing. The lean concrete shall be sampled in accordance with ASTM C172. Sampling locations shall be determined per ASTM D3665.

At least two test cylinders shall be made from each sample per ASTM C31. The 7-day compressive strength of each cylinder shall be determined per ASTM C39.

The Contractor shall provide adequate facilities for the initial curing of cylinders. During the 24 hours after molding, the temperature immediately adjacent to the specimens must be maintained in the range of 60 to 80°F (~~16 to 27°C~~), and loss of moisture from the specimens must be prevented. The specimens may be stored in tightly constructed wooden boxes, damp sand pits, temporary buildings at construction sites, under wet burlap in favorable weather or in heavyweight closed plastic bags, or use other suitable methods, provided the temperature and moisture loss requirements are met.

The compressive strength for each subplot shall be computed by averaging the 7-day compressive strengths of the two test cylinders representing that subplot. The compressive strength of the lot shall be the average compressive strength of the individual sublots comprising the lot.

Specimens that are noticeably defective shall not be considered in the determination of the strength. If the test specimens fail to conform to the requirements for strength, the Engineer shall request changes in the lean concrete mixture to increase the strength to meet the requirements.

If the maximum 7-day compressive strength values exceed the maximum strength requirements when evaluated in accordance with paragraph 306-6-2.1, the Contractor shall propose a jointing plan for approval by the Engineer.

306-6.1.3 Thickness testing. After the lean concrete base has cured for three (3) days, one 4-inch (~~100-mm~~) diameter core per subplot shall be obtained per ASTM D3665. The thickness of each sampled core shall be determined using the caliper measurement procedures per ASTM C174. The average thickness for the lot shall be determined using the individual subplot core thicknesses. Acceptance criteria for lean concrete thickness are provided in paragraph 306-6.2.2.

When such measurement is deficient more than 1/2 inch (12 mm) and not more than 1 inch (25 mm) from the plan thickness, two additional cores shall be taken at random and used in determining the average thickness for that lot. The thickness of the cores shall be determined by average caliper measurement of cores tested in accordance with ASTM C174.

At all locations where cores have been drilled, the resulting holes shall be filled with lean concrete or non-shrink grout material, as approved by the Engineer.

306-6.1.4 Grade testing. The elevations of the finished lean concrete shall be surveyed on both sides of the lean concrete lane, every 25 feet (~~7.5 m~~).

306-6.1.5 Surface tolerance testing. After the lean concrete has hardened sufficiently, it shall be tested for surface tolerance with a 12 feet (~~3.7 m~~) straightedge provided by the Contractor.

306-6.2 Acceptance criteria. Acceptance of lean concrete will be based on compressive strength, thickness, grade, and surface tolerance, as described in the paragraphs below.

306-6.2.1 Compressive strength requirements. The lean concrete shall meet all of the following compressive strength requirements on a lot basis:

- The compressive strength of the lot, tested at seven (7) days, shall be greater than 500 pounds per square inch (~~3,445 kPa~~). When a given lot of lean concrete fails to meet the minimum compressive strength requirements, the entire lot shall be replaced at the Contractor's expense.
- Not more than 20% of the individual cylinders in a given lot, tested at seven (7) days, shall have a compressive strength greater than 800 pounds per square inch (~~5,512 kPa~~). When greater than 20% of the individual cylinders in a given lot have 7-day compressive strengths in excess of 800 pounds per square inch (~~5,512 kPa~~), and transverse joints have not been constructed, a bond-breaker shall be used.

306-6.2.2 Thickness requirements. The completed thickness shall be as shown on the plans. When the average lot thickness is not deficient by more than 1/2 inch (~~12 mm~~) from the plan thickness, full payment shall be made. If the lot average thickness is deficient by more than one inch (~~25 mm~~), it shall be removed and replaced at the Contractor's expense. When such measurement is deficient more than 1/2 inch (~~12 mm~~) and not more than one inch (~~25 mm~~) from the plan thickness, one additional core shall be taken at random from each subplot within the lot. The thickness of these additional cores shall be determined as indicated in paragraph 304-6.1.2. A new lot average thickness shall be recomputed based on these additional cores and the original cores taken from each subplot. When the recomputed average lot thickness is not deficient by more than 1/2 inch (~~12 mm~~) from the plan thickness, full payment shall be made. If the average lot thickness is deficient by more than 1/2 inch (~~12 mm~~) from the plan thickness, the entire lot shall be removed and replaced at the Contractor's expense or shall be permitted to remain in place at an adjusted payment of 75% of the contract unit price.

When the measured thickness is more than that indicated on the plans, it will be considered as conforming to the requirements, provided the surface of the completed lean concrete layer is within the established grade and surface tolerance requirements.

306-6.2.3 Grade requirements. When the completed surface is more than 1/2 inch (~~12 mm~~) above the grade shown in the plans, the surface shall be trimmed at the Contractor's expense using an approved grinding machine to an elevation that falls within a tolerance of 1/4 inch (6 mm).

306-6.2.4 Surface tolerance requirements. Surface deviations shall not exceed 3/8 inch (~~9 mm~~) from a 12-foot (~~3.7 m~~) straightedge laid in any location parallel with or at right angles to the longitudinal axis of the centerline (includes along all edges of the paving lane). Any high spots of more than 3/8 inch (~~9 mm~~) in 12-foot (~~3.7 m~~) shall be marked and immediately trimmed with an approved grinding machine. If the overlying layer is PCC pavement, the ground surface shall be sprayed with a double application of the curing compound at the specified rate prior to paving.

METHOD OF MEASUREMENT

306-7.1 The quantity of lean concrete will be determined by the number of square yard (~~m~~²) of lean concrete actually constructed and accepted by the Engineer as complying with the plans and specifications.

BASIS OF PAYMENT

306-8.1 The accepted quantities of lean concrete will be paid for at the contract unit price per square yard (~~m~~²) for lean concrete base. The price and payment shall be full compensation for furnishing and placing all materials, provided; however, for any pavement found deficient in thickness as specified in paragraph 306-6.2.2, the reduced unit price shall be paid.

Item P-306-8.1

Lean Concrete Base Course (6" Thick) - per square yard.

TESTING REQUIREMENTS

ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C174	Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C192	Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregates (Accelerated Mortar-Bar Method)
AASHTO T136	Standard Method of Test for Freezing-and-Thawing Tests of Compacted Soil-Cement Mixtures
ASTM D3665	Standard Practice for Random Sampling of Construction Materials

MATERIAL REQUIREMENTS

ACI 305R	Guide to Hot Weather Concreting
ACI 306R	Guide to Cold Weather Concreting
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Specification for Coal Fly Ash and Raw and Calcined Natural Pozzolans for Use in Concrete
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars

END OF ITEM P-306

ITEM P-401 HOT MIX ASPHALT (HMA) PAVEMENTS

DESCRIPTION

401-1.1 This item shall consist of pavement courses composed of mineral aggregate and asphalt cement binder (asphalt binder) mixed in a central mixing plant and placed on a prepared course in accordance with these specifications and shall conform to the lines, grades, thicknesses, and typical cross-sections shown on the plans. Each course shall be constructed to the depth, typical section, and elevation required by the plans and shall be rolled, finished, and approved before the placement of the next course.

MATERIALS

401-2.1 Aggregate. Aggregates shall consist of crushed stone, crushed gravel, crushed slag, screenings, natural sand and mineral filler, as required. The aggregates should be free of ferrous sulfides, such as pyrite, that would cause “rust” staining that can bleed through pavement markings. The portion retained on the No. 4 (4.75 mm) sieve is coarse aggregate. The portion passing the No. 4 (4.75 mm) sieve and retained on the No. 200 (0.075 mm) sieve is fine aggregate, and the portion passing the No. 200 (0.075 mm) sieve is mineral filler.

a. Coarse aggregate. Coarse aggregate shall consist of sound, tough, durable particles, free from films of matter that would prevent thorough coating and bonding with the bituminous material and free from organic matter and other deleterious substances. The percentage of wear shall not be greater than 40% when tested in accordance with ASTM C131. The sodium sulfate soundness loss shall not exceed 12%, or the magnesium sulfate soundness loss shall not exceed 18%, after five cycles, when tested in accordance with ASTM C88. Clay lumps and friable particles shall not exceed 1.0% when tested in accordance with ASTM C142.

Aggregate shall contain at least 75 percent by weight of individual pieces having two or more fractured faces and 85 percent by weight having at least one fractured face. The area of each face shall be equal to at least 75% of the smallest midsectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces. Fractured faces shall be achieved by crushing.

The aggregate shall not contain more than a total of 8%, by weight, of flat particles, elongated particles, and flat and elongated particles, when tested in accordance with ASTM D4791 with a value of 5:1.

~~Slag shall be air cooled, blast furnace slag, and shall have a compacted weight of not less than 70 pounds per cubic foot (1.12 mg/cubic meter) when tested in accordance with ASTM C29.~~

b. Fine aggregate. Fine aggregate shall consist of clean, sound, tough, durable, angular shaped particles produced by crushing stone, slag, or gravel that meets the requirements for wear and soundness specified for coarse aggregate. The aggregate particles shall be free from coatings of clay, silt, or other objectionable matter.

The fine aggregate, including any blended material for the fine aggregate, shall have a plasticity index of not more than six (6) and a liquid limit of not more than 25 when tested in accordance with ASTM D4318.

The soundness loss shall not exceed 10% when sodium sulfate is used or 15% when magnesium sulfate is used, after five cycles, when tested per ASTM C88.

Clay lumps and friable particles shall not exceed 1.0%, by weight, when tested in accordance with ASTM C142.

Natural (non-manufactured) sand may be used to obtain the gradation of the aggregate blend or to improve the workability of the mix. The amount of sand to be added will be adjusted to produce mixtures conforming to requirements of this specification. The fine aggregate shall not contain more than 15% natural sand by weight of total aggregates. If used, the natural sand shall meet the requirements of ASTM D1073 and shall have a plasticity index of not more than six (6) and a liquid limit of not more than 25 when tested in accordance with ASTM D4318.

The aggregate shall have sand equivalent values of 45 or greater when tested in accordance with ASTM D2419.

c. Sampling. ASTM D75 shall be used in sampling coarse and fine aggregate, and ASTM C183 shall be used in sampling mineral filler.

401-2.2 Mineral filler. If filler, in addition to that naturally present in the aggregate, is necessary, it shall meet the requirements of ASTM D242.

401-2.3 Asphalt cement binder. Asphalt cement binder shall conform to ASTM D6373 Performance Grade (PG) 76-22. A certificate of compliance from the manufacturer shall be included with the mix design submittal.

The supplier's certified test report with test data indicating grade certification for the asphalt binder shall be provided to the Engineer for each load at the time of delivery to the mix plant. A certified test report with test data indicating grade certification for the asphalt binder shall also be provided to the Engineer for any modification of the asphalt binder after delivery to the mix plant and before use in the HMA.

401-2.4 Preliminary material acceptance. Prior to delivery of materials to the job site, the Contractor shall submit certified test reports to the Engineer for the following materials:

a. Coarse aggregate:

- (1) Percent of wear
- (2) Soundness
- (3) Clay lumps and friable particles
- (4) Percent fractured faces
- (5) Flat and elongated particles

b. Fine aggregate:

- (1) Liquid limit and Plasticity index
- (2) Soundness
- (3) Clay lumps and friable particles
- (4) Percent natural sand
- (5) Sand equivalent

c. Mineral filler.

d. Asphalt binder. Test results for asphalt binder shall include temperature/viscosity charts for mixing and compaction temperatures.

The certifications shall show the appropriate ASTM tests for each material, the test results, and a statement that the material meets the specification requirement.

The Engineer may request samples for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

401-2.5 Anti-stripping agent. Any anti-stripping agent or additive if required shall be heat stable, shall not change the asphalt cement viscosity beyond specifications, shall contain no harmful ingredients, shall be added in recommended proportion by approved method, and shall be a material approved by the Department of Transportation of the State in which the project is located.

COMPOSITION

401-3.1 Composition of mixture. The HMA mix shall be composed of a mixture of well-graded aggregate, filler and anti-strip agent if required, and asphalt binder. The several aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF).

401-3.2 Job mix formula (JMF). No hot-mixed asphalt (HMA) for payment shall be produced until a JMF has been approved in writing by the Engineer. The asphalt mix-design and JMF shall be prepared by an accredited laboratory that meets the requirements of paragraph 401-3.4. The HMA shall be designed using procedures contained in Asphalt Institute MS-2 Mix Design Manual, 7th Edition. ASTM D6926 shall be used for preparation of specimens using the manually held and operated hammer for the mix design procedure. ASTM D6927 shall be used for testing for Marshall stability and flow.

If material variability exceeds the standard deviations indicated, the JMF and subsequent production targets shall be based on a stability greater than shown in Table 1 and the flow shall be targeted close to the mid-range of the criteria in order to meet the acceptance requirements.

Tensile strength ratio (TSR) of the composite mixture, as determined by ASTM D4867, shall not be less than 75 when tested at a saturation of 70-80% or an anti-stripping agent shall be added to the HMA, as necessary, to produce a TSR of not less than 75 when tested at a saturation of 70-80%. If an anti-strip agent is required, it shall be provided by the Contractor at no additional cost to the Owner.

The JMF shall be submitted in writing by the Contractor at least 30 days prior to the start of paving operations. The JMF shall be developed within the same construction season using aggregates currently being produced.

The submitted JMF shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items as a minimum:

a. Percent passing each sieve size for total combined gradation, individual gradation of all aggregate stockpiles and percent by weight of each stockpile used in the job mix formula.

b. Percent of asphalt cement.

c. Asphalt performance grade and type of modifier if used.

d. Number of blows per side of molded specimen.

e. Laboratory mixing temperature.

f. Laboratory compaction temperature.

g. Temperature-viscosity relationship of the PG asphalt cement binder showing acceptable range of mixing and compaction temperatures; and for modified binders include supplier recommended mixing and compaction temperatures.

h. Plot of the combined gradation on a 0.45 power gradation curve.

i. Graphical plots of stability, flow, air voids, voids in the mineral aggregate, and unit weight versus asphalt content.

j. Specific Gravity and absorption of each aggregate.

k. Percent natural sand.

l. Percent fractured faces.

m. Percent by weight of flat particles, elongated particles, and flat and elongated particles (and criteria).

n. Tensile Strength Ratio (TSR).

o. Anti-strip agent (if required).

p. Date the JMF was developed. Mix designs that are not dated or which are from a prior construction season shall not be accepted.

The Contractor shall submit to the Engineer the results of verification testing of three (3) asphalt samples prepared at the optimum asphalt content. The average of the results of this testing shall indicate conformance with the JMF requirements specified in Tables 1 and 3.

When the project requires asphalt mixtures of differing aggregate gradations, a separate JMF and the results of JMF verification testing shall be submitted for each mix.

The JMF for each mixture shall be in effect until a modification is approved in writing by the Engineer. Should a change in sources of materials be made, a new JMF must be submitted within 15 days and approved by the Engineer in writing before the new material is used. After the initial production JMF has been approved by the Engineer and a new or modified JMF is required for whatever reason, the subsequent cost of the Engineer's approval of the new or modified JMF will be borne by the Contractor. There will be no time extension given or considerations for extra costs associated with the stoppage of production paving or restart of production paving due to the time needed for the Engineer to approve the initial, new or modified JMF.

The Marshall Design Criteria applicable to the project shall meet the criteria specified in Table 1.

Table 1. Marshall Design Criteria

Test Property	Value
Number of blows	75
Stability, pounds (Newtons) minimum	2150 (9560)
Flow, 0.01 in. (0.25 mm)	10-16
Air voids (%)	3.5
Percent voids in mineral aggregate, minimum	See Table 2

¹ The flow requirement is not applicable for Polymer Modified Asphalts.

Table 2. Minimum Percent Voids In Mineral Aggregate (VMA)

Aggregate (See Table 3)	Minimum VMA
Gradation 3	16%
Gradation 2	15%
Gradation 1	14%

The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the gradation or gradations specified in Table 3 when tested in accordance with ASTM C136 and ASTM C117.

The gradations in Table 3 represent the limits that shall determine the suitability of aggregate for use from the sources of supply; be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa.

Table 3. Aggregate - HMA Pavements

Sieve Size	Percentage by Weight Passing Sieve
1 inch (25 mm)	--
3/4 inch (19 mm)	100
1/2 inch (12 mm)	79-99
3/8 inch (9 mm)	68-88
No. 4 (4.75 mm)	48-68
No. 8 (2.36 mm)	33-53
No. 16 (1.18 mm)	20-40
No. 30 (0.60 mm)	14-30
No. 50 (0.30 mm)	9-21
No. 100 (0.15 mm)	6-16
No. 200 (0.075 mm)	3-6

Sieve Size	Percentage by Weight Passing Sieve
Asphalt Percent:	
Stone or gravel	5.0-7.5
Slag	6.5-9.5

The aggregate gradations shown are based on aggregates of uniform specific gravity. The percentages passing the various sieves shall be corrected when aggregates of varying specific gravities are used, as indicated in the Asphalt Institute MS-2 Mix Design Manual, 7th Edition.

