

PHILIPPINE BIDDING DOCUMENTS

(As Harmonized with Development Partners)

PROCUREMENT OF BASCO AIRPORT DEVELOPMENT PROJECT CY 2019 (WIDENING OF STOPWAY, EXPANSION OF APRON, RUNWAY AND TAXIWAY ASPHALT OVERLAY INCLUDING STRIP WIDTH CORRECTION) (RE-BID)

Government of the Republic of the Philippines

Bid No. 21-015-07 (RE-BID) CHARLIE

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Glossary of Terms, Abbreviations, and Acronyms

ABC – Approved Budget for the Contract.

ARCC – Allowable Range of Contract Cost.

BAC – Bids and Awards Committee.

Bid – A signed offer or proposal to undertake a contract submitted by a bidder in response to and in consonance with the requirements of the bidding documents. Also referred to as *Proposal* and *Tender*. (2016 revised IRR, Section 5[c])

Bidder – Refers to a contractor, manufacturer, supplier, distributor and/or consultant who submits a bid in response to the requirements of the Bidding Documents. (2016 revised IRR, Section 5[d])

Bidding Documents – The documents issued by the Procuring Entity as the bases for bids, furnishing all information necessary for a prospective bidder to prepare a bid for the Goods, Infrastructure Projects, and/or Consulting Services required by the Procuring Entity. (2016 revised IRR, Section 5[e])

BIR – Bureau of Internal Revenue.

BSP – Bangko Sentral ng Pilipinas.

CDA – Cooperative Development Authority.

Consulting Services – Refer to services for Infrastructure Projects and other types of projects or activities of the GOP requiring adequate external technical and professional expertise that are beyond the capability and/or capacity of the GOP to undertake such as, but not limited to: (i) advisory and review services; (ii) pre-investment or feasibility studies; (iii) design; (iv) construction supervision; (v) management and related services; and (vi) other technical services or special studies. (2016 revised IRR, Section 5[i])

Contract – Refers to the agreement entered into between the Procuring Entity and the Supplier or Manufacturer or Distributor or Service Provider for procurement of Goods and Services; Contractor for Procurement of Infrastructure Projects; or Consultant or Consulting Firm for Procurement of Consulting Services; as the case may be, as recorded in the Contract Form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.

Contractor – is a natural or juridical entity whose proposal was accepted by the Procuring Entity and to whom the Contract to execute the Work was awarded. Contractor as used in these Bidding Documents may likewise refer to a supplier, distributor, manufacturer, or consultant.

CPI – Consumer Price Index.

DOLE – Department of Labor and Employment.

DTI – Department of Trade and Industry.

Foreign-funded Procurement or Foreign-Assisted Project – Refers to procurement whose funding source is from a foreign government, foreign or international financing institution as specified in the Treaty or International or Executive Agreement. (2016 revised IRR, Section 5[b]).

GFI – Government Financial Institution.

GOCC – Government-owned and/or –controlled corporation.

Goods – Refer to all items, supplies, materials and general support services, except Consulting Services and Infrastructure Projects, which may be needed in the transaction of public businesses or in the pursuit of any government undertaking, project or activity, whether in the nature of equipment, furniture, stationery, materials for construction, or personal property of any kind, including non-personal or contractual services such as the repair and maintenance of equipment and furniture, as well as trucking, hauling, janitorial, security, and related or analogous services, as well as procurement of materials and supplies provided by the Procuring Entity for such services. The term “related” or “analogous services” shall include, but is not limited to, lease or purchase of office space, media advertisements, health maintenance services, and other services essential to the operation of the Procuring Entity. (2016 revised IRR, Section 5[r])

GOP – Government of the Philippines.

Infrastructure Projects – Include the construction, improvement, rehabilitation, demolition, repair, restoration or maintenance of roads and bridges, railways, airports, seaports, communication facilities, civil works components of information technology projects, irrigation, flood control and drainage, water supply, sanitation, sewerage and solid waste management systems, shore protection, energy/power and electrification facilities, national buildings, school buildings, hospital buildings, and other related construction projects of the government. Also referred to as *civil works or works*. (2016 revised IRR, Section 5[u])

LGUs – Local Government Units.

NFCC – Net Financial Contracting Capacity.

NGA – National Government Agency.

PCAB – Philippine Contractors Accreditation Board.

PhilGEPS - Philippine Government Electronic Procurement System.

Procurement Project – refers to a specific or identified procurement covering goods, infrastructure project or consulting services. A Procurement Project shall be described, detailed, and scheduled in the Project Procurement Management Plan prepared by the agency which shall be consolidated in the procuring entity's Annual Procurement Plan. (GPPB Circular No. 06-2019 dated 17 July 2019)

PSA – Philippine Statistics Authority.

SEC – Securities and Exchange Commission.

SLCC – Single Largest Completed Contract.

UN – United Nations.

Section I. Invitation to Bid



Invitation to Bid for

BASCO AIRPORT DEVELOPMENT PROJECT CY 2019 (WIDENING OF STOPWAY, EXPANSION OF APRON, RUNWAY AND TAXIWAY ASPHALT OVERLAY INCLUDING STRIP WIDTH CORRECTION) (RE-BID) Bid No. 21-015-07 (RE-BID) CHARLIE

1. The Civil Aviation Authority of the Philippines through the GAA CY 2018 (B-4) DOTr Downloaded Projects intends to apply the sum of **ONE HUNDRED FORTY-TWO MILLION THREE HUNDRED EIGHTY-TWO THOUSAND TWO HUNDRED FORTY-SEVEN PESOS 72/100 (PHP 142,382,247.72)** being the Approved Budget for the Contract (ABC) to payments under the contract for **BASCO AIRPORT DEVELOPMENT PROJECT CY 2019 (WIDENING OF STOPWAY, EXPANSION OF APRON, RUNWAY AND TAXIWAY ASPHALT OVERLAY INCLUDING STRIP WIDTH CORRECTION) (Bid No. 21-015-07 (RE-BID) CHARLIE)**. Bids received in excess of the ABC shall be automatically rejected at bid opening.
2. The Civil Aviation Authority of the Philippines now invites bids for the above Procurement Project.