401-3.3 Reclaimed asphalt pavement (RAP). RAP shall not be used.

401-3.4 Job mix formula (JMF) laboratory. The Contractor's laboratory used to develop the JMF shall be accredited in accordance with ASTM D3666. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the JMF must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

401-3.5 Test section. Prior to full production, the Contractor shall prepare and place a quantity of HMA according to the JMF. The amount of HMA shall be sufficient to construct a test section 300' long and 25' wide, placed in two lanes, with a longitudinal cold joint, and shall be of the same depth specified for the construction of the course which it represents. A cold joint for this test section is an exposed construction joint at least four (4) hours old or whose mat has cooled to less than 160°F (71°C). The cold joint must be cut back using the same procedure that will be used during production in accordance with 401-4.13. The underlying grade or pavement structure upon which the test section is to be constructed shall be the same as the remainder of the course represented by the test section. The equipment used in construction of the test section shall be the same type and weight to be used on the remainder of the course represented by the test section.

The test section shall be evaluated for acceptance as a single lot in accordance with the acceptance criteria in paragraph 401-5.1 and 401-5.2. The test section shall be divided into equal sublots. As a minimum the test section shall consist of three (3) sublots.

The test section shall be considered acceptable if (1) stability, flow, mat density, air voids, and joint density are 90% or more within limits, (2) gradation and asphalt content are within the action limits specified in paragraphs 401-6.5a and 5b, and (3) the voids in the mineral aggregate are within the limits of Table 2.

If the initial test section should prove to be unacceptable, the necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made. A second test section shall then be placed. If the second test section also does not meet specification requirements, both sections shall be removed at the Contractor's expense. Additional test sections, as required, shall be constructed and evaluated for conformance to the specifications. Any additional sections that are not acceptable shall be removed at the Contractor's expense. Full production shall not begin until an acceptable test section has been constructed and accepted in writing by the Engineer. Once an acceptable test section has been placed, payment for the initial test section and the section that meets specification requirements shall be made in accordance with paragraph 401-8.1.

Job mix control testing shall be performed by the Contractor at the start of plant production and in conjunction with the calibration of the plant for the JMF. If aggregates produced by the plant do not satisfy the gradation requirements or produce a mix that meets the JMF, it will be necessary to reevaluate and redesign the mix using plant-produced aggregates. Specimens shall be prepared and the optimum asphalt content determined in the same manner as for the original JMF tests.

Contractor will not be allowed to place the test section until the Contractor Quality Control Program, showing conformance with the requirements of Paragraph 401-6.1, has been approved, in writing, by the Engineer.

CONSTRUCTION METHODS

401-4.1 Weather limitations. The HMA shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 4. The temperature requirements may be waived by the Engineer, if requested; however, all other requirements including compaction shall be met.

Table 4. Surface Temperature Limitations of Underlying Course

Mat Thickness	Base Temperature (Minimum)	
	°F	°C
3 inches (7.5 cm) or greater	40	4
Greater than 2 inches (50 mm) but less than 3 inches (7.5 cm)	45	7

401-4.2 HMA plant. Plants used for the preparation of HMA shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M156 with the following changes:

Requirements for all plants include:

a. Truck scales. The HMA shall be weighed on approved scales furnished by the Contractor, or on certified public scales at the Contractor's expense. Scales shall be inspected and sealed as often as the Engineer deems necessary to assure their accuracy. Scales shall conform to the requirements of the General Provisions, subsection 90-01.

In lieu of scales, and as approved by the Engineer, HMA weight may be determined by the use of an electronic weighing system equipped with an automatic printer that weighs the total HMA production and as often thereafter as requested by the Engineer.

b. Testing facilities. The Contractor shall ensure laboratory facilities are provided at the plant for the use of the Engineer. The lab shall have sufficient space and equipment so that both testing representatives (Engineer's and Contractor's) can operate efficiently. The lab shall meet the requirements of ASTM D3666 including all necessary equipment, materials, calibrations, current reference standards to comply with the specifications and a masonry saw with diamond blade for trimming pavement cores and samples.

The plant testing laboratory shall have a floor space area of not less than 200 square feet (18.5 sq m), with a ceiling height of not less than 7-1/2 feet (2 m). The laboratory shall be weather tight, sufficiently heated in cold weather, air-conditioned in hot weather to maintain temperatures for testing purposes of 70°F ±5°F (21°C ±2.3°C). The plant testing laboratory shall be located on the plant site to provide an unobstructed view, from one of its windows, of the trucks being loaded with the plant mix materials. In addition, the facility shall include the minimum:

- (1) Adequate artificial lighting.
- (2) Electrical outlets sufficient in number and capacity for operating the required testing equipment and drying samples.
- (3) A minimum of two (2) Underwriter's Laboratories approved fire extinguishers of the appropriate types and class.
- (4) Work benches for testing.
- (5) Desk with chairs and file cabinet.
- (6) Sanitary facilities convenient to testing laboratory.
- (7) Exhaust fan to outside air.
- (8) Sink with running water.

Failure to provide the specified facilities shall be sufficient cause for disapproving HMA plant operations.

Laboratory facilities shall be kept clean, and all equipment shall be maintained in proper working condition. The Engineer shall be permitted unrestricted access to inspect the Contractor's laboratory facility and witness quality control activities. The Engineer will advise the Contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious

enough to be adversely affecting the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

c. Inspection of plant. The Engineer, or Engineer's authorized representative, shall have access, at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant: verifying weights, proportions, and material properties; and checking the temperatures maintained in the preparation of the mixtures.

d. Storage bins and surge bins. The HMA stored in storage and surge bins shall meet the same requirements as HMA loaded directly into trucks and may be permitted under the following conditions:

- (1) Stored in non-insulated bins for a period of time not to exceed three (3) hours.
- (2) Stored in insulated bins for a period of time not to exceed eight (8) hours.

If the Engineer determines that there is an excessive amount of heat loss, segregation, or oxidation of the HMA due to temporary storage, no temporary storage will be allowed.

401-4.3 Hauling equipment. Trucks used for hauling HMA shall have tight, clean, and smooth metal beds. To prevent the HMA from sticking to the truck beds, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other material approved by the Engineer. Petroleum products shall not be used for coating truck beds. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers shall be securely fastened.

401-4.3.1 Material transfer vehicle (MTV). Material transfer vehicles used to transfer the material from the hauling equipment to the paver, shall use a self-propelled, material transfer vehicle with a swing conveyor that can deliver material to the paver without making contact with the paver. The MTV shall be able to move back and forth between the hauling equipment and the paver providing material transfer to the paver, while allowing the paver to operate at a constant speed. The Material Transfer Vehicle will have remixing and storage capability to prevent physical and thermal segregation.

401-4.4 HMA pavers. HMA pavers shall be self-propelled with an activated heated screed, capable of spreading and finishing courses of HMA that will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface.

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the HMA uniformly in front of the screed without segregation. The screed shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.

If, during construction, it is found that the spreading and finishing equipment in use leaves tracks or indented areas, or produces other blemishes in the pavement that are not satisfactorily corrected by the scheduled operations, the use of such equipment shall be discontinued and satisfactory equipment shall be provided by the Contractor.

401-4.4.1 Automatic grade controls. The HMA paver shall be equipped with a control system capable of automatically maintaining the specified screed elevation. The control system shall be automatically actuated from either a reference line and/or through a system of mechanical sensors or sensor-directed mechanisms or devices that will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. The transverse slope controller shall be capable of maintaining the screed at the desired slope within $\pm 0.1\%$.

The controls shall be capable of working in conjunction with any of the following attachments:

- a. Ski-type device of not less than 30 feet (9 m) in length.
- b. Taut string-line (wire) set to grade.
- c. Short ski or shoe.
- d. Laser control.

401-4.5 Rollers. Rollers of the vibratory, steel wheel, and pneumatic-tired type shall be used. They shall be in good condition, capable of operating at slow speeds to avoid displacement of the HMA. The number, type, and weight of rollers shall be sufficient to compact the HMA to the required density while it is still in a workable condition.

All rollers shall be specifically designed and suitable for compacting HMA concrete and shall be properly used. Rollers that impair the stability of any layer of a pavement structure or underlying soils shall not be used. Depressions in pavement surfaces caused by rollers shall be repaired by the Contractor at their own expense.

The use of equipment that causes crushing of the aggregate will not be permitted.

401-4.6. Density device. The Contractor shall have on site a density gauge during all paving operations in order to assist in the determination of the optimum rolling pattern, type of roller and frequencies, as well as to monitor the effect of the rolling operations during production paving. The Contractor shall also supply a qualified technician during all paving operations to calibrate the gauge and obtain accurate density readings for all new HMA. These densities shall be supplied to the Engineer upon request at any time during construction. No separate payment will be made for supplying the density gauge and technician.

401-4.7 Preparation of asphalt binder. The asphalt binder shall be heated in a manner that will avoid local overheating and provide a continuous supply of the asphalt binder to the mixer at a uniform temperature. The temperature of unmodified asphalt binder delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles, but shall not exceed 325°F (160°C) when added to the aggregate. The temperature of modified asphalt binder shall be no more than 350°F (175°C) when added to the aggregate.

401-4.8 Preparation of mineral aggregate. The aggregate for the HMA shall be heated and dried. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates. The temperature of the aggregate and mineral filler shall not exceed 350°F (175°C) when the asphalt binder is added. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by overheating. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

401-4.9 Preparation of HMA. The aggregates and the asphalt binder shall be weighed or metered and introduced into the mixer in the amount specified by the JMF. The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but not less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor, based on the procedure for determining the percentage of coated particles described in ASTM D2489, for each individual plant and for each type of aggregate used. The wet mixing time will be set to achieve 95% of coated particles. For continuous mix plants, the minimum mixing time shall be determined by dividing the weight of its contents at operating level by the weight of the mixture delivered per second by the mixer. The moisture content of all HMA upon discharge shall not exceed 0.5%.

401-4.10 Preparation of the underlying surface. Immediately before placing the HMA, the underlying course shall be cleaned of all dust and debris. A prime coat and tack coat shall be applied in accordance with Item P-602 and P-603, if shown on the plans.

401-4.11 Laydown plan, transporting, placing, and finishing. Prior to the placement of the HMA, the Contractor shall prepare a laydown plan for approval by the Engineer. This is to minimize the number of cold joints in the pavement. The laydown plan shall include the sequence of paving laydown by stations, width of lanes, temporary ramp locations, and laydown temperature. The laydown plan shall also include estimated time of completion for each portion of the work (that is, milling, paving, rolling, cooling, etc.). Modifications to the laydown plan shall be approved by the Engineer.

The HMA shall be transported from the mixing plant to the site in vehicles conforming to the requirements of paragraph 401-4.3. Deliveries shall be scheduled so that placing and compacting of HMA is uniform with minimum stopping and starting of the paver. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to atmospheric temperature.

~~The Contractor shall use a material transfer vehicle to deliver HMA to the paver.~~

The alignment and elevation of the paver shall be regulated from outside reference lines established for this purpose for the first lift of all runway and taxiway pavements. Successive lifts of HMA surface course may be placed using a ski, or laser control per paragraph 401-4.4.1, provided grades of the first lift of HMA surface course meet the tolerances of paragraphs 401-5.2b(6) as verified by a survey. Contractor shall survey each lift of HMA surface course and certify to Engineer that every lot of each lift meets the grade tolerances of paragraph 401-5.2b(6) before the next lift can be placed.

The initial placement and compaction of the HMA shall occur at a temperature suitable for obtaining density, surface smoothness, and other specified requirements but not less than 250°F (121°C).

Edges of existing HMA pavement abutting the new work shall be saw cut and carefully removed as shown on the drawings and coated with asphalt tack coat before new material is placed against it.

Upon arrival, the HMA shall be placed to the full width by a HMA paver. It shall be struck off in a uniform layer of such depth that, when the work is completed, it shall have the required thickness and conform to the grade and contour indicated. The speed of the paver shall be regulated to eliminate pulling and tearing of the HMA mat. Unless otherwise permitted, placement of the HMA shall begin along the centerline of a crowned section or on the high side of areas with a one-way slope. The HMA shall be placed in consecutive adjacent strips having a minimum width of 12 feet (m) except where edge lanes require less width to complete the area. Additional screed sections shall not be attached to widen paver to meet the minimum lane width requirements specified above unless additional auger sections are added to match. The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least 1 foot (30 cm); however, the joint in the surface top course shall be at the centerline of crowned pavements. Transverse joints in one course shall be offset by at least 10 feet (3 m) from transverse joints in the previous course.

Transverse joints in adjacent lanes shall be offset a minimum of 10 feet (3 m).

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the HMA may be spread and luted by hand tools.

Areas of segregation in the surface course, as determined by the Engineer, shall be removed and replaced at the Contractor's expense. The area shall be removed by saw cutting and milling a minimum of 2 inches (50 mm) deep. The area to be removed and replaced shall be a minimum width of the paver and a minimum of 10 feet (3 m) long.

401-4.12 Compaction of HMA. After placing, the HMA shall be thoroughly and uniformly compacted by power rollers. The surface shall be compacted as soon as possible when the HMA has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross-section, and the required field density is obtained. To prevent adhesion of the HMA to the roller, the wheels shall be equipped with a scraper and kept properly moistened but excessive water will not be permitted.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with approved power driven tampers. Tampers shall weigh not less than 275 pounds (125 kg), have a tamping plate width not less than 15 inches (38 cm), be rated at not less than 4,200 vibrations per minute, and be suitably equipped with a standard tamping plate wetting device.

Any HMA that becomes loose and broken, mixed with dirt, contains check-cracking, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching shall not be allowed.

401-4.13 Joints. The formation of all joints shall be made in such a manner as to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

The roller shall not pass over the unprotected end of the freshly laid HMA except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing the adjacent lane. In both methods, all contact surfaces shall be coated with an asphalt tack coat before placing any fresh HMA against the joint.

Longitudinal joints which have been left exposed for more than four (4) hours; the surface temperature has cooled to less than 175°F (80°C); or are irregular, damaged, uncompacted or otherwise defective shall be cut back 3 inches (75 mm) to 6 inches (150 mm) to expose a clean, sound, uniform vertical surface for the full depth of the course. All cutback material shall be removed from the project. Asphalt tack coat or other product approved by the Engineer

shall be applied to the clean, dry joint, prior to placing any additional fresh HMA against the joint. Any laitance produced from cutting joints shall be removed by vacuuming and washing. The cost of this work shall be considered incidental to the cost of the HMA.

401-4.14 Saw-cut grooving. If shown on the plans, saw cut grooves shall be provided as specified in Item P-621.

401-4.15 Diamond grinding. When required, diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive. The saw blades shall be assembled in a cutting head mounted on a machine designed specifically for diamond grinding that will produce the required texture and smoothness level without damage to the pavement. The saw blades shall be 1/8-inch (3-mm) wide and there shall be a minimum of 55 to 60 blades per 12 inches (300 mm) of cutting head width; the actual number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Each machine shall be capable of cutting a path at least 3 feet (0.9 m) wide. Equipment that causes ravels, aggregate fractures, spalls or disturbance to the pavement will not be permitted. The depth of grinding shall not exceed 1/2 inch (13mm) and all areas in which diamond grinding has been performed will be subject to the final pavement thickness tolerances specified. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. Areas that have been ground will be sealed with a P-608 surface treatment as directed by the Engineer. It may be necessary to seal a larger area to avoid surface treatment creating any conflict with runway or taxiway markings.

401-4.16 Nighttime paving requirements. Paving during nighttime construction shall require the following:

a. All paving machines, rollers, distribution trucks and other vehicles required by the Contractor for his operations shall be equipped with artificial illumination sufficient to safely complete the work.

b. Minimum illumination level shall be twenty (20) horizontal foot-candles and maintained in the following areas:

(1) An area of 30 feet (9 m) wide by 30 feet (9 m) long immediately behind the paving machines during the operations of the machines.

(2) An area 15 feet (4.5 m) wide by 30 feet (9 m) long immediately in front and back of all rolling equipment, during operation of the equipment.

(3) An area 15 feet (4.5 m) wide by 15 feet (4.5 m) long at any point where an area is being tack coated prior to the placement of pavement.

c. As partial fulfillment of the above requirements, the Contractor shall furnish and use, complete artificial lighting units with a minimum capacity of 3,000 watt electric beam lights, affixed to all equipment in such a way to direct illumination on the area under construction.

d. A lighting plan must be submitted by the Contractor and approved by the Engineer prior to the start of any nighttime work.