Prospective Bidders should possess the following:

Technical Personnel	One (1) Project (Civil) Engineer One (1) Geodetic Engineer One (1) Materials Engineer One (1) Construction Foreman One (1) Safety and Health Officer
Equipment	One (1) Unit Bulldozer, 165HP Two (2) Units Payloader, 1.50 cu.m. Six (6) Units Dump Truck, 12yd ³ One (1) Unit Motorized Road Grader, 140HP G710A One (1) Unit Vibratory Single Smooth Drum Roller, 10MT One (1) Unit Water Truck, 4,000 gals One (1) Unit Concrete Batch Plant, 30 cu.m. One (1) Unit Concrete Screeder, 5.5HP Two (2) Units Transit Mixer, 5 cu.m. Two (2) Units Concrete Vibrator One (1) Unit Bar Cutter, Single Phase One (1) Unit Concrete Saw, self-propelled 14 in One (1) Unit Asphalt Distributor/Sprayer Pen, 5T One (1) Unit Power Broom & Blower, 30 km/hr One (1) Unit Stake Truck

	One (1) Unit Generator Set, 51-100kW (with lighting assembly) One (1) Unit Asphalt Paver Finisher, 10ft. width One (1) Unit Vibratory Tandem Steel Roller, 10.10MT One (1) Unit Pneumatic Tire Roller, 20MT One (1) Unit Improvised Asphalt Batch Plant, 60-80tph
PCAB License	Medium A - License Category B <i>(Road, Highway pavement, Railways, Airport, horizontal structures and Bridges)</i>

Completion of the Works is required **Two Hundred Ten (210) Calendar Days (inclusive of twenty (20) rainy/unworkable Days)**. Bidders should have completed a contract similar to the Project. The description of an eligible bidder is contained in the Bidding Documents, particularly, in Section II (Instructions to Bidders).

3. Bidding will be conducted through open competitive bidding procedures using non-discretionary “*pass/fail*” criterion as specified in the 2016 revised Implementing Rules and Regulations (IRR) of Republic Act (RA) No. 9184.
4. Interested bidders may obtain further information from BAC Office, CAAP Compound, MIA Road corner Ninoy Aquino Avenue, 1300 Pasay City, Metro Manila on **October 27, 2021 until deadline of submission of bid** and inspect the Bidding Documents at the address given below from 08:00 AM to 05:00 PM from MONDAY to FRIDAY.
5. A complete set of Bidding Documents may be acquired by interested bidders on **October 27, 2021 until deadline of submission of bid** from given address and website/s below and upon payment of the applicable fee for the Bidding Documents, pursuant to the latest Guidelines issued by the GPPB, in the amount of **Php 56,000.00 (inclusive of 12% VAT)**. The Procuring Entity shall allow the bidder to present its proof of payment for the fees by presenting the official receipt in person.
6. The Civil Aviation Authority of the Philippines will hold a Pre-Bid Conference¹ on **2:00PM of November 05, 2021** at CAAP Conference Room, CAAP Compound, MIA Road Ninoy Aquino Avenue, 1300 Pasay City, Metro and/or through videoconferencing/webcasting via Jitsi/Zoom/Google Meet, which shall be open to prospective bidders.
7. Bids must be duly received by the BAC Secretariat at the address below on or before **November 17, 2021 @ 10:00AM** at BAC Office, CAAP Compound, MIA Road corner Ninoy Aquino Avenue, 1300 Pasay City, Metro Manila. Late bids shall not be accepted.
8. All bids must be accompanied by a bid security in any of the acceptable forms and in the amount stated in **ITB** Clause 16.
9. Bid opening shall be on **November 17, 2021 @ 10:00AM** at the given address below and/or through Jitsi/Zoom/Google Meet. Bids will be opened in the presence of the bidders’ representatives who choose to attend the activity.
10. The Civil Aviation Authority of the Philippines reserves the right to reject any and all bids, declare a failure of bidding, or not award the contract at any time prior to contract award in accordance with Sections 35.6 and 41 of the 2016 revised Implementing Rules and

¹ May be deleted in case the ABC is less than One Million Pesos (PhP1,000,000) where the Procuring Entity may not hold a pre-bid conference.

Regulations (IRR) of RA No. 9184, without thereby incurring any liability to the affected bidder or bidders.

11. For further information, please refer to:

DR. ROLLY T. BAYABAN, M.D.

Head, BAC Secretariat

Civil Aviation Authority of the Philippines

MIA Road corner Ninoy Aquino Avenue

1300 Pasay City, Metro Manila

Telephone number – (02) 944-2358

www.caap.gov.ph

12. Bidding Documents may also be downloaded free of charge from the website of the Philippine Government Electronic Procurement System (PhilGEPS) and the website of the Procuring Entity, provided that bidders shall pay the applicable fee for the Bidding Documents not later than the submission of their bids.

October 27, 2021

CAPTAIN DONALDO A. MENDOZA

Chairperson, BAC – Charlie

Section II. Instructions to Bidders

1. Scope of Bid

The Procuring Entity, Civil Aviation Authority of the Philippines invites Bids for the **BASCO AIRPORT DEVELOPMENT PROJECT CY 2019 (WIDENING OF STOPWAY, EXPANSION OF APRON, RUNWAY AND TAXIWAY ASPHALT OVERLAY INCLUDING STRIP WIDTH CORRECTION)**, with Project Identification Number: **Bid No. 21-015-07 (RE-BID) CHARLIE**.

The Procurement Project (referred to herein as “Project”) is for the construction of Works, as described in Section VI (Specifications).

2. Funding Information

2.1. The GOP through the source of funding as indicated below for GAA CY 2018 (B-4) DOTr Downloaded Projects in the amount of **ONE HUNDRED FORTY-TWO MILLION THREE HUNDRED EIGHTY-TWO THOUSAND TWO HUNDRED FORTY-SEVEN PESOS 72/100 (PHP 142,382,247.72)**.

2.2. The source of funding is:

a. GOCC and GFIs, the Corporate Operating Budget.

3. Bidding Requirements

The Bidding for the Project shall be governed by all the provisions of RA No. 9184 and its 2016 revised IRR, including its Generic Procurement Manual and associated policies, rules and regulations as the primary source thereof, while the herein clauses shall serve as the secondary source thereof.

Any amendments made to the IRR and other GPPB issuances shall be applicable only to the ongoing posting, advertisement, or invitation to bid by the BAC through the issuance of a supplemental or bid bulletin.

The Bidder, by the act of submitting its Bid, shall be deemed to have inspected the site, determined the general characteristics of the contracted Works and the conditions for this Project, such as the location and the nature of the work; (b) climatic conditions; (c) transportation facilities; (c) nature and condition of the terrain, geological conditions at the site communication facilities, requirements, location and availability of construction aggregates and other materials, labor, water, electric power and access roads; and (d) other factors that may affect the cost, duration and execution or implementation of the contract, project, or work and examine all instructions, forms, terms, and project requirements in the Bidding Documents.

4. Corrupt, Fraudulent, Collusive, Coercive, and Obstructive Practices

The Procuring Entity, as well as the Bidders and Contractors, shall observe the highest standard of ethics during the procurement and execution of the contract. They or through an agent shall not engage in corrupt, fraudulent, collusive, coercive, and obstructive practices defined under Annex “I” of the 2016 revised IRR of RA No. 9184 or other integrity violations in competing for the Project.

5. Eligible Bidders

- 5.1. Only Bids of Bidders found to be legally, technically, and financially capable will be evaluated.
- 5.2. The Bidder must have an experience of having completed a Single Largest Completed Contract (SLCC) that is similar to this Project, equivalent to at least fifty percent (50%) of the ABC adjusted, if necessary, by the Bidder to current prices using the PSA's CPI, except under conditions provided for in Section 23.4.2.4 of the 2016 revised IRR of RA No. 9184.

A contract is considered to be "similar" to the contract to be bid if it has the major categories of work stated in the **BDS**.

- 5.3. For Foreign-funded Procurement, the Procuring Entity and the foreign government/foreign or international financing institution may agree on another track record requirement, as specified in the Bidding Document prepared for this purpose.
- 5.4. The Bidders shall comply with the eligibility criteria under Section 23.4.2 of the 2016 IRR of RA No. 9184.

6. Origin of Associated Goods

There is no restriction on the origin of Goods other than those prohibited by a decision of the UN Security Council taken under Chapter VII of the Charter of the UN.

7. Subcontracts

- 7.1. The Bidder may subcontract portions of the Project to the extent allowed by the Procuring Entity as stated herein, but in no case more than fifty percent (50%) of the Project.

The Procuring Entity has prescribed that:

- a. Subcontracting is not allowed.

- 7.1. *[If Procuring Entity has determined that subcontracting is allowed during the bidding , state:]* The Bidder must submit together with its Bid the documentary requirements of the subcontractor(s) complying with the eligibility criteria stated in **ITB** Clause 5 in accordance with Section 23.4 of the 2016 revised IRR of RA No. 9184 pursuant to Section 23.1 thereof.

- 7.2. *[If subcontracting is allowed during the contract implementation stage, state:]* The Supplier may identify its subcontractor during the contract implementation stage. Subcontractors identified during the bidding may be changed during the implementation of this Contract. Subcontractors must submit the documentary requirements under Section 23.1 of the 2016 revised IRR of RA No. 9184 and comply with the eligibility criteria specified in **ITB** Clause 5 to the implementing or end-user unit.

- 7.3. Subcontracting of any portion of the Project does not relieve the Contractor of any liability or obligation under the Contract. The Supplier will be responsible for the acts, defaults, and negligence of any subcontractor, its agents, servants, or workmen as fully as if these were the Contractor's own acts, defaults, or negligence, or those of its agents, servants, or workmen.

8. Pre-Bid Conference

The Procuring Entity will hold a pre-bid conference for this Project on the specified date and time and either at its physical address and/or through videoconferencing/webcasting} as indicated in paragraph 6 of the **IB**.

9. Clarification and Amendment of Bidding Documents

Prospective bidders may request for clarification on and/or interpretation of any part of the Bidding Documents. Such requests must be in writing and received by the Procuring Entity, either at its given address or through electronic mail indicated in the **IB**, at least ten (10) calendar days before the deadline set for the submission and receipt of Bids.

10. Documents Comprising the Bid: Eligibility and Technical Components

- 10.1. The first envelope shall contain the eligibility and technical documents of the Bid as specified in **Section X. Checklist of Technical and Financial Documents**.
- 10.2. If the eligibility requirements or statements, the bids, and all other documents for submission to the BAC are in foreign language other than English, it must be accompanied by a translation in English, which shall be authenticated by the appropriate Philippine foreign service establishment, post, or the equivalent office having jurisdiction over the foreign bidder's affairs in the Philippines. For Contracting Parties to the Apostille Convention, only the translated documents shall be authenticated through an apostille pursuant to GPPB Resolution No. 13-2019 dated 23 May 2019. The English translation shall govern, for purposes of interpretation of the bid.
- 10.3. A valid PCAB License is required, and in case of joint ventures, a valid special PCAB License, and registration for the type and cost of the contract for this Project. Any additional type of Contractor license or permit shall be indicated in the **BDS**.
- 10.4. A List of Contractor's key personnel (e.g., Project Manager, Project Engineers, Materials Engineers, and Foremen) assigned to the contract to be bid, with their complete qualification and experience data shall be provided. These key personnel must meet the required minimum years of experience set in the **BDS**.
- 10.5. A List of Contractor's major equipment units, which are owned, leased, and/or under purchase agreements, supported by proof of ownership, certification of availability of equipment from the equipment lessor/vendor for the duration of

the project, as the case may be, must meet the minimum requirements for the contract set in the **BDS**.

11. Documents Comprising the Bid: Financial Component

- 11.1. The second bid envelope shall contain the financial documents for the Bid as specified in **Section X. Checklist of Technical and Financial Documents**.
- 11.2. Any bid exceeding the ABC indicated in paragraph 1 of the **IB** shall not be accepted.
- 11.3. For Foreign-funded procurement, a ceiling may be applied to bid prices provided the conditions are met under Section 31.2 of the 2016 revised IRR of RA No. 9184.

12. Alternative Bids

Bidders shall submit offers that comply with the requirements of the Bidding Documents, including the basic technical design as indicated in the drawings and specifications. Unless there is a value engineering clause in the **BDS**, alternative Bids shall not be accepted.

13. Bid Prices

All bid prices for the given scope of work in the Project as awarded shall be considered as fixed prices, and therefore not subject to price escalation during contract implementation, except under extraordinary circumstances as determined by the NEDA and approved by the GPPB pursuant to the revised Guidelines for Contract Price Escalation guidelines.

14. Bid and Payment Currencies

- 14.1. Bid prices may be quoted in the local currency or tradeable currency accepted by the BSP at the discretion of the Bidder. However, for purposes of bid evaluation, Bids denominated in foreign currencies shall be converted to Philippine currency based on the exchange rate as published in the BSP reference rate bulletin on the day of the bid opening.
- 14.2. *Payment of the contract price shall be made in:*
 - a. Philippine Pesos.

15. Bid Security

- 15.1. The Bidder shall submit a Bid Securing Declaration or any form of Bid Security in the amount indicated in the **BDS**, which shall be not less than the percentage of the ABC in accordance with the schedule in the **BDS**.

- 15.2. The Bid and bid security shall be valid until *[indicate date]*. Any bid not accompanied by an acceptable bid security shall be rejected by the Procuring Entity as non-responsive.

16. Sealing and Marking of Bids

Each Bidder shall submit one copy of the first and second components of its Bid.

The Procuring Entity may request additional hard copies and/or electronic copies of the Bid. However, failure of the Bidders to comply with the said request shall not be a ground for disqualification.

If the Procuring Entity allows the submission of bids through online submission to the given website or any other electronic means, the Bidder shall submit an electronic copy of its Bid, which must be digitally signed. An electronic copy that cannot be opened or is corrupted shall be considered non-responsive and, thus, automatically disqualified.