If the Contractor places any out of specification mix in the project work area, the Contractor is required to remove it at its own expense, to the satisfaction of the Engineer. If the Contractor has to continue placing non-payment HMA, as directed by the Engineer, to make the surfaces safe for aircraft operations, the Contractor shall do so to the satisfaction of the Engineer. It is the Contractor's responsibility to leave the facilities to be paved in a safe condition ready for aircraft operations. No consideration for extended closure time of the area being paved will be given. As a first order of work for the next paving shift, the Contractor shall remove all out of specification material and replace with approved material to the satisfaction of the Engineer. When the above situations occur, there will be no consideration given for additional construction time or payment for extra costs.

MATERIAL ACCEPTANCE

401-5.1 Acceptance sampling and testing. Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the Engineer at no cost to the Contractor except that coring as required in this section shall be completed and paid for by the Contractor.

Testing organizations performing these tests shall be accredited in accordance with ASTM D3666. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for

acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction. All equipment in Contractor furnished laboratories shall be calibrated by an independent testing organization prior to the start of operations at the Contractor's expense.

a. Hot mixed asphalt. Plant-produced HMA shall be tested for air voids and stability and flow on a lot basis. Sampling shall be from material deposited into trucks at the plant or from trucks at the job site. Samples shall be taken in accordance with ASTM D979.

A standard lot shall be equal to one day's production or 2000 tons (1814 metric tons) whichever is smaller. If the day's production is expected to exceed 2000 tons (1814 metric tons), but less than 4000 tons (3628 metric tons), the lot size shall be 1/2 day's production. If the day's production exceeds 4000 tons (3628 metric tons), the lot size shall be an equal sized fraction of the day's production, but shall not exceed 2000 tons (1814 metric tons).

Where more than one plant is simultaneously producing HMA for the job, the lot sizes shall apply separately for each plant.

(1) Sampling. Each lot will consist of four equal sublots. Sufficient HMA for preparation of test specimens for all testing will be sampled by the Engineer on a random basis, in accordance with the procedures contained in ASTM D3665. Samples will be taken in accordance with ASTM D979.

The sample of HMA may be put in a covered metal tin and placed in an oven for not less than 30 minutes nor more than 60 minutes to stabilize to compaction temperature. The compaction temperature of the specimens shall be as specified in the JMF.

(2) Testing. Sample specimens shall be tested for stability and flow in accordance with ASTM D6927. Air voids will be determined by the Engineer in accordance with ASTM D3203. One set of laboratory compacted specimens will be prepared for each subplot in accordance with ASTM D6926 at the number of blows required by paragraph 401-3.2, Table 1. Each set of laboratory compacted specimens will consist of three test specimens prepared from the same sample. The manual hammer in ASTM D6926 shall be used.

Prior to testing, the bulk specific gravity of each test specimen shall be measured by the Engineer in accordance with ASTM D2726 using the procedure for laboratory-prepared thoroughly dry specimens for use in computing air voids and pavement density.

For air voids determination, the theoretical maximum specific gravity of the mixture shall be measured one time for each subplot in accordance with ASTM D2041. The value used in the air voids computation for each subplot shall be based on theoretical maximum specific gravity measurement for the subplot.

The stability and flow for each subplot shall be computed by averaging the results of all test specimens representing that subplot.

(3) Acceptance. Acceptance of plant produced HMA for stability, flow, and air voids shall be determined by the Engineer in accordance with the requirements of paragraph 401-5.2b.

b. In-place HMA. HMA placed in the field shall be tested for mat and joint density on a lot basis. A standard lot shall be equal to one day's production or 2000 tons (1814 metric tons) whichever is smaller. If the day's production is expected to exceed 2000 tons (1814 metric tons), but less than 4000 tons (3628 metric tons), the lot size shall be 1/2 day's production. If the day's production exceeds 4000 tons (3628 metric tons), the lot size shall be an equal sized fraction of the day's production, but shall not exceed 2000 tons (1814 metric tons).

(1) Mat density. The lot size shall be the same as that indicated in paragraph 401-5.1a and shall be divided into four equal sublots. One core of finished, compacted HMA shall be taken by the Contractor from each subplot. Core locations will be determined by the Engineer on a random basis in accordance with procedures contained in ASTM D3665. Cores for mat density shall not be taken closer than one foot (30 cm) from a transverse or longitudinal joint.

(2) Joint density. The lot size shall be the total length of longitudinal joints constructed by a lot of HMA as defined in paragraph 401-5.1a. The lot shall be divided into four equal sublots. One core of finished, compacted HMA shall be taken by the Contractor from each subplot. Core locations will be determined by the Engineer on a random basis in accordance with procedures contained in ASTM D3665. All cores for joint density shall be taken centered on the joint. The minimum core diameter for joint density determination shall be 5 inches (125 mm).

(3) Sampling. Samples shall be neatly cut with a diamond core drill bit. Samples will be taken in accordance with ASTM D979. The minimum diameter of the sample shall be 5 inches (125 mm). Samples that are clearly defective, as a result of sampling, shall be discarded and another sample taken. The Contractor shall furnish all tools, labor, and materials for cutting samples, cleaning, and filling the cored pavement. Cored pavement shall be cleaned and core holes shall be filled in a manner acceptable to the Engineer and within one day after sampling. Laitance produced by the coring operation shall be removed immediately.

The top most lift of HMA shall be completely bonded to the underlying layer. If any of the cores reveal that the surface is not bonded to the layer immediately below the surface then additional cores shall be taken as directed by the Engineer in accordance with paragraph 401-5.1b to determine the extent of any delamination. All delaminated areas shall be completely removed by milling to the limits and depth and replaced as directed by the Engineer at no additional cost.

(4) Testing. The bulk specific gravity of each cored sample will be measured by the Engineer in accordance with ASTM D2726. Samples will be taken in accordance with ASTM D979. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each subplot sample by the average bulk specific gravity of all laboratory prepared specimens for the lot, as determined in paragraph 401-5.1a(2). The bulk specific gravity used to determine the joint density at joints formed between different lots shall be the lowest of the bulk specific gravity values from the two different lots.

(5) Acceptance. Acceptance of field placed HMA for mat density will be determined by the Engineer in accordance with the requirements of paragraph 401-5.2b(1). Acceptance for joint density will be determined by the Engineer in accordance with the requirements of paragraph 401-5.2b(3).

c. Partial lots. When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot, or when the Contractor and Engineer agree in writing to allow overages or other minor tonnage placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.

The last batch produced where production is halted will be sampled, and its properties shall be considered as representative of the particular subplot from which it was taken. In addition, an agreed to minor placement will be sampled, and its properties shall be considered as representative of the particular subplot from which it was taken. Where three sublots are produced, they shall constitute a lot. Where one or two sublots are produced, they shall be incorporated into the next lot, and the total number of sublots shall be used in the acceptance plan calculation, that is, $n = 5$ or $n = 6$, for example. Partial lots at the end of asphalt production on the project shall be included with the previous lot. The lot size for field placed material shall correspond to that of the plant material, except that, in no cases, shall less than three (3) cored samples be obtained, that is, $n = 3$.

401-5.2 Acceptance criteria.

a. General. Acceptance will be based on the following characteristics of the HMA and completed pavement as well as the implementation of the Contractor Quality Control Program and test results:

- (1) Air voids
- (2) Mat density
- (3) Joint density
- (4) Thickness
- (5) Smoothness
- (6) Grade
- (7) Stability
- (8) Flow

Mat density and air voids will be evaluated for acceptance in accordance with paragraph 401-5.2b(1). Stability and flow will be evaluated for acceptance in accordance with paragraph 401-5.2b(2). Joint density will be evaluated for acceptance in accordance with paragraph 401-5.2b(3).

Thickness will be evaluated by the Engineer for compliance in accordance with paragraph 401-5.2b(4). Acceptance for smoothness will be based on the criteria contained in paragraph 401-5.2b(5). Acceptance for grade will be based on the criteria contained in paragraph 401-5.2b(7).

The Engineer may at any time, reject and require the Contractor to dispose of any batch of HMA which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or improper mix temperature. Such rejection may be based on only visual inspection or temperature measurements. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the Engineer, and if it can be demonstrated in the laboratory, in the presence of the Engineer, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

b. Acceptance criteria.

(1) Mat density and air voids. Acceptance of each lot of plant produced material for mat density and air voids shall be based on the percentage of material within specification limits (PWL). If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. Acceptance and payment shall be determined in accordance with paragraph 401-8.1.

(2) Stability and flow. Acceptance of each lot of plant produced HMA for stability and flow shall be based on the PWL. If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. If the PWL is less than 90%, the Contractor shall determine the reason and take corrective action. If the PWL is below 80%, the Contractor must stop production until the reason for poor stability and/or flow has been determined and adjustments to the HMA are made.

(3) Joint density. Acceptance of each lot of plant produced HMA for joint density shall be based on the PWL. If the PWL of the lot is equal to or exceeds 90%, the lot shall be considered acceptable. If the PWL is less than 90%, the Contractor shall evaluate the reason and act accordingly. If the PWL is less than 80%, the Contractor shall cease operations and until the reason for poor compaction has been determined. If the PWL is less than 71%, the pay factor for the lot used to complete the joint shall be reduced by five (5) percentage points. This lot pay factor reduction shall be incorporated and evaluated in accordance with paragraph 401-8.1.

(4) Thickness. Thickness of each lift of surface course shall be evaluated by the Engineer for compliance to the requirements shown on the plans. Measurements of thickness shall be made by the Engineer using the cores extracted for each subplot for density measurement. The maximum allowable deficiency at any point shall not be more than 1/4 inch (6 mm) less than the thickness indicated for the lift. Average thickness of lift, or combined lifts, shall not be less than the indicated thickness. Where the thickness tolerances are not met, the lot or subplot shall be corrected by the Contractor at his expense by removing the deficient area and replacing with new pavement. The Contractor, at his expense, may take additional cores as approved by the Engineer to circumscribe the deficient area.

(5) Smoothness. The final surface shall be free from roller marks. After the final rolling, but not later than 24 hours after placement, the surface of each lot shall be tested in both longitudinal and transverse directions for smoothness to reveal all surface irregularities exceeding the tolerances specified. The Contractor shall furnish paving equipment and employ methods that produce a surface for each pavement lot having an average profile index meeting the requirements of paragraph 401-8.1d when evaluated with a profilograph; and the finished surface course of the pavement shall not vary more than 1/4 inch (6mm) when evaluated with a 12-foot (3.7m) straightedge. When the surface course smoothness exceeds specification tolerances which cannot be corrected by diamond grinding of the surface course, full depth removal and replacement of surface course corrections shall be to the limit of the longitudinal placement. Corrections involving diamond grinding will be subject to the final pavement thickness tolerances specified. The Contractor shall apply a surface treatment per Item P-608 or P-609 to all areas that have been subject to grinding as directed by the Engineer.

(a) Transverse measurements. Transverse measurements will be taken for each lot placed. Transverse measurements will be taken perpendicular to the pavement centerline each 50 feet (15m) or more often as determined by the Engineer.

(i) Testing shall be continuous across all joints, starting with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. Smoothness readings will not be made across grade changes or cross slope transitions; at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. High spots on final surface course > 1/4 inch (6mm) in transverse direction shall be corrected with diamond grinding per paragraph 401-4.15 or by removing and replacing full depth of surface

course. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

(ii) The joint between lots shall be tested separately to facilitate smoothness between lots. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface, with half the straightedge on one side of the joint and the other half of the straightedge on the other side of the joint. Measure the maximum gap between the straightedge and the pavement surface in the area between these two high points. One measurement shall be taken at the joint every 50 feet (15m) or more often if directed by the Engineer. Deviations on final surface course $> 1/4$ inch (6mm) in transverse direction shall be corrected with diamond grinding per paragraph 401-4.15 or by removing and replacing full depth of surface course. Each measurement shall be recorded and a copy of the data shall be furnished to the Engineer at the end of each days testing.

(b) Longitudinal measurements. Longitudinal measurements will be taken for each lot placed. Longitudinal tests will be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet (6m); and at the third points of paving lanes when widths of paving lanes are 20 ft (6m) or greater.

(i) Longitudinal Short Sections. Longitudinal Short Sections are when the longitudinal lot length is less than 200 feet (60m) and areas not requiring a profilograph. When approved by the Engineer, the first and last 15 feet (4.5m) of the lot can also be considered as short sections for smoothness. The finished surface shall not vary more than $1/4$ inch (6mm) when evaluated with a 12-foot (3.7m) straightedge. Smoothness readings will not be made across grade changes or cross slope transitions; at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. Testing shall be continuous across all joints, starting with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Deviations on final surface course $> 1/4$ inch (6mm) in longitudinal direction will be corrected with diamond grinding per paragraph 401-4.15 or by removing and replacing full depth of surface course. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

~~(ii) Profilograph Testing. Profilograph testing shall be performed by the contractor using approved equipment and procedures as described as ASTM E1274. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2 inch (5 mm) blanking band. The bump template must span one inch (25 mm) with an offset of 0.4 inches (10 mm). The profilograph must be calibrated prior to use and operated by a factory or State DOT approved operator. Profilograms shall be recorded on a longitudinal scale of one inch (25 mm) equals 25 feet (7.5 m) and a vertical scale of one inch (25 mm) equals one inch (25 mm). A copy of the reduced tapes shall be furnished to the Engineer at the end of each days testing.~~

~~The pavement must have an average profile index meeting the requirements of paragraph 401-8.1d. High spots, or "must grind" spots, on final surface course in longitudinal direction shall be corrected with diamond grinding per paragraph 401-4.15 or by removing and replacing full depth of surface course. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.~~

~~Where corrections are necessary, second profilograph runs shall be performed to verify that the corrections produced an average profile index of 15 inches (38 cm) per mile or less. If the initial average profile index was less than 15 inches (38 cm), only those areas representing greater than 0.4 inch (10 mm) deviation will be re-profiled for correction verification.~~

~~(iii) Final profilograph of [runway]. Final profilograph, full length of runway, shall be performed to facilitate testing of smoothness between lots. Profilograph testing shall be performed by the contractor using approved equipment and procedures as described as ASTM E1274. The pavement must have an average profile index meeting the requirements of paragraph 401-8.1d. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement~~

~~using a 0.2-inch (5 mm) blanking band. The bump template must span one inch (25 mm) with an offset of 0.4 inches (10 mm). The profilograph must be calibrated prior to use and operated by a factory or State DOT approved, trained operator. Profilograms shall be recorded on a longitudinal scale of one inch (25 mm) equals 25 feet (7.5 m) and a vertical scale of one inch (25 mm) equals one inch (25 mm). A copy of the reduced tapes shall be furnished to the Engineer at the end of each days testing. Profilograph of final runway shall be performed one foot right and left of runway centerline and 15 feet (4.5 m) right and left of centerline. Any areas that indicate "must grind" will be corrected as directed by the Engineer.~~

~~Smoothness testing indicated in the above paragraphs except paragraph (iii) shall be performed within 24 hours of placement of material. Smoothness testing indicated in paragraph (iii) shall be performed within 48 hours of paving completion. The primary purpose of smoothness testing is to identify areas that may be prone to ponding of water which could lead to hydroplaning of aircraft. If the contractor's machines and/or methods are producing significant areas that need corrective actions then production should be stopped until corrective measures can be implemented. If corrective measures are not implemented and when directed by the Engineer, production shall be stopped until corrective measures can be implemented.~~

(6) Grade. Grade shall be evaluated on the first day of placement and then as a minimum, every day to allow adjustments to paving operations if measurements do not meet specification requirements. The Contractor must submit the survey data to the Engineer by the following day after measurements have been taken. The finished surface of the pavement shall not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch (12 mm). The finished grade of each lot will be determined by running levels at intervals of 50 feet (15 m) or less longitudinally and all breaks in grade transversely (not to exceed 50 feet (15 m)) to determine the elevation of the completed pavement. The Contractor shall pay the cost of surveying of the level runs that shall be performed by a licensed surveyor. The documentation, stamped and signed by a licensed surveyor, shall be provided by the Contractor to the Engineer. The lot size shall be 2,000 square yards (~~m²~~). When more than 15% of all the measurements within a lot are outside the specified tolerance, or if any one shot within the lot deviates 3/4 inch (19 mm) or more from planned grade, the Contractor shall remove the deficient area to the depth of the final course plus 1/2 inch (12 mm) of pavement and replace with new material. Skin patching shall not be permitted. Isolated high points may be ground off provided the course thickness complies with the thickness specified on the plans. The surface of the ground pavement shall have a texture consisting of grooves between 0.090 and 0.130 inches (2 and 3.5 mm) wide. The peaks and ridges shall be approximately 1/32 inch (1 mm) higher than the bottom of the grooves. The pavement shall be left in a clean condition. The removal of all of the slurry resulting from the grinding operation shall be continuous. The grinding operation should be controlled so the residue from the operation does not flow across other lanes of pavement. High point grinding will be limited to 15 square yards (12.5 m²). Areas in excess of 15 square yards (12.5 m²) will require removal and replacement of the pavement in accordance with the limitations noted above. The Contractor shall apply a surface treatment per P-608 to all areas that have been subject to grinding.

c. Percentage of material within specification limits (PWL). The PWL shall be determined in accordance with procedures specified in Section 110 of the General Provisions. The specification tolerance limits (L) for lower and (U) for upper are contained in Table 5.