17. Deadline for Submission of Bids

The Bidders shall submit on the specified date and time and either at its physical address or through online submission as indicated in paragraph 7 of the **IB**.

18. Opening and Preliminary Examination of Bids

- 18.1. The BAC shall open the Bids in public at the time, on the date, and at the place specified in paragraph 9 of the **IB**. The Bidders' representatives who are present shall sign a register evidencing their attendance. In case videoconferencing, webcasting or other similar technologies will be used, attendance of participants shall likewise be recorded by the BAC Secretariat.

In case the Bids cannot be opened as scheduled due to justifiable reasons, the rescheduling requirements under Section 29 of the 2016 revised IRR of RA No. 9184 shall prevail.

- 18.2. The preliminary examination of Bids shall be governed by Section 30 of the 2016 revised IRR of RA No. 9184.

19. Detailed Evaluation and Comparison of Bids

- 19.1. The Procuring Entity's BAC shall immediately conduct a detailed evaluation of all Bids rated "*passed*" using non-discretionary pass/fail criteria. The BAC shall consider the conditions in the evaluation of Bids under Section 32.2 of 2016 revised IRR of RA No. 9184.
- 19.2. If the Project allows partial bids, all Bids and combinations of Bids as indicated in the **BDS** shall be received by the same deadline and opened and evaluated simultaneously so as to determine the Bid or combination of Bids offering the lowest calculated cost to the Procuring Entity. Bid Security as required by **ITB** Clause 16 shall be submitted for each contract (lot) separately.

19.3. In all cases, the NFCC computation pursuant to Section 23.4.2.6 of the 2016 revised IRR of RA No. 9184 must be sufficient for the total of the ABCs for all the lots participated in by the prospective Bidder.

20. Post Qualification

Within a non-extendible period of five (5) calendar days from receipt by the Bidder of the notice from the BAC that it submitted the Lowest Calculated Bid, the Bidder shall submit its latest income and business tax returns filed and paid through the BIR Electronic Filing and Payment System (eFPS), and other appropriate licenses and permits required by law and stated in the **BDS**.

21. Signing of the Contract

The documents required in Section 37.2 of the 2016 revised IRR of RA No. 9184 shall form part of the Contract. Additional Contract documents are indicated in the **BDS**.

Section III. Bid Data Sheet

Bid Data Sheet

ITB Clause	
3.0	<p>Certificate of Site Inspection (<i>Annex “B” Form I</i>) duly signed by Ms. Louie Asantor, Officer in-Charge of Basco Airport or her duly authorized representative, is required to be submitted.</p> <p>This shall include all of the following documents as attachment to the Certificate of Site Inspection and shall form part of the bidder’s technical documents:</p> <ul style="list-style-type: none"> a) Copy of company ID of the person who conducted the site inspection; b) Copy of the airport/facility visitor’s logbook; & c) Picture of the proposed site including the personnel who conducted the site inspection together with the Airport Manager/Officer in Charge or his duly authorized representative. <p>Bids not complying with the above instruction shall be disqualified.</p>
5.2	<p>For this purpose, contracts similar to the Project refer to contracts which have the same major categories of work, which shall be:</p> <p>“Concreting/Asphalting of Roads or other Horizontal Structures”</p>
7.1	<p>Subcontracting is not allowed.</p>
10.1	<p>Bidder shall submit all eligibility and technical documents as specified in Section X. Checklist of Technical and Financial Documents:</p> <p>Class “A” Documents <u>Legal Documents</u></p> <ul style="list-style-type: none"> a. Valid PhilGEPS Registration Certificate (Platinum Membership) (all pages); or b. Registration certificate from Securities and Exchange Commission (SEC), Department of Trade and Industry (DTI) for sole proprietorship, or Cooperative Development Authority (CDA) for cooperatives or its equivalent document; and c. Mayor’s or Business permit issued by the city or municipality where the principal place of business of the prospective bidder is located, or the equivalent document for Exclusive Economic Zones or Areas; and d. Tax clearance per E.O. No. 398, s. 2005, as finally reviewed and approved by the Bureau of Internal Revenue (BIR); and <p><i>In connection to GPPB Circular 07-2017 dated 31 July 2017, the bidder shall have the following options:</i></p> <ul style="list-style-type: none"> 1. <i>Submit the Certificate of PhilGEPS Registration and Platinum Membership including its Annex “A” in lieu of the uploaded Class “A” Eligibility Documents identified in Section 8.5.2 of the Revised</i>

Implementing Rules and Regulations of Republic Act 9184 (Revised IRR of RA 9184), provided that all Class “A” Eligibility Documents listed under the aforesaid Annex “A” are all uploaded and maintained current and updated in the PhilGEPS Registry.

2. *Submit a combination of the PhilGEPS Registration and Platinum Membership including its Annex “A” and Class “A” Eligibility Documents identified in Section 8.5.2 of the Revised IRR of RA 9184.*
 - *In the event that aforesaid Class “A” Eligibility Document(s) listed in the Annex “A” of the PhilGEPS Registration and Platinum Membership is/are reflected to be outdated, the bidder shall submit such current and updated Class “A” Eligibility Document(s).*
3. *Submit all the Class “A” Eligibility Documents only, provided that the PhilGEPS Registration and Platinum Membership shall be submitted as a Post-Qualification requirement in accordance with Section 34.2 of the Revised IRR of RA 9184.*

Technical Documents

- e. Statement of the prospective bidder of all its ongoing government and private contracts, including contracts awarded but not yet started, if any, whether similar or not similar in nature and complexity to the contract to be bid. (*Annex “A” Form 1*); and
- f. Statement of the bidder’s Single Largest Completed Contract (SLCC) similar to the contract to be bid, except under conditions provided under the rules. (*Annex “A” Form 2*); and
- g. Philippine Contractors Accreditation Board (PCAB) License; or Special PCAB License in case of Joint Ventures; and registration for the type and cost of the contract to be bid; and Joint Resolution (*Annex “A” Form 3*); and
- h. Original copy of Bid Security. If in the form of a Surety Bond, submit also a certification issued by the Insurance Commission; or Original copy of Notarized Bid Securing Declaration (*Annex “B” Form 2*); and
- i. Project Requirements, which shall include the following:
 1. Organizational chart for the contract to be bid (*Annex “B” Form 3*); and
 2. List of contractor’s key personnel (e.g., Project Manager, Project Engineers, Materials Engineers, and Foremen), to be assigned to the contract to be bid, with their complete qualification and experience data (*Annex “B” Form 4, 5a, 5b & 5c*); and