Table 5. Marshall acceptance limits for stability, flow, air voids, density

TEST PROPERTY		
Number of Blows	75 blows	
	Specification Tolerance	
	L	U
Stability, minimum (pounds)(N)	1800	--
Flow, 0.01 inch (25 mm)	8	18*
Air Voids Total Mix (%)	2	5
Mat Density (%)	96.3	101.3
Joint Density (%)	93.3	--

* Upper flow limit requirements do not apply for any mix with a polymer-modified binder (where the difference between the upper and lower temperature number is 90°F (32°C) or greater).

d. Outliers. All individual tests for mat density and air voids shall be checked for outliers (test criterion) in accordance with ASTM E178, at a significance level of 5%. Outliers shall be discarded, and the PWL shall be determined using the remaining test values. The criteria in Table 5 is based on production processes which have a variability with the following standard deviations: Surface Course Mat Density (%), 1.30; Base Course Mat Density (%), 1.55; Joint Density (%), 2.1.

The Contractor should note that (1) 90 PWL is achieved when consistently producing a surface course with an average mat density of at least 98% with 1.30% or less variability, (2) 90 PWL is achieved when consistently producing a base course with an average mat density of at least 97.5% with 1.55% or less variability, and (3) 90 PWL is achieved when consistently producing joints with an average joint density of at least 96% with 2.1% or less variability.

401-5.3 Resampling pavement for mat density.

a. General. Resampling of a lot of pavement will only be allowed for mat density, and then, only if the Contractor requests same, in writing, within 48 hours after receiving the written test results from the Engineer. A retest will consist of all the sampling and testing procedures contained in paragraphs 401-5.1b and 401-5.2b(1). Only one resampling per lot will be permitted.

(1) A redefined PWL shall be calculated for the resampled lot. The number of tests used to calculate the redefined PWL shall include the initial tests made for that lot plus the retests.

(2) The cost for resampling and retesting shall be borne by the Contractor.

b. Payment for resampled lots. The redefined PWL for a resampled lot shall be used to calculate the payment for that lot in accordance with Table 6.

c. Outliers. Check for outliers in accordance with ASTM E178, at a significance level of 5%.

401-5.4 Leveling course. Any course used for trueing and leveling shall meet the aggregate gradation in Table 3, paragraph 401-3.2. The trueing and leveling course shall meet the requirements of paragraph 401-3.2, 401-5.2b(1) for air voids and 401-5.2b(2) for stability and flow, but shall not be subject to the density requirements of paragraph 401-5.2b(1) for mat density and 401-5.2b(3) for joint density. The leveling course shall be compacted with the same effort used to achieve density of the test section. The trueing and leveling course shall not exceed the maximum lift thickness associated with each gradation in Table 3, paragraph 401-3.2. The leveling course is the first variable thickness lift of an overlay placed prior to subsequent courses.

CONTRACTOR QUALITY CONTROL

401-6.1 General. The Contractor shall develop a Quality Control Program in accordance with Section 100 of the General Provisions. The program shall address all elements that affect the quality of the pavement including, but not limited to:

- a. Mix design
- b. Aggregate grading
- c. Quality of materials
- d. Stockpile management
- e. Proportioning
- f. Mixing and transportation
- g. Placing and finishing
- h. Joints
- i. Compaction
- j. Surface smoothness
- k. Personnel
- l. Laydown plan

The Contractor shall perform quality control sampling, testing, and inspection during all phases of the work and shall perform them at a rate sufficient to ensure that the work conforms to the contract requirements, and at minimum test frequencies required by paragraph 401-6.3 and Section 100 of the General Provisions. As a part of the process for approving the Contractor's plan, the Engineer may require the Contractor's technician to perform testing of samples to demonstrate an acceptable level of performance.

No partial payment will be made for materials that are subject to specific quality control requirements without an approved plan.

401-6.2 Contractor testing laboratory. The lab shall meet the requirements of ASTM D3666 including all necessary equipment, materials, and current reference standards to comply with the specifications.

401-6.3 Quality control testing. The Contractor shall perform all quality control tests necessary to control the production and construction processes applicable to these specifications and as set forth in the approved Quality Control Program. The testing program shall include, but not necessarily be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, field compaction, and surface smoothness. A Quality Control Testing Plan shall be developed as part of the Quality Control Program.

a. Asphalt content. A minimum of two asphalt content tests shall be performed per lot in accordance with ASTM D6307 or ASTM D2172 if the correction factor in ASTM D6307 is greater than 1.0. The asphalt content for the lot will be determined by averaging the test results.

b. Gradation. Aggregate gradations shall be determined a minimum of twice per lot from mechanical analysis of extracted aggregate in accordance with ASTM D5444, ASTM C136, and ASTM C117.

c. Moisture content of aggregate. The moisture content of aggregate used for production shall be determined a minimum of once per lot in accordance with ASTM C566.

d. Moisture content of HMA. The moisture content shall be determined once per lot in accordance with ASTM D1461.

e. Temperatures. Temperatures shall be checked, at least four times per lot, at necessary locations to determine the temperatures of the dryer, the asphalt binder in the storage tank, the HMA at the plant, and the HMA at the job site.

f. In-place density monitoring. The Contractor shall conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the pavement density in accordance with ASTM D2950.

g. Additional testing. Any additional testing that the Contractor deems necessary to control the process may be performed at the Contractor's option.

h. Monitoring. The Engineer reserves the right to monitor any or all of the above testing.

401-6.4 Sampling. When directed by the Engineer, the Contractor shall sample and test any material that appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

401-6.5 Control charts. The Contractor shall maintain linear control charts both for individual measurements and range (that is, difference between highest and lowest measurements) for aggregate gradation, asphalt content, and VMA. The VMA for each subplot will be calculated and monitored by the Quality Control laboratory.

Control charts shall be posted in a location satisfactory to the Engineer and shall be kept current. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a problem and the Contractor is not taking satisfactory corrective action, the Engineer may suspend production or acceptance of the material.

a. Individual measurements. Control charts for individual measurements shall be established to maintain process control within tolerance for aggregate gradation, asphalt content, and VMA. The control charts shall use the job mix formula target values as indicators of central tendency for the following test parameters with associated Action and Suspension Limits:

Control Chart Limits For Individual Measurements		
Sieve	Action Limit	Suspension Limit
3/4 inch (19 mm)	±6%	±9%
1/2 inch (12 mm)	±6%	±9%
3/8 inch (9 mm)	±6%	±9%
No. 4 (4.75 mm)	±6%	±9%
No. 16 (1.18 mm)	±5%	±7.5%
No. 50 (0.30 mm)	±3%	±4.5%
No. 200 (0.075 mm)	±2%	±3%
Asphalt Content	±0.45%	±0.70%
VMA	-1.00%	-1.50%

b. Range. Control charts for range shall be established to control process variability for the test parameters and Suspension Limits listed below. The range shall be computed for each lot as the difference between the two test results for each control parameter. The Suspension Limits specified below are based on a sample size of $n = 2$. Should the Contractor elect to perform more than two tests per lot, the Suspension Limits shall be adjusted by multiplying the Suspension Limit by 1.18 for $n = 3$ and by 1.27 for $n = 4$.

Control Chart Limits Based On Range (Based On n = 2)	
Sieve	Suspension Limit
1/2 inch (12 mm)	11%
3/8 inch (9 mm)	11%
No. 4 (4.75 mm)	11%
No. 16 (1.18 mm)	9%
No. 50 (0.30 mm)	6%
No. 200 (0.075 mm)	3.5%
Asphalt Content	0.8%

c. Corrective Action. The Contractor Quality Control Program shall indicate that appropriate action shall be taken when the process is believed to be out of tolerance. The Plan shall contain sets of rules to gauge when a process is out of control and detail what action will be taken to bring the process into control. As a minimum, a process shall be deemed out of control and production stopped and corrective action taken, if:

- (1) One point falls outside the Suspension Limit line for individual measurements or range; or
- (2) Two points in a row fall outside the Action Limit line for individual measurements.

401-6.6 Quality control reports. The Contractor shall maintain records and shall submit reports of quality control activities daily, in accordance with the Contractor Quality Control Program described in General Provisions, Section 100.

METHOD OF MEASUREMENT

401-7.1 Measurement. HMA shall be measured by the number of tons (kg) of HMA used in the accepted work. Recorded batch weights or truck scale weights will be used to determine the basis for the tonnage.

BASIS OF PAYMENT

401-8.1 Payment. Payment for a lot of HMA meeting all acceptance criteria as specified in paragraph 401-5.2 shall be made based on results of tests for *straightedge* smoothness, mat density and air voids. Payment for acceptable lots shall be adjusted according to paragraph 401-8.1a for mat density and air voids and ~~401-8.1c for smoothness~~, subject to the limitation that:

a. The total project payment for plant mix bituminous concrete pavement shall not exceed 100 percent of the product of the contract unit price and the total number of tons (kg) of HMA used in the accepted work (See Note 1 under Table 6).

b. The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

c. Basis of adjusted payment. The pay factor for each individual lot shall be calculated in accordance with Table 6. A pay factor shall be calculated for both mat density and air voids. The lot pay factor shall be the higher of the two values when calculations for both mat density and air voids are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either mat density or air voids is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both mat density and air voids are less than 100%. If PWL for joint density is less than 71 percent then the lot pay factor shall be reduced by 5% but be no higher than 95%.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 401-8.1.

Payment in excess of 100% for accepted lots of HMA shall be used to offset payment for accepted lots of bituminous concrete pavement that achieve a lot pay factor less than 100%.

Table 6. Price Adjustment Schedule ¹

Percentage of Material Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)
93 – 100	103
90 – 93	PWL + 10
70 – 89	0.125 PWL + 88.75
40 – 69	0.75 PWL + 45
Below 40	Reject ²

¹ Although it is theoretically possible to achieve a pay factor of 103% for each lot, actual payment above 100% shall be subject to the total project payment limitation specified in paragraph 401-8.1.

² The lot shall be removed and replaced. However, the Engineer may decide to allow the rejected lot to remain. In that case, if the Engineer and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50% of the contract unit price and the total project payment shall be reduced by the amount withheld for the rejected lot.

d. Profilograph smoothness. ~~When the final average profile index (subsequent to any required corrective action) does not exceed 7 inches per mile (18 cm per 1.6 km), payment will be made at the contract unit price for the completed pavement. If the final average profile index (subsequent to any required corrective action) exceeds 7 inches per mile (18 cm per 1.6 km), but does not exceed 15 inches per mile (38 cm per 1.6 m), the Contractor may elect to accept a contract unit price adjustment in lieu of reducing the profile index.~~

c. Basis of adjusted payment for smoothness. ~~Price adjustment for pavement smoothness will be made in accordance with Table 7. The adjustment will apply to the total tonnage of HMA within a lot of pavement and shall be applied with the following equation:~~

~~(Tons of asphalt concrete in lot) × (lot pay factor) × (unit price per ton) × (smoothness pay factor) = payment for lot~~

Table 7. Profilograph Average Profile Index Smoothness Pay Factor

Inches/miles per 1/10 mile	Short Sections	Pay Factor
0.0 – 7	00.0 – 15.0	100%
7.1 – 9	15.1 – 16	98%
9.1 – 11	16.1 – 17	96%
11.1 – 13	17.1 – 18	94%
13.1 – 14	18.1 – 20	92%
14.1 – 15	20.1 – 22	90%
15.1 and up	22.1 and up	Corrective work required [†]

[†] ~~The Contractor shall correct pavement areas not meeting these tolerances by removing and replacing the defective work. If the Contractor elects to construct an overlay to correct deficiencies, the minimum thickness of the overlay should be at least three times the maximum aggregate size (approximately four (4) times the nominal maximum aggregate size). The corrective overlay shall not violate grade Criteria and butt joints shall be constructed by sawing and removing the original pavement in compliance with the thickness/ maximum aggregate size ratio. Skin patching shall not be permitted.~~

HMA placed above the specified grade shall not be included in the quantities for payment.

401-8.1.1. Payment. Payment will be made under:

Item P-401-8.1 Asphaltic Concrete (For 20' Wide Asphalt Apron Shoulders) – per ton

TESTING REQUIREMENTS

ASTM C29	Standard Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C127	Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C183	Standard Practice for Sampling and the Amount of Testing of Hydraulic Cement
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D979	Standard Practice for Sampling Bituminous Paving Mixtures
ASTM D1073	Standard Specification for Fine Aggregate for Bituminous Paving Mixtures
ASTM D2172	Standard Test Method for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D1461	Standard Test Method for Moisture or Volatile Distillates in Bituminous Paving Mixtures
ASTM D2041	Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D2489	Standard Practice for Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D2726	Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D2950	Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods
ASTM D3203	Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D3666	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D4867	Standard Test Method for Effect of Moisture on Asphalt Concrete Paving Mixtures

ASTM D5444	Standard Test Method for Mechanical Size Analysis of Extracted Aggregate
ASTM D6084	Standard Test Method for Elastic Recovery of Bituminous Materials by Durometer
ASTM D6307	Standard Test Method for Asphalt Content of Hot Mix Asphalt by Ignition Method
ASTM D6752	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method
ASTM D6926	Standard Practice for Preparation of Bituminous Specimens Using Marshall Apparatus
ASTM D6927	Standard Test Method for Marshall Stability and Flow of Bituminous mixtures
ASTM E11	Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
ASTM E178	Standard Practice for Dealing with Outlying Observations
ASTM E1274	Standard Test Method for Measuring Pavement Roughness Using a Profilograph
AASHTO T030	Standard Method of Test for Mechanical Analysis of Extracted Aggregate
AASHTO T110	Standard Method of Test for Moisture or Volatile Distillates in Hot Mix Asphalt (HMA)
AASHTO T275	Standard Method of Test for Bulk Specific Gravity (Gmb) of Compacted Hot Mix Asphalt (HMA) Using Paraffin-Coated Specimens
AASHTO M156	Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
AASHTO T329	Standard Method of Test for Moisture Content of Hot Mix Asphalt (HMA) by Oven Method
Asphalt Institute Handbook MS-26,	Asphalt Binder
Asphalt Institute MS-2	Mix Design Manual, 7th Edition

MATERIAL REQUIREMENTS

ASTM D242	Standard Specification for Mineral Filler for Bituminous Paving Mixtures
ASTM D946	Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D3381	Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D4552	Standard Practice for Classifying Hot-Mix Recycling Agents
ASTM D6373	Standard Specification for Performance Graded Asphalt Binder

END OF ITEM P-401

ITEM P-501 PORTLAND CEMENT CONCRETE (PCC) PAVEMENT

DESCRIPTION

501-1.1 This work shall consist of pavement composed of portland cement concrete (PCC), with reinforcement **or** without reinforcement constructed on a prepared underlying surface in accordance with these specifications and shall conform to the lines, grades, thickness, and typical cross-sections shown on the plans.

MATERIALS

501-2.1 Aggregates.

a. Reactivity. Fine and Coarse aggregates to be used in all concrete shall be evaluated and tested by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and ASTM C1567. Aggregate and mix proportion reactivity tests shall be performed for each project.

(1) Coarse and fine aggregate shall be tested separately in accordance with ASTM C1260. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.10% at 28 days (30 days from casting).

(2) Combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) Concrete Research Division (CRD) C662. If lithium nitrate admixture is used, it shall be nominal 30% \pm 0.5% weight lithium nitrate in water.

(3) If the expansion of the proposed combined materials test specimens, tested in accordance with ASTM C1567, modified for combined aggregates, or COE CRD C662, does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion of the proposed combined materials test specimens is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

b. Fine aggregate. Fine aggregate shall conform to the requirements of ASTM C33. Grading of the fine aggregate, as delivered to the mixer, shall conform to the requirements of ASTM C33 and shall have a fineness modulus of not less than 2.50 nor more than 3.40. The soundness loss shall not exceed 10% when sodium sulfate is used or 15% when magnesium sulfate is used, after five cycles, when tested per ASTM C88.

The amount of deleterious material in the fine aggregate shall not exceed the following limits:

Limits for Deleterious Substances in Fine Aggregate for Concrete

Deleterious material	ASTM	Percentage by Mass
Clay Lumps and friable particles	ASTM C142	1.0
Material finer than 0.075mm (No. 200 sieve)	ASTM C117	3.0
Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Total of all deleterious Material		3.0

c. Coarse aggregate. Gradation, within the separated size groups, shall meet the coarse aggregate grading requirements of ASTM C33 when tested in accordance with ASTM C136. When the nominal maximum size of the aggregate is greater than one inch (~~25 mm~~), the aggregates shall be furnished in two size groups.