	<p>3. List of contractor's major equipment units, which are owned, leased, and/or under purchase agreements, supported by proof of ownership or certification of availability of equipment from the equipment lessor/vendor for the duration of the project, as the case may be (<i>Annex "B" Form 6</i>); and</p> <p>j. Original duly signed Omnibus Sworn Statement (OSS) (<i>Annex "B" Form 7</i>); and if applicable, Original Notarized Secretary's Certificate in case of a corporation, partnership, or cooperative; or Original Special Power of Attorney of all members of the joint venture giving full power and authority to its officer to sign the OSS and do acts to represent the Bidder; and</p> <p>This shall include all of the following documents as attachment to the Omnibus Sworn Statement:</p> <ol style="list-style-type: none"> 1. Certification, under oath, attesting that they have no pending case(s) against the Government, in addition to the eligibility requirements as prescribe under the 2016 Revised Implementing Rules and Regulation (R-IRR) of RA No. 9184; and 2. Legal Clearance to be issued by the CAAP Enforcement and Legal Service with respect to the non-pending cases of the prospective bidders against this Authority; and 3. Bid Bulletins (if applicable); and <p>k. Certificate of Site Inspection (<i>Annex "B" Form 1</i>) duly signed by Ms. Louie Asantor, Officer in-Charge of Basco Airport or her duly authorized representative; and</p> <p>This shall include all of the following documents as attachment to the Certificate of Site Inspection:</p> <ol style="list-style-type: none"> 1. Copy of company ID of the person who conducted the site inspection; and 2. Copy of the airport/facility visitor's logbook; and 3. Picture of the proposed site including the personnel who conducted the site inspection together with the Airport Manager/Officer in Charge or his duly authorized representative; and <p><u>Financial Documents</u></p> <ol style="list-style-type: none"> 1. The prospective bidder's audited financial statements, showing, among others, the prospective bidder's total and current assets and liabilities, stamped "received" by the BIR or its duly accredited and authorized institutions, for the preceding calendar year which should not be earlier than two (2) years from the date of bid submission; and
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	<p>m. The prospective bidder’s computation of Net Financial Contracting Capacity (NFCC).</p> <p>Class “B” Documents</p> <p>n. If applicable, duly signed joint venture agreement (JVA) in accordance with RA No. 4566 and its IRR in case the joint venture is already in existence; or duly notarized statements from all the potential joint venture partners stating that they will enter into and abide by the provisions of the JVA in the instance that the bid is successful.</p> <p>Applicable CAAP BAC Standard Forms included in this PBD shall be complied in accordance with the prescribed forms under Section IX Bidding Forms – Annexes “A” & “B”.</p> <p>Bids not complying with the above instruction shall be disqualified.</p>						
10.3	<p>Valid PCAB License or Special PCAB License in case of Joint Ventures, and Registration (<i>Medium A License Category B for horizontal works - Road, Highway pavement, Railways, Airport, horizontal structures and Bridges</i>) for the type and cost of the contract to be bid.</p> <p>Bids not complying with the above instruction shall be disqualified.</p>						
10.4	<p>The key personnel must meet the required minimum years of experience set below:</p> <table><tr><td><u>Key Personnel</u></td><td><u>General Experience</u></td><td><u>Relevant Experience</u></td></tr><tr><td>Project (Civil) Engineer Geodetic Engineer Materials Engineer Construction Foreman Safety and Health Officer</td><td>Five (5) years in General Engineering</td><td>Three (3) years in Concreting/ Asphaltting of Roads or other Horizontal Structures</td></tr></table> <p>Bids not complying with the above instruction shall be disqualified.</p>	<u>Key Personnel</u>	<u>General Experience</u>	<u>Relevant Experience</u>	Project (Civil) Engineer Geodetic Engineer Materials Engineer Construction Foreman Safety and Health Officer	Five (5) years in General Engineering	Three (3) years in Concreting/ Asphaltting of Roads or other Horizontal Structures
<u>Key Personnel</u>	<u>General Experience</u>	<u>Relevant Experience</u>					
Project (Civil) Engineer Geodetic Engineer Materials Engineer Construction Foreman Safety and Health Officer	Five (5) years in General Engineering	Three (3) years in Concreting/ Asphaltting of Roads or other Horizontal Structures					
10.5	<p>The minimum major equipment requirements are the following:</p> <p>One (1) Unit Bulldozer, 165HP Two (2) Units Payloader, 1.50 cu.m. Six (6) Units Dump Truck, 12yd³ One (1) Unit Motorized Road Grader, 140HP G710A One (1) Unit Vibratory Single Smooth Drum Roller, 10MT One (1) Unit Water Truck, 4,000 gals One (1) Unit Concrete Batch Plant, 30 cu.m. One (1) Unit Concrete Screeder, 5.5HP Two (2) Units Transit Mixer, 5 cu.m. Two (2) Units Concrete Vibrator One (1) Unit Bar Cutter, Single Phase One (1) Unit Concrete Saw, self-propelled 14 in One (1) Unit Asphalt Distributor/Sprayer Pen, 5T One (1) Unit Power Broom & Blower, 30 km/hr One (1) Unit Stake Truck</p>						

	<p>One (1) Unit Generator Set, 51-100kW (with lighting assembly) One (1) Unit Asphalt Paver Finisher, 10ft. width One (1) Unit Vibratory Tandem Steel Roller, 10.10MT One (1) Unit Pneumatic Tire Roller, 20MT One (1) Unit Improvised Asphalt Batch Plant, 60-80tph</p> <p>Bids not complying with the above instruction shall be disqualified.</p>
11.1.	<p>The discounts stated in the Financial Bid Form shall be computer written with the same font style and size as of the whole text of the said Form.</p> <p>Discounts that are either handwritten, type written or computer written in other font style and size shall not be considered.</p> <p>The second bid envelope shall contain the financial documents for the Bid as specified in Section X. Checklist of Technical and Financial Documents.</p> <p>This shall include the complete accomplishment of all of the following documents as stated and required under Section VIII of this PBD and shall form part of the bidder's financial documents:</p> <ul style="list-style-type: none"> a) Original of duly signed and accomplished Financial Bid Form; and b) Bill of Quantities (BOQ) (<i>Annex "C" Form 1</i>); and c) Detailed Breakdown of Component of Each Item (<i>Annex "C" Form 2</i>); and d) Detailed Unit Price Analysis (DUPA) (<i>Annex "C" Form 3</i>); and e) Summary Sheet indicating the Unit Prices of Construction Materials, Labor Rates, and Equipment Rentals used in coming up with the Bid (<i>Annex "C" Form 4, 5 & 6</i>); and f) Cash Flow by Quarter and Payment Schedule (<i>Annex "C" Form 7</i>) <p>Modifications and/or alterations on the stated requirements in the financial document forms (BOQ, Detailed Breakdown of Component of Each Item & DUPA) shall not be allowed.</p> <p>Applicable CAAP BAC Standard Forms included in this PBD shall be complied in accordance with the prescribed forms under Section IX Bidding Forms – Annex "C".</p> <p>Bids not complying with the above instruction shall be disqualified.</p>
11.2	Bid exceeding the ABC of the project shall be disqualified.
12	No further instructions.
15.1	<p>The bid security shall be in the form of a Bid Securing Declaration or any of the following forms and amounts:</p> <ul style="list-style-type: none"> a. The amount of not less than two percent (2%) of ABC, if bid security is in cash, cashier's/manager's check, bank draft/guarantee or irrevocable letter of credit;