Aggregates delivered to the mixer shall consist of crushed stone, crushed or uncrushed gravel, air-cooled iron blast furnace slag, crushed recycled concrete pavement, or a combination. The aggregates should be free of ferrous sulfides, such as pyrite, that would cause "rust" staining that can bleed through pavement markings. Steel blast furnace slag shall not be permitted. The aggregate shall be composed of clean, hard, uncoated particles. Dust and other coating shall be removed from the aggregates by washing.

The percentage of wear shall be no more than 40% when tested in accordance with ASTM C131.

The quantity of flat, elongated, and flat and elongated particles in any size group coarser than 3/8 sieve (9 mm) shall not exceed 8% by weight when tested in accordance with ASTM D4791. A flat particle is defined as one having a ratio of width to thickness greater than 5. An elongated particle is one having a ratio of length to width greater than 5.

The soundness loss shall not exceed 12% when sodium sulfate is used or 18% when magnesium sulfate is used, after five cycles, when tested per ASTM C88.

The amount of deleterious material in the coarse aggregate shall not exceed the following limits:

Limits for Deleterious Substances in Coarse Aggregate for Concrete

Deleterious material	ASTM	Percentage by Mass
Clay Lumps and friable particles	ASTM C142	1.0
Material finer than No. 200 sieve (0.075mm)	ASTM C117	1.0
Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Chert (less than 2.40 Sp Gr.)	ASTM C123 using a medium with a density of Sp. Gr. of 2.40)	1.0
Total of all deleterious Material		3.0

Table 1. Gradations for Coarse Aggregate

Sieve Designations (square openings)		Percentage Passing Sieves by Weight		
		From 1-1/2 inch to No. 4 (38 mm - 4.75 mm)		From 1 inch to No. 4 (25.0 mm - 4.75 mm)
		#4 1-1/2 inch - 3/4 inch	#67 3/4 inch - No. 4	#57 1 inch - No. 4
inch	mm			
2-1/2	60	---	---	---
2	50	100	---	---
1-1/2	38	90-100	---	100
1	25	20-55	100	95-100
3/4	19	0-15	90-100	---
1/2	13	---	---	25-60
3/8	9	0-5	20-55	---
No. 4	4.75	---	0-10	0-10
No. 8	2.36	---	0-5	0-5

(1) Aggregate susceptibility to durability (D) cracking. Aggregates that have a history of D-cracking shall not be used.

Coarse aggregate may be accepted from sources that have a 20 year service history for the same gradation to be supplied with no durability issues. Aggregates that do not have a record of 20 years of service without major repairs (less than 5% of slabs replaced) in similar conditions without D-cracking shall not be used unless it meets the following:

(a) Material currently being produced shall have a durability factor ≥ 95 using ASTM C666 procedure B. Coarse aggregates that are crushed granite, calcite cemented sandstone, quartzite, basalt, diabase, rhyolite or trap rock are considered to meet the D-cracking test but must meet all other quality tests. Aggregates meeting State Highway Department material specifications may be acceptable.

(b) The Contractor shall submit a current certification that the aggregate does not have a history of D-cracking and that the aggregate meets the state specifications for use in PCC pavement for use on interstate highways. Certifications, tests and any history reports must be for the same gradation as being proposed for use on the project. Certifications which are not dated or which are over one (1) year old or which are for different gradations will not be accepted. Test results will only be accepted when tests were performed by a State Department of Transportation (DOT) materials laboratory or an accredited laboratory.

(2) Combined aggregate gradation. If substituted for the grading requirements specified for coarse aggregate and for fine aggregate and when approved by the Engineer, the combined aggregate grading shall meet the following requirements:

(a) The materials selected and the proportions used shall be such that when the Coarseness Factor (CF) and the Workability Factor (WF) are plotted on a diagram as described in d. below, the point thus determined shall fall within the parallelogram described therein.

(b) The CF shall be determined from the following equation:

$$CF = (\text{cumulative percent retained on the } 3/8 \text{ in. sieve})(100) / (\text{cumulative percent retained on the No. 8 sieve})$$

(c) The Workability Factor WF is defined as the percent passing the No. 8 (2.36 mm) sieve based on the combined gradation. However, WF shall be adjusted, upwards only, by 2.5 percentage points for each 94 pounds (42 kg) of cementitious material per cubic meter yard greater than 564 pounds per cubic yard (335 kg per cubic meter).

(d) A diagram shall be plotted using a rectangular scale with WF on the Y-axis with units from 20 (bottom) to 45 (top), and with CF on the X-axis with units from 80 (left side) to 30 (right side). On this diagram a

parallelogram shall be plotted with corners at the following coordinates (CF-75, WF-28), (CF-75, WF-40), (CF-45, WF-32.5), and (CF-45, WF-44.5). If the point determined by the intersection of the computed CF and WF does not fall within the above parallelogram, the grading of each size of aggregate used and the proportions selected shall be changed as necessary.

501-2.2 Cement. Cement shall conform to the requirements of ASTM C150, Type 1 or ASTM C595, Type IP.

If aggregates are deemed innocuous when tested in accordance with paragraph 501-2.1.a.1 and accepted in accordance with paragraph 501-2.1.a.2, higher equivalent alkali content in the cement may be allowed if approved by the Engineer and FAA. If cement becomes partially set or contains lumps of caked cement, it shall be rejected. Cement salvaged from discarded or used bags shall not be used.

501-2.3 Cementitious materials.

a. Fly ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash for use in mitigating alkali-silica reactivity shall have a Calcium Oxide (CaO) content of less than 13% and a total available alkali content less than 3% per ASTM C311. Fly ash produced in furnace operations using liming materials or soda ash (sodium carbonate) as an additive shall not be acceptable. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the mix design, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the Engineer.

b. Slag cement (ground granulated blast furnace(GGBF)). Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.

c. Raw or calcined natural pozzolan. Natural pozzolan shall be raw or calcined and conform to ASTM C618, Class N, including the optional requirements for uniformity and effectiveness in controlling Alkali-Silica reaction and shall have a loss on ignition not exceeding 6%. Class N pozzolan for use in mitigating Alkali-Silica Reactivity shall have a total available alkali content less than 3%.

d. Ultrafine fly ash and ultrafine pozzolan. UltraFine Fly Ash (UFFA) and UltraFine Pozzolan (UFP) shall conform to ASTM C618, Class F or N, and the following additional requirements:

- (1) The strength activity index at 28 days of age shall be at least 95% of the control specimens.
- (2) The average particle size shall not exceed 6 microns.

501-2.4 Joint seal. The joint seal for the joints in the concrete pavement shall meet the requirements of Item P-604 ~~Item P-605~~ and shall be of the type specified in the plans.

501-2.5 Isolation joint filler. Premolded joint filler for isolation joints shall conform to the requirements of [ASTM D1751 ~~ASTM D1752, Type II or III~~] and shall be where shown on the plans. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint, unless otherwise specified by the Engineer. When the use of more than one piece is required for a joint, the abutting ends shall be fastened securely and held accurately to shape by stapling or other positive fastening means satisfactory to the Engineer.

501-2.6 Steel reinforcement. Reinforcing shall consist of **Welded Steel Wire Fabric** conforming to the requirements of ASTM A 185.

501-2.7 Dowel and tie bars. Dowel bars shall be plain steel bars conforming to ASTM A615 and shall be free from burring or other deformation restricting slippage in the concrete. Before delivery to the construction site each dowel bar shall be epoxy coated per ASTM A1078. The dowels shall be coated with a bond-breaker recommended by the manufacturer. Dowel sleeves or inserts are not permitted. Grout retention rings shall be fully circular metal or plastic devices capable of supporting the dowel until the grout hardens.

Tie bars shall be deformed steel bars and conform to the requirements of ASTM A615. Tie bars designated as Grade 60 in ASTM A615 or ASTM A706 shall be used for construction requiring bent bars.

501-2.8 Water. Water used in mixing or curing shall be potable, clean, free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product, except that non-potable water, or water from concrete production operations, may be used if it meets the requirements of ASTM C1602.

501-2.9 Material for curing concrete. Curing materials shall conform to one of the following specifications:

a. Liquid membrane-forming compounds for curing concrete shall conform to the requirements of ASTM C309, Type 2, Class B, or Class A if wax base only.

b. White polyethylene film for curing concrete shall conform to the requirements of ASTM C171.

c. White burlap-polyethylene sheeting for curing concrete shall conform to the requirements of ASTM C171.

d. Waterproof paper for curing concrete shall conform to the requirements of ASTM C171.

501-2.10 Admixtures. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the Engineer may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the Engineer from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. **Air-entraining admixtures.** Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. **Water-reducing admixtures.** Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

c. **Other admixtures.** The use of set retarding, and set-accelerating admixtures shall be approved by the Engineer. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

d. **Lithium Nitrate.** The lithium admixture shall be a nominal 30% aqueous solution of Lithium Nitrate, with a density of 10 pounds/gallon (1.2 kg/L), and shall have the approximate chemical form as shown below:

<u>Constituent</u>	<u>Limit (Percent by Mass)</u>
LiNO ₃ (Lithium Nitrate)	30 ±0.5
SO ₄ (Sulfate Ion)	0.1 (max)
Cl (Chloride Ion)	0.2 (max)
Na (Sodium Ion)	0.1 (max)
K (Potassium Ion)	0.1 (max)

Provide a trained manufacturer's representative to supervise the lithium nitrate admixture dispensing and mixing operations.

501-2.11 Epoxy-resin. All epoxy-resin materials shall be two-component materials conforming to the requirements of ASTM C881, Class as appropriate for each application temperature to be encountered, except that in addition, the materials shall meet the following requirements:

a. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.

b. Material for use as patching materials for complete filling of spalls and other voids and for use in preparing epoxy resin mortar shall be Type III, Grade as approved.

c. Material for use for injecting cracks shall be Type IV, Grade 1.

d. Material for bonding freshly mixed Portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete shall be Type V, Grade as approved.

501-2.12 Material acceptance. Prior to use of materials, the Contractor shall submit certified test reports to the Engineer for those materials proposed for use during construction. The certification shall show the appropriate ASTM test for each material, the test results, and a statement that the material passed or failed.

The Engineer may request samples for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

MIX DESIGN

501-3.1. General. No concrete shall be placed until the mix design has been submitted to the Engineer for review and the Engineer has taken appropriate action. The Engineer's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

501-3.2 Proportions. The laboratory preparing the mix design shall be accredited in accordance with ASTM C1077. The mix design for all Portland cement concrete placed under P-501 shall be stamped or sealed by the responsible professional Engineer of the laboratory. Concrete shall be proportioned to achieve a 28-day flexural strength that meets or exceeds the acceptance criteria contained in paragraph 501-5.2 for a flexural strength of **650** psi per ASTM C78. The mix shall be developed using the procedures contained in the Portland Cement Association's (PCA) publication, "Design and Control of Concrete Mixtures".

The minimum cementitious material shall be adequate to ensure a workable, durable mix. The minimum cementitious material (cement plus fly ash, or slag cement) shall be **564** pounds per cubic yard (~~227 kg per cubic meter~~). The ratio of water to cementitious material, including free surface moisture on the aggregates but not including moisture absorbed by the aggregates shall not be more than **0.50** by weight.

Flexural strength test specimens shall be prepared in accordance with ASTM C192 and tested in accordance with ASTM C78. The mix determined shall be workable concrete having a maximum allowable slump between one and two inches (~~25mm and 50 mm~~) as determined by ASTM C143. For slip-form concrete, the slump shall be between 1/2 inch (~~42 mm~~) and 1-1/2 inch (~~38 mm~~). At the start of the project, the Contractor shall determine a maximum allowable slump for slip-form pavement which will produce in-place pavement to control the edge slump. The selected slump shall be applicable to both pilot and fill-in lanes.

Before the start of paving operations and after approval of all material to be used in the concrete, the Contractor shall submit a mix design showing the proportions and flexural strength obtained from the concrete at seven (7) and 28 days. The mix design shall include copies of test reports, including test dates, and a complete list of materials including type, brand, source, and amount of cement, fly ash, ground slag, coarse aggregate, fine aggregate, water, and admixtures. The mix design shall be submitted to the Engineer at least 30 days prior to the start of operations. The submitted mix design shall not be more than 90 days old. Production shall not begin until the mix design is approved in writing by the Engineer.

If a change in sources is made, or admixtures added or deleted from the mix, a new mix design must be submitted to the Engineer for approval.

The results of the mix design shall include a statement giving the maximum nominal coarse aggregate size and the weights and volumes of each ingredient proportioned on a one cubic yard (meter) basis. Aggregate quantities shall be based on the mass in a saturated surface dry condition. The recommended mixture proportions shall be accompanied by test results demonstrating that the proportions selected will produce concrete of the qualities indicated. Trial mixtures having proportions, slumps, and air content suitable for the work shall be based on methodology described in PCA's publication, Design and Control of Concrete Mixtures, modified as necessary to accommodate flexural strength.

The submitted mix design shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items as a minimum:

- a. Coarse, fine, and combined aggregate gradations and plots including fineness modulus of the fine aggregate.
- b. Reactivity Test Results.
- c. Coarse aggregate quality test results, including deleterious materials.
- d. Fine aggregate quality test results, including deleterious materials.
- e. Mill certificates for cement and supplemental cementitious materials.
- f. Certified test results for all admixtures, including Lithium Nitrate if applicable.
- g. Specified flexural strength, slump, and air content.
- h. Recommended proportions/volumes for proposed mixture and trial water-cementitious materials ratio, including actual slump and air content.

- i. Flexural and compressive strength summaries and plots, including all individual beam and cylinder breaks.
- j. Correlation ratios for acceptance testing and Contractor Quality Control testing, when applicable.
- k. Historical record of test results documenting production standard deviation, when applicable.

501-3.3 Cementitious materials.

a. Fly ash. When fly ash is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If fly ash is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

b. Slag cement (ground granulated blast furnace (GGBF)). Slag cement may be used. The slag cement, or slag cement plus fly ash if both are used, may constitute between 25 to 55% of the total cementitious material by weight. If the concrete is to be used for slipforming operations and the air temperature is expected to be lower than 55°F (13°C) the percent slag cement shall not exceed 30% by weight.

c. Raw or calcined natural pozzolan. Natural pozzolan may be used in the mix design. When pozzolan is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If pozzolan is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

d. Ultrafine fly ash (UFFA) and ultrafine pozzolan (UFP). UFFA and UFP may be used in the mix design with the Engineer's approval. When UFFA and UFP is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between seven (7) and 16% by weight of the total cementitious material.

501-3.4 Admixtures.

a. Air-entraining admixtures. Air-entraining admixture are to be added in such a manner that will ensure uniform distribution of the agent throughout the batch. The air content of freshly mixed air-entrained concrete shall be based upon trial mixes with the materials to be used in the work adjusted to produce concrete of the required plasticity and workability. The percentage of air in the mix shall be **2.0 percent plus or minus ½ percent for coarse aggregate 1 ½ inch or larger, 3 percent plus or minus ½ percent for coarse aggregate ¾ inch to 1 inch and 4 ½ percent plus or minus 1 ½ percent for coarse aggregate 3/8 inch to ½ inch**. Air content shall be determined by testing in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag and other highly porous coarse aggregate.

Recommended Air Content (Percent)

Exposure Level	Size				
	Maximum inch (mm)				Aggregate
	2 inch (50 mm)	1-1/2 inch (38 mm)	1 inch (25 mm)	3/4 inch (19 mm)	1/2 inch (12 mm)
Mild	2.0%	2.5%	3.0%	3.5%	4.0%
Moderate	4.0%	4.5%	4.5%	5.0%	5.5%
Severe	5.0%	5.5%	6.0%	6.0%	7.0%

b. Water-reducing admixtures. Water-reducing admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted on trial mixes, with the materials to be used in the work, in accordance with ASTM C494.

c. Other admixtures. Set controlling, and other approved admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted on trial mixes, with the materials to be used in the work, in accordance with ASTM C 494.

d. Lithium nitrate. Lithium nitrate shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements in accordance with paragraph 501-2.10d.

501-3.5 Concrete mix design laboratory. The Contractor's laboratory used to develop the concrete mix design shall be accredited in accordance with ASTM C1077. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the concrete mix design must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction

CONSTRUCTION METHODS

501-4.1 Equipment. Equipment necessary for handling materials and performing all parts of the work shall be approved by the Engineer, but does not relieve the Contractor of the responsibility for the proper operation of equipment and maintaining the equipment in good working condition. The equipment shall be at the jobsite sufficiently ahead of the start of paving operations to be examined thoroughly and approved.

a. Batch plant and equipment. The batch plant and equipment shall conform to the requirements of ASTM C94.

b. Mixers and transportation equipment.

(1) General. Concrete may be mixed at a central plant, or wholly or in part in truck mixers. Each mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.

(2) Central plant mixer. Central plant mixers shall conform to the requirements of ASTM C94. The mixer shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades. The pickup and throwover blades shall be replaced when they have worn down 3/4 inch (~~19-mm~~) or more. The Contractor shall have a copy of the manufacturer's design on hand showing dimensions and arrangement of blades in reference to original height and depth.

(3) Truck mixers and truck agitators. Truck mixers used for mixing and hauling concrete and truck agitators used for hauling central-mixed concrete shall conform to the requirements of ASTM C94.

(4) Nonagitator trucks. Nonagitating hauling equipment shall conform to the requirements of ASTM C94.

(5) Transfer and spreading equipment. Equipment for transferring concrete from the transporting equipment to the paving lane in front of the paver shall be specially manufactured, self-propelled transfer equipment which will accept the concrete outside the paving lane and will transfer and spread it evenly across the paving lane in front of the paver and strike off the surface evenly to a depth which permits the paver to operate efficiently.

c. Finishing equipment. The standard method of constructing concrete pavements shall be with an approved slip-form paving equipment designed and operated to spread, consolidate, screed, and float-finish the freshly placed concrete in one complete pass of the machine so that the end result is a dense and homogeneous pavement which is achieved with a minimum of hand finishing. The paver-finisher shall be a heavy duty, self-propelled machine designed specifically for paving and finishing high quality concrete pavements. It shall weigh at least 2,200 lbs per foot (3274 kg/m) of paving lane width and powered by an engine having at least 6.0 horsepower per foot of lane width.

On projects requiring less than 500 square yard (~~418-sq-m~~) of cement concrete pavement or requiring individual placement areas of less than 500 square yard (~~418-sq-m~~), or irregular areas at locations inaccessible to slip-form paving equipment, concrete pavement may be placed with approved placement and finishing equipment using stationary side forms. Hand screeding and float finishing may only be used on small irregular areas as allowed by the Engineer.

d. Vibrators. Vibrator shall be the internal type. Operating frequency for internal vibrators shall be between 8,000 and 12,000 vibrations per minute. Average amplitude for internal vibrators shall be 0.025-0.05 inch (~~0.06-0.13-cm~~).

The number, spacing, and frequency shall be as necessary to provide a dense and homogeneous pavement and meet the recommendations of American Concrete Institute (ACI) 309, Guide for Consolidation of Concrete. Adequate power to operate all vibrators shall be available on the paver. The vibrators shall be automatically controlled so that they shall be stopped as forward motion ceases. The Contractor shall provide an electronic or

mechanical means to monitor vibrator status. The checks on vibrator status shall occur a minimum of two times per day or when requested by the Engineer.

Hand held vibrators may be used in irregular areas only, but shall meet the recommendations of ACI 309R, Guide for Consolidation of Concrete.

e. Concrete saws. The Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions. The Contractor shall provide at least one standby saw in good working order and a supply of saw blades at the site of the work at all times during sawing operations. Early-entry saws may be used, subject to demonstration and approval of the Engineer.

f. Side forms. Straight side forms shall be made of steel and shall be furnished in sections not less than 10 feet (~~3-m~~) in length. Forms shall have a depth equal to the pavement thickness at the edge, and a base width equal to or greater than the depth. Flexible or curved forms of proper radius shall be used for curves of 100-foot (~~31-m~~) radius or less. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms with battered top surfaces and bent, twisted or broken forms shall not be used. Built-up forms shall not be used, except as approved by the Engineer. The top face of the form shall not vary from a true plane more than 1/8 inch (3 mm) in 10 feet (~~3-m~~), and the upstanding leg shall not vary more than 1/4 inch (~~6-mm~~). The forms shall contain provisions for locking the ends of abutting sections together tightly for secure setting. Wood forms may be used under special conditions, when approved by the Engineer.

g. Pavers. The paver shall be fully energized, self-propelled, and designed for the specific purpose of placing, consolidating, and finishing the concrete pavement, true to grade, tolerances, and cross-section. It shall be of sufficient weight and power to construct the maximum specified concrete paving lane width as shown in the plans, at adequate forward speed, without transverse, longitudinal or vertical instability or without displacement. The paver shall be equipped with electronic or hydraulic horizontal and vertical control devices.

501-4.2 Form setting. Forms shall be set sufficiently in advance of the concrete placement to ensure continuous paving operation. After the forms have been set to correct grade, the underlying surface shall be thoroughly tamped, either mechanically or by hand, at both the inside and outside edges of the base of the forms. Forms shall be staked into place sufficiently to maintain the form in position for the method of placement.

Form sections shall be tightly locked and shall be free from play or movement in any direction. The forms shall not deviate from true line by more than 1/8 inch (~~3-mm~~) at any joint. Forms shall be so set that they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the placing of concrete.

The alignment and grade elevations of the forms shall be checked and corrections made by the Contractor immediately before placing the concrete.

501-4.3 Conditioning of underlying surface. The compacted underlying surface on which the pavement will be placed shall be widened approximately 3 feet (~~1-m~~) to extend beyond the paving machine track to support the paver without any noticeable displacement. After the underlying surface has been placed and compacted to the required density, the areas that will support the paving machine and the area to be paved shall be trimmed or graded to the plan grade elevation and profile by means of a properly designed machine. The grade of the underlying surface shall be controlled by a positive grade control system using lasers, stringlines, or guide wires. If the density of the underlying surface is disturbed by the trimming operations, it shall be corrected by additional compaction and retested at the option of the Engineer before the concrete is placed except when stabilized subbases are being constructed. If damage occurs on a stabilized subbase, it shall be corrected full depth by the Contractor. If traffic is allowed to use the prepared grade, the grade shall be checked and corrected immediately before the placement of concrete. The prepared grade shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from concrete. The underlying surface shall be protected so that it will be entirely free of frost when concrete is placed.

501-4.4 Conditioning of underlying surface, side-form and fill-in lane construction. The prepared underlying surface shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from the concrete. Damage caused by hauling or usage of other equipment shall be corrected and retested at the option of the Engineers. If damage occurs to a stabilized subbase, it shall be corrected full depth by the Contractor. A template shall be provided and operated on the forms immediately in advance of the placing of all

concrete. The template shall be propelled only by hand and not attached to a tractor or other power unit. Templates shall be adjustable so that they may be set and maintained at the correct contour of the underlying surface. The adjustment and operation of the templates shall be such as will provide an accurate retest of the grade before placing the concrete thereon. All excess material shall be removed and wasted. Low areas shall be filled and compacted to a condition similar to that of the surrounding grade. The underlying surface shall be protected so that it will be entirely free from frost when the concrete is placed. The use of chemicals to eliminate frost in the underlying surface shall not be permitted.

The template shall be maintained in accurate adjustment, at all times by the Contractor, and shall be checked daily.

501-4.5 Handling, measuring, and batching material. The batch plant site, layout, equipment, and provisions for transporting material shall assure a continuous supply of material to the work. Stockpiles shall be constructed in such a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the concrete batch plant.

Aggregates that have become segregated or mixed with earth or foreign material shall not be used. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall be stockpiled or binned for draining at least 12 hours before being batched. Rail shipments requiring more than 12 hours will be accepted as adequate binning only if the car bodies permit free drainage.

Batching plants shall be equipped to proportion aggregates and bulk cement, by weight, automatically using interlocked proportioning devices of an approved type. When bulk cement is used, the Contractor shall use a suitable method of handling the cement from weighing hopper to transporting container or into the batch itself for transportation to the mixer, such as a chute, boot, or other approved device, to prevent loss of cement. The device shall be arranged to provide positive assurance that the cement content specified is present in each batch.

501-4.6 Mixing concrete. The concrete may be mixed at the work site, in a central mix plant or in truck mixers. The mixer shall be of an approved type and capacity. Mixing time shall be measured from the time all materials, except water, are emptied into the drum. All concrete shall be mixed and delivered to the site in accordance with the requirements of ASTM C94.

Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators, or non-agitating trucks. The elapsed time from the addition of cementitious material to the mix until the concrete is deposited in place at the work site shall not exceed 30 minutes when the concrete is hauled in non-agitating trucks, nor 90 minutes when the concrete is hauled in truck mixers or truck agitators. Retempering concrete by adding water or by other means will not be permitted. With transit mixers additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements provided the addition of water is performed within 45 minutes after the initial mixing operations and provided the water/cementitious ratio specified in the approved mix design is not exceeded, and approved by the Engineer.

501-4.7 Limitations on mixing and placing. No concrete shall be mixed, placed, or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

a. Cold weather. Unless authorized in writing by the Engineer, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40°F (4°C) and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F (2°C).

The aggregate shall be free of ice, snow, and frozen lumps before entering the mixer. The temperature of the mixed concrete shall not be less than 50°F (10°C) at the time of placement. Concrete shall not be placed on frozen material nor shall frozen aggregates be used in the concrete.

When concreting is authorized during cold weather, water and/or the aggregates may be heated to not more than 150°F (66°C). The apparatus used shall heat the mass uniformly and shall be arranged to preclude the possible occurrence of overheated areas which might be detrimental to the materials.

b. Hot weather. During periods of hot weather when the maximum daily air temperature exceeds 85°F (30°C), the following precautions shall be taken.

The forms and/or the underlying surface shall be sprinkled with water immediately before placing the concrete. The concrete shall be placed at the coolest temperature practicable, and in no case shall the temperature of the

concrete when placed exceed 90°F (32°C). The aggregates and/or mixing water shall be cooled as necessary to maintain the concrete temperature at or not more than the specified maximum.

The finished surfaces of the newly laid pavement shall be kept damp by applying a water-fog or mist with approved spraying equipment until the pavement is covered by the curing medium. When necessary, wind screens shall be provided to protect the concrete from an evaporation rate in excess of 0.2 psf (0.98 kg/m² per hour) per hour. When conditions are such that problems with plastic cracking can be expected, and particularly if any plastic cracking begins to occur, the Contractor shall immediately take such additional measures as necessary to protect the concrete surface. Such measures shall consist of wind screens, more effective fog sprays, and similar measures commencing immediately behind the paver. If these measures are not effective in preventing plastic cracking, paving operations shall be immediately stopped.

c. Temperature management program. Prior to the start of paving operation for each day of paving, the Contractor shall provide the Engineer with a Temperature Management Program for the concrete to be placed to assure that uncontrolled cracking is avoided. As a minimum the program shall address the following items:

- (1) Anticipated tensile strains in the fresh concrete as related to heating and cooling of the concrete material.
- (2) Anticipated weather conditions such as ambient temperatures, wind velocity, and relative humidity; and anticipated evaporation rate using Figure 11-8, PCA, Design and Control of Concrete Mixtures.
- (3) Anticipated timing of initial sawing of joint.
- (4) Anticipated number and type of saws to be used.

501-4.8 Placing concrete. At any point in concrete conveyance, the free vertical drop of the concrete from one point to another or to the underlying surface shall not exceed 3 feet (1-m). The finished concrete product must be dense and homogeneous, without segregation and conforming to the standards in this specification. Backhoes and grading equipment shall not be used to distribute the concrete in front of the paver. Front end loaders will not be used. All concrete shall be consolidated without voids or segregation, including under and around all load-transfer devices, joint assembly units, and other features embedded in the pavement. Hauling equipment or other mechanical equipment can be permitted on adjoining previously constructed pavement when the concrete strength reaches a flexural strength of 550 psi (3792 kPa), based on the average of four field cured specimens per 2,000 cubic yards (1,530 cubic meters) of concrete placed. Also, subgrade and subbase planers, concrete pavers, and concrete finishing equipment may be permitted to ride upon the edges of previously constructed pavement when the concrete has attained a minimum flexural strength of 400 psi (2757 kPa).

The Contractor shall have available materials for the protection of the concrete during inclement weather. Such protective materials shall consist of rolled polyethylene sheeting at least 4 mils (0.1 mm) thick of sufficient length and width to cover the plastic concrete slab and any edges. The sheeting may be mounted on either the paver or a separate movable bridge from which it can be unrolled without dragging over the plastic concrete surface. When rain appears imminent, all paving operations shall stop and all available personnel shall begin covering the surface of the unhardened concrete with the protective covering.

a. Slip-form construction. The concrete shall be distributed uniformly into final position by a self-propelled slip-form paver without delay. The alignment and elevation of the paver shall be regulated from outside reference lines established for this purpose. The paver shall vibrate the concrete for the full width and depth of the strip of pavement being placed and the vibration shall be adequate to provide a consistency of concrete that will stand normal to the surface with sharp well defined edges. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms. The plastic concrete shall be effectively consolidated by internal vibration with transverse vibrating units for the full width of the pavement and/or a series of equally placed longitudinal vibrating units. The space from the outer edge of the pavement to longitudinal unit shall not exceed 9 inches (23 cm) for slipform and at the end of the dowels for the fill-in lanes. The spacing of internal units shall be uniform and shall not exceed 18 inches (0.5-m).

The term internal vibration means vibrating units located within the specified thickness of pavement section.

The rate of vibration of each vibrating unit shall be within 8000 to 12000 cycles per minute and the amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete along the entire length of the vibrating unit and for a distance of at least one foot (30-cm). The frequency of vibration or amplitude shall vary

proportionately with the rate of travel to result in a uniform density and air content. The paving machine shall be equipped with a tachometer or other suitable device for measuring and indicating the actual frequency of vibrations.

The concrete shall be held at a uniform consistency. The slip-form paver shall be operated with as nearly a continuous forward movement as possible and all operations of mixing, delivering, and spreading concrete shall be coordinated to provide uniform progress with stopping and starting of the paver held to a minimum. If for any reason, it is necessary to stop the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately. No tractive force shall be applied to the machine, except that which is controlled from the machine.

When concrete is being placed adjacent to an existing pavement, that part of the equipment which is supported on the existing pavement shall be equipped with protective pads on crawler tracks or rubber-tired wheels on which the bearing surface is offset to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.

Not more than 15% of the total free edge of each 500 foot (~~450-m~~) segment of pavement, or fraction thereof, shall have an edge slump exceeding 1/4 inch (~~6-mm~~), and none of the free edge of the pavement shall have an edge slump exceeding 3/8 inch (~~9-mm~~). (The total free edge of 500 feet (~~450-m~~) of pavement will be considered the cumulative total linear measurement of pavement edge originally constructed as nonadjacent to any existing pavement; that is, 500 feet (~~450-m~~) of paving lane originally constructed as a separate lane will have 1,000 feet (~~300-m~~) of free edge, 500 feet (~~450-m~~) of fill-in lane will have no free edge, etc.). The area affected by the downward movement of the concrete along the pavement edge shall be limited to not more than 18 inches (~~0.5-m~~) from the edge. When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump shall be removed and replaced at the expense of the Contractor as directed by the Engineer.

b. Side-form construction. Side form sections shall be straight, free from warps, bends, indentations, or other defects. Defective forms shall be removed from the work. Metal side forms shall be used except at end closures and transverse construction joints where straight forms of other suitable material may be used.

Side forms may be built up by rigidly attaching a section to either top or bottom of forms. If such build-up is attached to the top of metal forms, the build-up shall also be metal.

Width of the base of all forms shall be equal to or greater than the specified pavement thickness.

Side forms shall be of sufficient rigidity, both in the form and in the interlocking connection with adjoining forms, that springing will not occur under the weight of subgrading and paving equipment or from the pressure of the concrete. The Contractor shall provide sufficient forms so that there will be no delay in placing concrete due to lack of forms.

Before placing side forms, the underlying material shall be at the proper grade. Side forms shall have full bearing upon the foundation throughout their length and width of base and shall be placed to the required grade and alignment of the finished pavement. They shall be firmly supported during the entire operation of placing, compacting, and finishing the pavement.

Forms shall be drilled in advance of being placed to line and grade to accommodate tie bars where these are specified.

Immediately in advance of placing concrete and after all subbase operations are completed, side forms shall be trued and maintained to the required line and grade for a distance sufficient to prevent delay in placing.

Side forms shall remain in place at least 12 hours after the concrete has been placed, and in all cases until the edge of the pavement no longer requires the protection of the forms. Curing compound shall be applied to the concrete immediately after the forms have been removed.

Side forms shall be thoroughly cleaned and oiled each time they are used and before concrete is placed against them.

Concrete shall be spread, screeded, shaped and consolidated by one or more self-propelled machines. These machines shall uniformly distribute and consolidate concrete without segregation so that the completed pavement will conform to the required cross-section with a minimum of handwork.

The number and capacity of machines furnished shall be adequate to perform the work required at a rate equal to that of concrete delivery.