	b. The amount of not less than five percent (5%) of ABC if bid security is in Surety Bond.
16	<p>1. Each and every page thereof shall be initialed/signed by the duly authorized representative/s of the Bidder.</p> <p>Submitted Eligibility, Technical and Financial documents shall be properly marked with index tabs (ear tab) and must be sequentially paginated in accurate order in the form i.e. “page 3 of 100”. Page number of last page of the document (per envelope basis).</p> <p>Pagination should be sequential based on the entire span of the whole documents inside the envelope.</p> <p>Bids not complying with the above instructions shall be automatically disqualified.</p> <p>2. Each Bidder shall submit one (1) original and two (2) copies of the first and second components of its bid.</p>
19.2	Partial bid is not allowed. The infrastructure project is packaged in a single lot and the lot shall not be divided into sub-lots for the purpose of bidding, evaluation, and contract award.
20	<p>The Bidder with the Lowest Calculated Bid (LCB) that complies with and is responsive to all the requirements and conditions shall submit its</p> <ul style="list-style-type: none"> a) Latest income and business tax returns filed through the Electronic Filing and Payment System (EFPS); b) Business licenses and permits required by law (Registration Certificate, Mayor’s Permit, Tax Clearance & PCAB License); c) Latest Audited Financial Statements; and d) Key personnel licenses <p>Failure to submit any of the post-qualification requirements on time, or a finding against the veracity thereof, shall disqualify the bidder for award. Provided, that in the event that a finding against the veracity of any of the documents submitted is made, it shall cause the forfeiture of the Bid Security in accordance with Section 69 of the IRR of RA 9184.</p>
21	<p>The following relevant project documents are required to be submitted by the successful bidder who submitted the LCRB as part of the Contract Agreement during its signing:</p> <ul style="list-style-type: none"> a) Construction schedule b) Bar Chart & S-curve c) PERT/CPM Network Diagram d) Manpower schedule e) Construction methods f) Equipment utilization schedule <p>Construction safety & health programs approved by the Department of Labor & Employment (BASCO AIRPORT DEVELOPMENT PROJECT CY 2019 (WIDENING OF STOPWAY, EXPANSION OF APRON, RUNWAY AND</p>

	TAXIWAY ASPHALT OVERLAY INCLUDING STRIP WIDTH CORRECTION))
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Section IV. General Conditions of Contract

1. Scope of Contract

This Contract shall include all such items, although not specifically mentioned, that can be reasonably inferred as being required for its completion as if such items were expressly mentioned herein. All the provisions of RA No. 9184 and its 2016 revised IRR, including the Generic Procurement Manual, and associated issuances, constitute the primary source for the terms and conditions of the Contract, and thus, applicable in contract implementation. Herein clauses shall serve as the secondary source for the terms and conditions of the Contract.

This is without prejudice to Sections 74.1 and 74.2 of the 2016 revised IRR of RA No. 9184 allowing the GPPB to amend the IRR, which shall be applied to all procurement activities, the advertisement, posting, or invitation of which were issued after the effectivity of the said amendment.

2. Sectional Completion of Works

If sectional completion is specified in the **Special Conditions of Contract (SCC)**, references in the Conditions of Contract to the Works, the Completion Date, and the Intended Completion Date shall apply to any Section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works).

3. Possession of Site

3.1 The Procuring Entity shall give possession of all or parts of the Site to the Contractor based on the schedule of delivery indicated in the **SCC**, which corresponds to the execution of the Works. If the Contractor suffers delay or incurs cost from failure on the part of the Procuring Entity to give possession in accordance with the terms of this clause, the Procuring Entity's Representative shall give the Contractor a Contract Time Extension and certify such sum as fair to cover the cost incurred, which sum shall be paid by Procuring Entity.

3.2 If possession of a portion is not given by the above date, the Procuring Entity will be deemed to have delayed the start of the relevant activities. The resulting adjustments in contract time to address such delay may be addressed through contract extension provided under Annex "E" of the 2016 revised IRR of RA No. 9184.

4. The Contractor's Obligations

The Contractor shall employ the key personnel named in the Schedule of Key Personnel indicating their designation, in accordance with **ITB** Clause 10.3 and specified in the **BDS**, to carry out the supervision of the Works.

The Procuring Entity will approve any proposed replacement of key personnel only if their relevant qualifications and abilities are equal to or better than those of the personnel listed in the Schedule.

5. Performance Security

- 5.1. Within ten (10) calendar days from receipt of the Notice of Award from the Procuring Entity but in no case later than the signing of the contract by both parties, the successful Bidder shall furnish the performance security in any of the forms prescribed in Section 39 of the 2016 revised IRR.
- 5.2. The Contractor, by entering into the Contract with the Procuring Entity, acknowledges the right of the Procuring Entity to institute action pursuant to RA No. 3688 against any subcontractor be they an individual, firm, partnership, corporation, or association supplying the Contractor with labor, materials and/or equipment for the performance of this Contract.

6. Site Investigation Reports

The Contractor, in preparing the Bid, shall rely on any Site Investigation Reports referred to in the **SCC** supplemented by any information obtained by the Contractor.

7. Warranty

- 7.1. In case the Contractor fails to undertake the repair works under Section 62.2.2 of the 2016 revised IRR, the Procuring Entity shall forfeit its performance security, subject its property(ies) to attachment or garnishment proceedings, and perpetually disqualify it from participating in any public bidding. All payables of the GOP in his favor shall be offset to recover the costs.
- 7.2. The warranty against Structural Defects/Failures, except that occasioned-on force majeure, shall cover the period from the date of issuance of the Certificate of Final Acceptance by the Procuring Entity. Specific duration of the warranty is found in the **SCC**.

8. Liability of the Contractor

Subject to additional provisions, if any, set forth in the **SCC**, the Contractor's liability under this Contract shall be as provided by the laws of the Republic of the Philippines.

If the Contractor is a joint venture, all partners to the joint venture shall be jointly and severally liable to the Procuring Entity.

9. Termination for Other Causes

Contract termination shall be initiated in case it is determined *prima facie* by the Procuring Entity that the Contractor has engaged, before, or during the implementation of the contract, in unlawful deeds and behaviors relative to contract acquisition and implementation, such as, but not limited to corrupt, fraudulent, collusive, coercive, and obstructive practices as stated in **ITB** Clause 4.