Concrete for the full paving width shall be effectively consolidated by internal vibrators without causing segregation. Internal type vibrators' rate of vibration shall be not less than 7,000 cycles per minute. Amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete more than one foot (30 cm) from the vibrating element. The Contractor shall furnish a tachometer or other suitable device for measuring and indicating frequency of vibration.

Power to vibrators shall be connected so that vibration ceases when forward or backward motion of the machine is stopped.

The provisions relating to the frequency and amplitude of internal vibration shall be considered the minimum requirements and are intended to ensure adequate density in the hardened concrete.

c. Consolidation. Concrete shall be consolidated with the specified type of lane-spanning, gang-mounted, mechanical, immersion type vibrating equipment mounted in front of the paver, supplemented, in rare instances as specified, by hand-operated vibrators. The vibrators shall be inserted into the concrete to a depth that will provide the best full-depth consolidation but not closer to the underlying material than inches (~~50 mm~~). Excessive vibration shall not be permitted. If the vibrators cause visible tracking in the paving lane, the paving operation shall be stopped and equipment and operations modified to prevent it. Concrete in small, odd-shaped slabs or in isolated locations inaccessible to the gang-mounted vibration equipment shall be vibrated with an approved hand-operated immersion vibrator operated from a bridge spanning the area. Vibrators shall not be used to transport or spread the concrete. Hand-operated vibrators shall not be operated in the concrete at one location for more than 20 seconds. Insertion locations for hand-operated vibrators shall be between 6 to 15 inches (~~150 to 400 mm~~) on centers. For each paving train, at least one additional vibrator spud, or sufficient parts for rapid replacement and repair of vibrators shall be maintained at the paving site at all times. Any evidence of inadequate consolidation (honeycomb along the edges, large air pockets, or any other evidence) shall require the immediate stopping of the paving operation and adjustment of the equipment or procedures as approved by the Engineer.

If a lack of consolidation of the concrete is suspected by the Engineer, referee testing may be required. Referee testing of hardened concrete will be performed by the Engineer by cutting cores from the finished pavement after a minimum of 24 hours curing. Density determinations will be made by the Engineer based on the water content of the core as taken. ASTM C642 shall be used for the determination of core density in the saturated-surface dry condition. When required, referee cores will be taken at the minimum rate of one for each 500 cubic yards (~~382 m³~~) of pavement, or fraction. The Contractor shall be responsible for all referee testing cost if they fail to meet the required density.

The average density of the cores shall be at least 97% of the original mix design density, with no cores having a density of less than 96% of the original mix design density. Failure to meet the referee tests will be considered evidence that the minimum requirements for vibration are inadequate for the job conditions. Additional vibrating units or other means of increasing the effect of vibration shall be employed so that the density of the hardened concrete conforms to the above requirements.

501-4.9 Strike-off of concrete and placement of reinforcement. Following the placing of the concrete, it shall be struck off to conform to the cross-section shown on the plans and to an elevation that when the concrete is properly consolidated and finished, the surface of the pavement shall be at the elevation shown on the plans. When reinforced concrete pavement is placed in two layers, the bottom layer shall be struck off to such length and depth that the sheet of reinforcing steel fabric or bar mat may be laid full length on the concrete in its final position without further manipulation. The reinforcement shall then be placed directly upon the concrete, after which the top layer of the concrete shall be placed, struck off, and screeded. If any portion of the bottom layer of concrete has been placed more than 30 minutes without being covered with the top layer or if initial set has taken place, it shall be removed and replaced with freshly mixed concrete at the Contractor's expense. When reinforced concrete is placed in one layer, the reinforcement may be positioned in advance of concrete placement or it may be placed in plastic concrete by mechanical or vibratory means after spreading.

Reinforcing steel, at the time concrete is placed, shall be free of mud, oil, or other organic matter that may adversely affect or reduce bond. Reinforcing steel with rust, mill scale or a combination of both will be considered satisfactory, provided the minimum dimensions, weight, and tensile properties of a hand wire-brushed test specimen are not less than the applicable ASTM specification requirements.

501-4.10 Joints. Joints shall be constructed as shown on the plans and in accordance with these requirements. All joints shall be constructed with their faces perpendicular to the surface of the pavement and finished or edged as

shown on the plans. Joints shall not vary more than 1/2 inch (~~42 mm~~) from their designated position and shall be true to line with not more than 1/4 inch (~~6 mm~~) variation in 10 feet (~~3 m~~). The surface across the joints shall be tested with a 12 feet (~~3 m~~) straightedge as the joints are finished and any irregularities in excess of 1/4 inch (~~6 mm~~) shall be corrected before the concrete has hardened. All joints shall be so prepared, finished, or cut to provide a groove of uniform width and depth as shown on the plans.

a. Construction. Longitudinal construction joints shall be slip-formed or formed against side forms as shown in the plans.

Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for more than 30 minutes or it appears that the concrete will obtain its initial set before fresh concrete arrives. The installation of the joint shall be located at a planned contraction or expansion joint. If placing of the concrete is stopped, the Contractor shall remove the excess concrete back to the previous planned joint.

b. Contraction. Contraction joints shall be installed at the locations and spacing as shown on the plans. Contraction joints shall be installed to the dimensions required by forming a groove or cleft in the top of the slab while the concrete is still plastic or by sawing a groove into the concrete surface after the concrete has hardened. When the groove is formed in plastic concrete the sides of the grooves shall be finished even and smooth with an edging tool. If an insert material is used, the installation and edge finish shall be according to the manufacturer's instructions. The groove shall be finished or cut clean so that spalling will be avoided at intersections with other joints. Grooving or sawing shall produce a slot at least 1/8 inch (3 mm) wide and to the depth shown on the plans.

c. Isolation (expansion). Isolation joints shall be installed as shown on the plans. The premolded filler of the thickness as shown on the plans, shall extend for the full depth and width of the slab at the joint, except for space for sealant at the top of the slab. The filler shall be securely staked or fastened into position perpendicular to the proposed finished surface. A cap shall be provided to protect the top edge of the filler and to permit the concrete to be placed and finished. After the concrete has been placed and struck off, the cap shall be carefully withdrawn leaving the space over the premolded filler. The edges of the joint shall be finished and tooled while the concrete is still plastic. Any concrete bridging the joint space shall be removed for the full width and depth of the joint.

d. Tie bars. Tie bars shall consist of deformed bars installed in joints as shown on the plans. Tie bars shall be placed at right angles to the centerline of the concrete slab and shall be spaced at intervals shown on the plans. They shall be held in position parallel to the pavement surface and in the middle of the slab depth. When tie bars extend into an unpaved lane, they may be bent against the form at longitudinal construction joints, unless threaded bolt or other assembled tie bars are specified. Tie bars shall not be painted, greased, or enclosed in sleeves. When slip-form operations call for tie bars, two-piece hook bolts can be installed.

e. Dowel bars. Dowel bars or other load-transfer units of an approved type shall be placed across joints as shown on the plans. They shall be of the dimensions and spacings as shown and held rigidly in the middle of the slab depth in the proper horizontal and vertical alignment by an approved assembly device to be left permanently in place. The dowel or load-transfer and joint devices shall be rigid enough to permit complete assembly as a unit ready to be lifted and placed into position. The dowels shall be coated with a bond-breaker or other lubricant recommended by the manufacturer and approved by the Engineer.

f. Dowels bars at longitudinal construction joints shall be bonded in drilled holes.

g. Placing dowels and tie bars. The method used in installing and holding dowels in position shall ensure that the error in alignment of any dowel from its required horizontal and vertical alignment after the pavement has been completed will not be greater than 1/8 inch per feet (~~3 mm per 0.3 m~~). Except as otherwise specified below, horizontal spacing of dowels shall be within a tolerance of $\pm 5/8$ inch (~~16 mm~~). The vertical location on the face of the slab shall be within a tolerance of $\pm 1/2$ inch (~~42 mm~~). The vertical alignment of the dowels shall be measured parallel to the designated top surface of the pavement, except for those across the crown or other grade change joints. Dowels across crowns and other joints at grade changes shall be measured to a level surface. Horizontal alignment shall be checked perpendicular to the joint edge. The horizontal alignment shall be checked with a framing square. Dowels and tie bars shall not be placed closer than 0.6 times the dowel bar or tie bar length to the planned joint line. If the last regularly spaced longitudinal dowel or tie bar is closer than that dimension, it shall be moved away from the joint to a location 0.6 times the dowel bar or tie bar length, but not closer than 6 inches (~~450 mm~~) to its nearest neighbor. The portion of each dowel intended to move within the concrete or expansion cap shall

be wiped clean and coated with a thin, even film of lubricating oil or light grease before the concrete is placed. Dowels shall be installed as specified in the following subparagraphs.

(1) Contraction joints. Dowels and tie bars in longitudinal and transverse contraction joints within the paving lane shall be held securely in place, as indicated, by means of rigid metal frames or basket assemblies of an approved type. The basket assemblies shall be held securely in the proper location by means of suitable pins or anchors. Do not cut or crimp the dowel basket tie wires. At the Contractor's option, in lieu of the above, dowels and tie bars in contraction joints shall be installed near the front of the paver by insertion into the plastic concrete using approved equipment and procedures. Approval will be based on the results of a preconstruction demonstration, showing that the dowels and tie bars are installed within specified tolerances.

(2) Construction joints. Install dowels and tie bars by the cast-in-place or the drill-and-dowel method. Installation by removing and replacing in preformed holes will not be permitted. Dowels and tie bars shall be prepared and placed across joints where indicated, correctly aligned, and securely held in the proper horizontal and vertical position during placing and finishing operations, by means of devices fastened to the forms. The spacing of dowels and tie bars in construction joints shall be as indicated.

(3) Dowels installed in isolation joints and other hardened concrete. Install dowels for isolation joints and in other hardened concrete by bonding the dowels into holes drilled into the hardened concrete. The concrete shall have cured for seven (7) days or reached a minimum flexural strength of 450 psi (~~3.1 MPa~~) before drilling commences. Holes 1/8 inch (~~3 mm~~) greater in diameter than the dowels shall be drilled into the hardened concrete using rotary-core drills. Rotary-percussion drills may be used, provided that excessive spalling does not occur to the concrete joint face. Modification of the equipment and operation shall be required if, in the Engineer's opinion, the equipment and/or operation is causing excessive damage. Depth of dowel hole shall be within a tolerance of $\pm 1/2$ inch (~~12 mm~~) of the dimension shown on the drawings. On completion of the drilling operation, the dowel hole shall be blown out with oil-free, compressed air. Dowels shall be bonded in the drilled holes using epoxy resin. Epoxy resin shall be injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel will not be permitted. The dowels shall be held in alignment at the collar of the hole, after insertion and before the grout hardens, by means of a suitable metal or plastic grout retention ring fitted around the dowel. Dowels required to be installed in any joints between new and existing concrete shall be grouted in holes drilled in the existing concrete, all as specified above.

h. Sawing of joints. Joints shall be cut as shown on the plans. Equipment shall be as described in paragraph 501-4.1. The circular cutter shall be capable of cutting a groove in a straight line and shall produce a slot at least 1/8 inch (~~3 mm~~) wide and to the depth shown on the plans. The top of the slot shall be widened by sawing to provide adequate space for joint sealers as shown on the plans. Sawing shall commence, without regard to day or night, as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling, or tearing and before uncontrolled shrinkage cracking of the pavement occurs and shall continue without interruption until all joints have been sawn. The joints shall be sawn at the required spacing. All slurry and debris produced in the sawing of joints shall be removed by vacuuming and washing. Curing compound or system shall be reapplied in the initial sawcut and maintained for the remaining cure period.

501-4.11 Finishing. Finishing operations shall be a continuing part of placing operations starting immediately behind the strike-off of the paver. Initial finishing shall be provided by the transverse screed or extrusion plate. The sequence of operations shall be transverse finishing, longitudinal machine floating if used, straightedge finishing, texturing, and then edging of joints. Finishing shall be by the machine method. The hand method shall be used only on isolated areas of odd slab widths or shapes and in the event of a breakdown of the mechanical finishing equipment. Supplemental hand finishing for machine finished pavement shall be kept to an absolute minimum. Any machine finishing operation which requires appreciable hand finishing, other than a moderate amount of straightedge finishing, shall be immediately stopped and proper adjustments made or the equipment replaced. Any operations which produce more than 1/8 inch (3 mm) of mortar-rich surface (defined as deficient in plus U.S. No. 4 (~~4.75 mm~~) sieve size aggregate) shall be halted immediately and the equipment, mixture, or procedures modified as necessary. Compensation shall be made for surging behind the screeds or extrusion plate and settlement during hardening and care shall be taken to ensure that paving and finishing machines are properly adjusted so that the finished surface of the concrete (not just the cutting edges of the screeds) will be at the required line and grade. Finishing equipment and tools shall be maintained clean and in an approved condition. At no time shall water be added to the surface of the slab with the finishing equipment or tools, or in any other way, except for fog (mist) sprays specified to prevent plastic shrinkage cracking.

a. Machine finishing with slipform pavers. The slipform paver shall be operated so that only a very minimum of additional finishing work is required to produce pavement surfaces and edges meeting the specified tolerances. Any equipment or procedure that fails to meet these specified requirements shall immediately be replaced or modified as necessary. A self-propelled non-rotating pipe float may be used while the concrete is still plastic, to remove minor irregularities and score marks. Only one pass of the pipe float shall be allowed. If there is concrete slurry or fluid paste on the surface that runs over the edge of the pavement, the paving operation shall be immediately stopped and the equipment, mixture, or operation modified to prevent formation of such slurry. Any slurry which does run down the vertical edges shall be immediately removed by hand, using stiff brushes or scrapers. No slurry, concrete or concrete mortar shall be used to build up along the edges of the pavement to compensate for excessive edge slump, either while the concrete is plastic or after it hardens.

b. Machine finishing with fixed forms. The machine shall be designed to straddle the forms and shall be operated to screed and consolidate the concrete. Machines that cause displacement of the forms shall be replaced. The machine shall make only one pass over each area of pavement. If the equipment and procedures do not produce a surface of uniform texture, true to grade, in one pass, the operation shall be immediately stopped and the equipment, mixture, and procedures adjusted as necessary.

c. Other types of finishing equipment. Clary screeds, other rotating tube floats, or bridge deck finishers are not allowed on mainline paving, but may be allowed on irregular or odd-shaped slabs, and near buildings or trench drains, subject to the Engineer's approval.

Bridge deck finishers shall have a minimum operating weight of 7500 pounds (3400 kg) and shall have a transversely operating carriage containing a knock-down auger and a minimum of two immersion vibrators. Vibrating screeds or pans shall be used only for isolated slabs where hand finishing is permitted as specified, and only where specifically approved.

d. Hand finishing. Hand finishing methods will not be permitted, except under the following conditions: (1) in the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade and (2) in areas of narrow widths or of irregular dimensions where operation of the mechanical equipment is impractical. Use hand finishing operations only as specified below.

(1) Equipment and screed. In addition to approved mechanical internal vibrators for consolidating the concrete, provide a strike-off and tamping screed and a longitudinal float for hand finishing. The screed shall be at least one foot (30 cm) longer than the width of pavement being finished, of an approved design, and sufficiently rigid to retain its shape, and shall be constructed of metal or other suitable material shod with metal. The longitudinal float shall be at least 10 feet (3 m) long, of approved design, and rigid and substantially braced, and shall maintain a plane surface on the bottom. Grate tampers (jitterbugs) shall not be used.

(2) Finishing and floating. As soon as placed and vibrated, the concrete shall be struck off and screeded to the crown and cross-section and to such elevation above grade that when consolidated and finished, the surface of the pavement will be at the required elevation. In addition to previously specified complete coverage with handheld immersion vibrators, the entire surface shall be tamped with the strike-off and tamping template, and the tamping operation continued until the required compaction and reduction of internal and surface voids are accomplished. Immediately following the final tamping of the surface, the pavement shall be floated longitudinally from bridges resting on the side forms and spanning but not touching the concrete. If necessary, additional concrete shall be placed, consolidated and screeded, and the float operated until a satisfactory surface has been produced. The floating operation shall be advanced not more than half the length of the float and then continued over the new and previously floated surfaces.

e. Straightedge testing and surface correction. After the pavement has been struck off and while the concrete is still plastic, it shall be tested for trueness with a Contractor furnished 12-foot (3.7-m) straightedge swung from handles 3 feet (1 m) longer than one-half the width of the slab. The straightedge shall be held in contact with the surface in successive positions parallel to the centerline and the whole area gone over from one side of the slab to the other, as necessary. Advancing shall be in successive stages of not more than one-half the length of the straightedge. Any excess water and laitance in excess of 1/8 inch (~~3 mm~~) thick shall be removed from the surface of the pavement and wasted. Any depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the smoothness requirements of paragraph 501-5.2e(3). Straightedge testing and surface corrections shall continue until the entire surface is found to be free from observable departures from the

straightedge and until the slab conforms to the required grade and cross-section. The use of long-handled wood floats shall be confined to a minimum; they may be used only in emergencies and in areas not accessible to finishing equipment. This straight-edging is not a replacement for the straightedge testing of paragraph 501-5.2e(3), Smoothness.

501-4.12 Surface texture. The surface of the pavement shall be finished with either a brush or broom, burlap drag, or artificial turf finish for all newly constructed concrete pavements. It is important that the texturing equipment not tear or unduly roughen the pavement surface during the operation. Any imperfections resulting from the texturing operation shall be corrected to the satisfaction of the Engineer.

a. Brush or broom finish. If the pavement surface texture is to be a type of brush or broom finish, it shall be applied when the water sheen has practically disappeared. The equipment shall operate transversely across the pavement surface, providing corrugations that are uniform in appearance and approximately 1/16 inch (~~2-mm~~) in depth.

b. Burlap drag finish. If a burlap drag is used to texture the pavement surface, it shall be at least 15 ounces per square yard (~~555 grams per square meter~~). To obtain a textured surface, the transverse threads of the burlap shall be removed approximately one foot (~~30-cm~~) from the trailing edge. A heavy buildup of grout on the burlap threads produces the desired wide sweeping longitudinal striations on the pavement surface. The corrugations shall be uniform in appearance and approximately 1/16 inch (~~2-mm~~) in depth.

c. Artificial turf finish. If artificial turf is used to texture the surface, it shall be applied by dragging the surface of the pavement in the direction of concrete placement with an approved full-width drag made with artificial turf. The leading transverse edge of the artificial turf drag will be securely fastened to a lightweight pole on a traveling bridge. At least 2 feet (~~60-cm~~) of the artificial turf shall be in contact with the concrete surface during dragging operations. A variety of different types of artificial turf are available and approval of any one type will be done only after it has been demonstrated by the Contractor to provide a satisfactory texture. One type that has provided satisfactory texture consists of 7,200 approximately 0.85 inch-long polyethylene turf blades per square foot. The corrugations shall be uniform in appearance and approximately 1/16 inch (~~2-mm~~) in depth.]

501-4.13 Curing. Immediately after finishing operations are completed and marring of the concrete will not occur, the entire surface of the newly placed concrete shall be cured for a 7-day cure period in accordance with one of the methods below. Failure to provide sufficient cover material of whatever kind the Contractor may elect to use, or lack of water to adequately take care of both curing and other requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than 1/2 hour during the curing period.

When a two-sawcut method is used to construct the contraction joint, the curing compound shall be applied to the sawcut immediately after the initial cut has been made. The sealant reservoir shall not be sawed until after the curing period has been completed. When the one cut method is used to construct the contraction joint, the joint shall be cured with wet rope, wet rags, or wet blankets. The rags, ropes, or blankets shall be kept moist for the duration of the curing period.

a. Impervious membrane method. The entire surface of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place. The curing compound shall not be applied during rainfall. Curing compound shall be applied by mechanical sprayers under pressure at the rate of one gallon (~~4-liters~~) to not more than 150 sq ft (~~14-sq-m~~). The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application the compound shall be stirred continuously by mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms will be permitted. When hand spraying is approved by the Engineer, a double application rate shall be used to ensure coverage. The curing compound shall be of such character that the film will harden within 30 minutes after application. Should the film become damaged from any cause, including sawing operations, within the required curing period, the damaged portions shall be repaired immediately with additional compound or other approved means. Upon removal of side forms, the sides of the exposed slabs shall be protected immediately to provide a curing treatment equal to that provided for the surface. Curing shall be applied immediately after the bleed water is gone from the surface.

b. White burlap-polyethylene sheets. The surface of the pavement shall be entirely covered with the sheeting. The sheeting used shall be such length (or width) that it will extend at least twice the thickness of the pavement beyond the edges of the slab. The sheeting shall be placed so that the entire surface and both edges of the slab are

completely covered. The sheeting shall be placed and weighted to remain in contact with the surface covered, and the covering shall be maintained fully saturated and in position for seven (7) days after the concrete has been placed.

c. Water method. The entire area shall be covered with burlap or other water absorbing material. The material shall be of sufficient thickness to retain water for adequate curing without excessive runoff. The material shall be kept wet at all times and maintained for seven (7) days. When the forms are stripped, the vertical walls shall also be kept moist. It shall be the responsibility of the Contractor to prevent ponding of the curing water on the subbase.

d. Concrete protection for cold weather. The concrete shall be maintained at an ambient temperature of at least 50°F (10°C) for a period of 72 hours after placing and at a temperature above freezing for the remainder of the curing time. The Contractor shall be responsible for the quality and strength of the concrete placed during cold weather; and any concrete damaged shall be removed and replaced at the Contractor's expense.

e. Concrete protection for hot weather. Concrete should be continuous moisture cured for the entire curing period and shall commence as soon as the surfaces are finished and continue for at least 24 hours. However, if moisture curing is not practical beyond 24 hours, the concrete surface shall be protected from drying with application of a liquid membrane-forming curing compound while the surfaces are still damp. Other curing methods may be approved by the Engineer.

501-4.14 Removing forms. Unless otherwise specified, forms shall not be removed from freshly placed concrete until it has hardened sufficiently to permit removal without chipping, spalling, or tearing. After the forms have been removed, the sides of the slab shall be cured as per the methods indicated in paragraph 501-4.13. Major honeycombed areas shall be considered as defective work and shall be removed and replaced in accordance with paragraph 501-5.2(f).

501-4.15 Saw-cut grooving. If shown on the plans, grooved surfaces shall be provided in accordance with the requirements of Item P-621.

501-4.16 Sealing joints. The joints in the pavement shall be sealed in accordance with Item P-604.

501-4.17 Protection of pavement. The Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by the Contractor's employees and agents until accepted by the Engineer. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, crossovers, and protection of unsealed joints from intrusion of foreign material, etc. Any damage to the pavement occurring prior to final acceptance shall be repaired or the pavement replaced at the Contractor's expense.

Aggregates, rubble, or other similar construction materials shall not be placed on airfield pavements. Traffic shall be excluded from the new pavement by erecting and maintaining barricades and signs until the concrete is at least seven (7) days old, or for a longer period if directed by the Engineer.

In paving intermediate lanes between newly paved pilot lanes, operation of the hauling and paving equipment will be permitted on the new pavement after the pavement has been cured for seven (7) days and the joints have been sealed or otherwise protected, and the concrete has attained a minimum field cured flexural strength of 550 psi (3792.8 kPa) and approved means are furnished to prevent damage to the slab edge.

All new and existing pavement carrying construction traffic or equipment shall be continuously kept completely clean, and spillage of concrete or other materials shall be cleaned up immediately upon occurrence.

Damaged pavements shall be removed and replaced at the Contractor's expense. Slabs shall be removed to the full depth, width, and length of the slab.

501-4.18 Opening to construction traffic. The pavement shall not be opened to traffic until test specimens molded and cured in accordance with ASTM C31 have attained a flexural strength of 550 lb / square inch (3.8 kPa) when tested in accordance with ASTM C78. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Prior to opening the pavement to construction traffic, all joints shall either be sealed or protected from damage to the joint edge and intrusion of foreign materials into the joint. As a minimum, backer rod or tape may be used to protect the joints from foreign matter intrusion.

501-4.19 Repair, removal, or replacement of slabs.

a. General. New pavement slabs that are broken or contain cracks or are otherwise defective or unacceptable shall be removed and replaced or repaired, as directed by the Engineer and as specified hereinafter at no cost to the Owner. Spalls along joints shall be repaired as specified. Removal of partial slabs is not permitted. Removal and

replacement shall be full depth, shall be full width of the slab, and the limit of removal shall be normal to the paving lane and to each original transverse joint. The Engineer will determine whether cracks extend full depth of the pavement and may require cores to be drilled on the crack to determine depth of cracking. Such cores shall be 4 inch (~~400-mm~~) diameter, shall be drilled by the Contractor and shall be filled by the Contractor with a well consolidated concrete mixture bonded to the walls of the hole with epoxy resin, using approved procedures. Drilling of cores and refilling holes shall be at no expense to the Owner. All epoxy resin used in this work shall conform to ASTM C881, Type V. Repair of cracks as described in this section shall not be allowed if in the opinion of the Engineer the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of cracks shall be allowed in any panel that demonstrates segregated aggregate with an absence of coarse aggregate in the upper 1/8 inch (~~3-mm~~) of the pavement surface.

b. Shrinkage cracks. Shrinkage cracks, which do not exceed 4 inches (~~100-mm~~) in depth, shall be cleaned and then pressure injected with epoxy resin, Type IV, Grade 1, using procedures as approved by the Engineer. Care shall be taken to assure that the crack is not widened during epoxy resin injection. All epoxy resin injection shall take place in the presence of the Engineer. Shrinkage cracks, which exceed 4 inches (~~100-mm~~) in depth, shall be treated as full depth cracks in accordance with paragraphs 4.19b and 4.19c.

c. Slabs with cracks through interior areas. Interior area is defined as that area more than 6 inches (~~150-mm~~) from either adjacent original transverse joint. The full slab shall be removed and replaced at no cost to the Owner, when there are any full depth cracks, or cracks greater than 4 inches (~~100-mm~~) in depth, that extend into the interior area.

d. Cracks close to and parallel to joints. All cracks essentially parallel to original joints, extending full depth of the slab, and lying wholly within 6 inches (~~150-mm~~) either side of the joint shall be treated as specified here. Any crack extending more than 6 inches (~~150-mm~~) from the joint shall be treated as specified above in subparagraph c.

(1) Full depth cracks present, original joint not opened. When the original un-cracked joint has not opened, the crack shall be sawed and sealed, and the original joint filled with epoxy resin as specified below. The crack shall be sawed with equipment specially designed to follow random cracks. The reservoir for joint sealant in the crack shall be formed by sawing to a depth of 3/4 inches (~~19-mm~~), $\pm 1/16$ inch (~~2-mm~~), and to a width of 5/8 inch (~~16-mm~~), $\pm 1/8$ inch (~~3-mm~~). Any equipment or procedure which causes raveling or spalling along the crack shall be modified or replaced to prevent such raveling or spalling. The joint sealant shall be a liquid sealant as specified. Installation of joint seal shall be as specified for sealing joints or as directed. If the joint sealant reservoir has been sawed out, the reservoir and as much of the lower saw cut as possible shall be filled with epoxy resin, Type IV, Grade 2, thoroughly tooled into the void using approved procedures.

If only the original narrow saw cut has been made, it shall be cleaned and pressure injected with epoxy resin, Type IV, Grade 1, using approved procedures. If filler type material has been used to form a weakened plane in the transverse joint, it shall be completely sawed out and the saw cut pressure injected with epoxy resin, Type IV, Grade 1, using approved procedures. Where a parallel crack goes part way across paving lane and then intersects and follows the original joint which is cracked only for the remained of the width, it shall be treated as specified above for a parallel crack, and the cracked original joint shall be prepared and sealed as originally designed.

(2) Full depth cracks present, original joint also cracked. At a joint, if there is any place in the lane width where a parallel crack and a cracked portion of the original joint overlap, the entire slab containing the crack shall be removed and replaced for the full lane width and length.

e. Removal and replacement of full slabs. Where it is necessary to remove full slabs, unless there are dowels present, all edges of the slab shall be cut full depth with a concrete saw. All saw cuts shall be perpendicular to the slab surface. If dowels, or tie bars are present along any edges, these edges shall be sawed full depth just beyond the end of the dowels or tie bars. These joints shall then be carefully sawed on the joint line to within one inch (~~25-mm~~) of the depth of the dowel or tie bar.

The main slab shall be further divided by sawing full depth, at appropriate locations, and each piece lifted out and removed. Suitable equipment shall be used to provide a truly vertical lift, and approved safe lifting devices used for attachment to the slabs. The narrow strips along doweled edges shall be carefully broken up and removed using light, hand-held jackhammers, 30 lb (~~14-kg~~) or less, or other approved similar equipment.

Care shall be taken to prevent damage to the dowels, tie bars, or to concrete to remain in place. The joint face below dowels shall be suitably trimmed so that there is not abrupt offset in any direction greater than 1/2 inch (~~42~~

~~mm)~~ and no gradual offset greater than one inch (25 mm) when tested in a horizontal direction with a 12-foot (~~3.7-m~~) straightedge.

No mechanical impact breakers, other than the above hand-held equipment shall be used for any removal of slabs. If underbreak between 1-1/2 and 4 inches (~~38 and 100 mm~~) deep occurs at any point along any edge, the area shall be repaired as directed before replacing the removed slab. Procedures directed will be similar to those specified for surface spalls, modified as necessary.

If underbreak over 4 inches (~~100 mm~~) deep occurs, the entire slab containing the underbreak shall be removed and replaced. Where there are no dowels or tie bars, or where they have been damaged, dowels or tie bars of the size and spacing as specified for other joints in similar pavement shall be installed by epoxy grouting them into holes drilled into the existing concrete using procedures as specified. Original damaged dowels or tie bars shall be cut off flush with the joint face. Protruding portions of dowels shall be painted and lightly oiled. All four (4) edges of the new slab shall contain dowels or original tie bars.

Placement of concrete shall be as specified for original construction. Prior to placement of new concrete, the underlying material (unless it is stabilized) shall be re-compacted and shaped as specified in the appropriate section of these specifications. The surfaces of all four joint faces shall be cleaned of all loose material and contaminants and coated with a double application of membrane forming curing compound as bond breaker. Care shall be taken to prevent any curing compound from contacting dowels or tie bars. The resulting joints around the new slab shall be prepared and sealed as specified for original construction.

f. Repairing spalls along joints. Where directed, spalls along joints of new slabs, and along parallel cracks used as replacement joints, shall be repaired by first making a vertical saw cut at least one inch (~~25 mm~~) outside the spalled area and to a depth of at least 2 inch (~~50 mm~~). Saw cuts shall be straight lines forming rectangular areas. The concrete between the saw cut and the joint, or crack, shall be chipped out to remove all unsound concrete and at least 1/2 inch (~~12 mm~~) of visually sound concrete. The cavity thus formed shall be thoroughly cleaned with high-pressure water jets supplemented with compressed air to remove all loose material. Immediately before filling the cavity, a prime coat of epoxy resin, Type III, Grade I, shall be applied to the dry cleaned surface of all sides and bottom of the cavity, except any joint face. The prime coat shall be applied in a thin coating and scrubbed into the surface with a stiff-bristle brush. Pooling of epoxy resin shall be avoided. The cavity shall be filled with low slump Portland cement concrete or mortar or with epoxy resin concrete or mortar. Concrete shall be used for larger spalls, generally those more than 1/2 cu. ft. (~~0.014 m³~~) in size, and mortar shall be used for the smaller ones. Any spall less than 0.1 cu. ft. (~~0.003 m³~~) shall be repaired only with epoxy resin mortar or a Grade III epoxy resin. Portland cement concrete and mortar mixtures shall be proportioned as directed and shall be mixed, placed, consolidated, and cured as directed. Epoxy resin mortars shall be made with Type III, Grade 1, epoxy resin, using proportions and mixing and placing procedures as recommended by the manufacturer and approved by the Engineer. The epoxy resin materials shall be placed in the cavity in layers not over 2 inches (~~50 mm~~) thick. The time interval between placement of additional layers shall be such that the temperature of the epoxy resin material does not exceed 140°F (60°C) at any time during hardening. Mechanical vibrators and hand tampers shall be used to consolidate the concrete or mortar. Any repair material on the surrounding surfaces of the existing concrete shall be removed before it hardens. Where the spalled area abuts a joint, an insert or other bond-breaking medium shall be used to prevent bond at the joint face. A reservoir for the joint sealant shall be sawed to the dimensions required for other joints, or as required to be routed for cracks. The reservoir shall be thoroughly cleaned and sealed with the sealer specified for the joints. If any spall penetrates half the depth of the slab or more, the entire slab shall be removed and replaced as previously specified. If any spall would require over 25% of the length of any single joint to be repaired, the entire slab shall be removed and replaced. Repair of spalls as described in this section shall not be allowed if in the opinion of the Engineer the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of spalls shall be allowed in any panel that demonstrates segregated aggregate with a significant absence of coarse aggregate in the upper one-eighth (1/8th) inch of the pavement surface.

g. Diamond grinding of PCC surfaces. Diamond grinding of the hardened concrete with an approved diamond grinding machine should not be performed until the concrete is 14 days or more old and concrete has reached full minimum strength. When required, diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive. The saw blades shall be assembled in a cutting head mounted on a machine designed specifically for diamond grinding that will produce the required texture and smoothness level without damage to the pavement. The saw blades shall be 1/8-inch (~~3 mm~~) wide and there shall be a minimum of 55 to 60 blades per 12 inches (~~300 mm~~) of cutting head width; the actual number of blades will be determined by the