10. Dayworks

Subject to the guidelines on Variation Order in Annex "E" of the 2016 revised IRR of RA No. 9184, and if applicable as indicated in the **SCC**, the Dayworks rates in the

Contractor's Bid shall be used for small additional amounts of work only when the Procuring Entity's Representative has given written instructions in advance for additional work to be paid for in that way.

11. Program of Work

11.1. The Contractor shall submit to the Procuring Entity's Representative for approval the said Program of Work showing the general methods, arrangements, order, and timing for all the activities in the Works. The submissions of the Program of Work are indicated in the **SCC**.

11.2. The Contractor shall submit to the Procuring Entity's Representative for approval an updated Program of Work at intervals no longer than the period stated in the **SCC**. If the Contractor does not submit an updated Program of Work within this period, the Procuring Entity's Representative may withhold the amount stated in the **SCC** from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program of Work has been submitted.

12. Instructions, Inspections and Audits

The Contractor shall permit the GOP or the Procuring Entity to inspect the Contractor's accounts and records relating to the performance of the Contractor and to have them audited by auditors of the GOP or the Procuring Entity, as may be required.

13. Advance Payment

The Procuring Entity shall, upon a written request of the Contractor which shall be submitted as a Contract document, make an advance payment to the Contractor in an amount not exceeding fifteen percent (15%) of the total contract price, to be made in lump sum, or at the most two installments according to a schedule specified in the **SCC**, subject to the requirements in Annex "E" of the 2016 revised IRR of RA No. 9184.

14. Progress Payments

The Contractor may submit a request for payment for Work accomplished. Such requests for payment shall be verified and certified by the Procuring Entity's Representative/Project Engineer. Except as otherwise stipulated in the **SCC**, materials and equipment delivered on the site but not completely put in place shall not be included for payment.

15. Operating and Maintenance Manuals

15.1. If required, the Contractor will provide "as built" Drawings and/or operating and maintenance manuals as specified in the **SCC**.

15.2. If the Contractor does not provide the Drawings and/or manuals by the dates stated above, or they do not receive the Procuring Entity's Representative's approval, the Procuring Entity's Representative may withhold the amount stated in the **SCC** from payments due to the Contractor.

Section V. Special Conditions of Contract

Special Conditions of Contract

GCC Clause	
2	Not applicable.
3.1	The CIVIL AVIATION AUTHORITY OF THE PHILIPPINES shall give possession of all parts of the Site to the Contractor upon receipt of the Notice to Proceed.
6	None.
7.2	In case of permanent structures, such as buildings of types 4 and 5 as classified under the National Building Code of the Philippines and other structures made of steel, iron, or concrete which comply with relevant structural codes (e.g., DPWH Standard Specifications), such as, but not limited to, steel/concrete bridges, flyovers, aircraft movement areas, ports, dams, tunnels, filtration and treatment plants, sewerage systems, power plants, transmission and communication towers, railway system, and other similar permanent structures: Fifteen (15) years.
10	No dayworks are applicable to the contract.
11.1	Not applicable
11.2	Not applicable
13	The amount of the advance payment shall not exceed 15% of the total contract price. However, as per Department of Transportation (DOTr) Policy, Procuring Entity will not give advance payment to contractors.
14	No further instructions.
15.1	<p>The date by which operating and maintenance manuals are required is upon completion of the project</p> <p>The date by which “as built” drawings are required is upon completion of the project.</p> <p>PDF/AutoCAD File of the “as built” plans shall include as attachment to the required hard copy of the same upon completion of the project.</p>
15.2	The amount to be withheld for failing to produce “as built” drawings and/or operating and maintenance manuals by the date required is two percent (2.00%) of the Contract price.

Section VI. Specifications and Scope of Work



Name of Project : **BASCO AIRPORT DEVELOPMENT PROJECT CY 2019
(WIDENING OF STOPWAY, EXPANSION OF APRON,
RUNWAY AND TAXIWAY ASPHALT OVERLAY
INCLUDING STRIP WIDTH CORRECTION)**

Location : Barangay Ihuvok II (Kayvalugananan), Basco, Batanes

Duration : Two Hundred Ten (210) Calendar Days
(inclusive of twenty (20) rainy/unworkable Days)

Source of Funds : GAA CY 2018 (B-4) DOTr Downloaded Projects

SCOPE OF WORK

The project covers the supply of labor, materials and equipment necessary for the ***BASCO AIRPORT DEVELOPMENT PROJECT CY 2019 - Widening of Stopway, Expansion of Apron, Runway and Taxiway Asphalt Overlay including strip width correction at Basco Airport.*** The details of work are best enumerated below, however, it is understood that the contract includes all works and services though not specifically mentioned herein, but are needed to fully complete the project shall be undertaken by the Contractor.

The following scopes of work shall be done in accordance with the approved plans, specifications and provisions of contract.

PART I FACILITIES FOR THE ENGINEER

The following provisions must be delivered within seven (7) days upon receipt of the Notice to Proceed (NTP).

ITEM A.1.1(10) Provision of Living Quarters for the Engineer (Rental Basis)

This Item covers the Contractor's provision of PMO Staff House on rental basis. The Facility shall be provided with air-con including the supply of kitchen utensils, gas and stove, beds and beddings, and dining sets for the exclusive use of CAAP-PMO in supervising the project. The Contractor shall be responsible for the payment of utility bills (water and electric) for the whole duration of the project.

ITEM A.1.2(3) Provision of 4x2 Pick Up Type Service for the Engineer

This cover the provision of one service vehicle, brand new MPV model service vehicle with air-conditioned, manual transmission, power window, diesel; for the exclusive use of CAAP Engineers supervising the project for the period of Two Hundred Ten (210) Calendar Days. Land Transportation Office (LTO) registration for the service vehicle will be provided by the Contractor. Moreover, driver, fuel and maintenance for the service vehicle will also be provided by the Contractor that are incorporated in the Contractor's overhead cost throughout the duration of the project, but will not be considered as pay item.

The service vehicle including the Certificate of Registration and Official Receipt will be transferred and registered in the name of Civil Aviation Authority of the Philippines (CAAP) and will be turned over to the ADMS in good running condition after the completion of the Project.

The ADMS will then transport the said service vehicle to the CAAP Central Office and will utilize the same as the Service's Official Vehicle.

PART II OTHER GENERAL REQUIREMENTS

The following provisions must be delivered within seven (7) days upon receipt of the Notice to Proceed (NTP).

ITEM B.5 Project Sign Board

This Item covers the Contractor's provision of project sign board placed within the vicinity of the airport. The details and dimension of the sign board must be in accordance with the COA requirements. The Contractor shall be responsible for the provision of materials, labor and equipment required in undertaking the proper construction.

ITEM B.9 Mobilization / Demobilization

This work includes mobilization and demobilization of the contractor's personnel and equipment necessary for performing the work required under the contract.

a. Mobilization shall include all activities and associated costs for transportation of contractor's personnel, equipment, and establishment of offices, and other necessary facilities for the contractor's operations at the site.

b. Demobilization shall include the disassembly of offices and other facilities on the site, as well as the removal and hauling of debris, excavated and rubbish materials.

PART III WIDENING OF STOPWAY INCLUDING STRIP WIDTH CORRECTION

ITEM P-152-4.1a Unclassified Excavation

This Item covers the excavation as shown on the approved plans and in accordance with specifications and in conformity with the lines, grades and dimensions. Place of disposal of excavated materials shall be directed by the CAAP Project-in-Charge. Whereas, any miscellaneous cost shall be the full responsibility of the Contractor. This item covers the following:

- Volume of Excavation 1 = 1,035.69 cu.m. (*excavation - stopway widening*)
(from Station 0+000.00 to Station -0+090.00)
- Volume of Excavation 2 = 355.43 cu.m. (*excavation - strip correction*)
(from Station 0+000.00 to Station -0+136.00)
- Total Volume of Excavation = 1,391.12
- Volume for Disposal = 104.33 cu.m.
- Volume to be used for embankment = 1,286.79 cu.m.

ITEM P-152-4.2a.1 Embankment in place (horizontal structures)

This Item covers embankment/backfilling as shown on the approved plans and in accordance with specifications and in conformity with the lines, grades and dimensions. The embankment shall be composed of common borrow (suitable materials). This item covers the following:

- Volume of Embankment = 2,217.59 cu.m. (*embankment for strip correction*)
(from Station 0+000.00 to Station -0+136.00)
- Total Required Volume of Embankment = 1,286.79 cu.m.
 Use suitable excavated materials from site
 plus 20% Compaction Factor = 257.35 cu.m.
- Total Loose Volume of Embankment in place = 1,544.14 cu.m.

ITEM P-152-4.2b Embankment from Borrow Excavation

This Item covers embankment/backfilling of strip width as shown on the approved plans and in accordance with specifications and in conformity with the lines, grades and dimensions. The embankment shall be composed of common borrow (suitable materials). This item covers the following:

- Volume of Embankment = 2,217.59 cu.m. (*embankment for strip correction*)
(from Station 0+000.00 to Station -0+136.00)
- Total Required Volume of Embankment = 673.45 cu.m.
 plus 20% Compaction Factor = 134.69 cu.m.
Total Loose Volume of Embankment from borrow excavation = 808.14 cu.m.

ITEM 105(1)a Subgrade Preparation

This Item covers the preparation of the subgrade prior to laying of structural layers. It shall extend to full width of the stopway. Unless authorized by the CAAP Project-in-Charge, subgrade preparation shall not be done unless the Contractor is able to start immediately the construction of the pavement structure.

- Area of subgrade preparation = 1,260.00 sq.m. (*for widening of stopway*)
(from Station 0+000.00 to Station -0+090.00)

ITEM P-208-5.1 Aggregate Subbase Course

This Item covers the furnishing, placing and compacting of aggregate subbase coarse on a prepared subgrade in accordance with specifications and shall conform to the lines, grade and cross section shown on the approved plans. The subbase coarse shall be composed of crushed/uncrushed coarse aggregate bonded with either soil or fine aggregates or both. The Contractor must ensure the subbase is compacted to 95% maximum density and secure material testing documents with the approval of Project-in-Charge.

- Required Aggregate subbase coarse volume = 216.00 cu.m.
with 15% Shrinkage Factor = 32.40 cu.m.

Total Loose Aggregate Subbase Coarse Volume = 248.40 cu.m.
(from Station 0+000.00 to Station -0+090.00)

ITEM P-154-5.1 Aggregate Base Course

This Item covers the furnishing, placing and compacting of aggregate base coarse on a prepared subbase in accordance with specifications and shall conform to the lines, grade and cross section shown on the approved plans. The base coarse shall consist of hard, durable particles or fragments of crushed stone, crushed slag or crushed or natural gravel and filler of natural or crushed sand or other finely divided mineral matter. The Contractor must ensure the base is compacted to 95% maximum density and secure material testing documents with the approval of Project-in-Charge.

- Required Aggregate base coarse volume = 486.00 cu.m.
with 15% Shrinkage Factor = 72.90 cu.m.

Total Loose Aggregate Base Coarse Volume = 558.90 cu.m.
(from Station 0+000.00 to Station -0+090.00)

ITEM P-501-8.1b Cement Concrete Pavement, 300mm thick

This item shall consist of pavement of 0.30 meters thick Portland Cement Concrete Pavement constructed on a prepared sub-base and also the provision of steel reinforcing dowel bars and formworks necessary for the complete widening of stopway in accordance with specifications and shall conform to the lines, grade, thickness and typical cross section shown on the approved plans. This item covers a total area of 1,260.00 sq. m.

- Volume of concrete = 378.00 cu.m.
Use Class AA Concrete Mixture (4,000psi)

PART IV

EXPANSION OF APRON

ITEM P-152-4.1a Unclassified Excavation

This Item covers the excavation as shown on the approved plans and in accordance with specifications and in conformity with the lines, grades and dimensions. Place of disposal of excavated materials shall be directed by the CAAP Project-in-Charge. Whereas, any miscellaneous cost shall be the full responsibility of the Contractor. This item covers the following:

- Volume of Excavation = 4,676.98 cu.m. (*excavation - apron expansion*)
(from Station 0+023.03 to Station 0+070.64)
- Volume for Disposal = 4,676.98 cu.m.

ITEM 105(1)a Subgrade Preparation

This Item covers the preparation of the subgrade prior to laying of structural layers. It shall extend to full width of the apron. Unless authorized by the CAAP Project-in-Charge, subgrade preparation shall not be done unless the Contractor is able to start immediately the construction of the pavement structure.

- Area of subgrade preparation = 2,427.60 sq.m. (*for apron expansion*)
(from Station 0+023.03 to Station 0+070.64)

ITEM P-208-5.1 Aggregate Subbase Course

This Item covers the furnishing, placing and compacting of aggregate subbase coarse on a prepared subgrade in accordance with specifications and shall conform to the lines, grade and cross section shown on the approved plans. The subbase coarse shall be composed of crushed/uncrushed coarse aggregate bonded with either soil or fine aggregates or both. The Contractor must ensure the subbase is compacted to 95% maximum density and secure material testing documents with the approval of Project-in-Charge.

- Required Aggregate subbase coarse volume = 371.36 cu.m.
with 15% Shrinkage Factor = 55.70 cu.m.
- Total Loose Aggregate Subbase Coarse Volume = 427.06 cu.m.
(from Station 0+023.03 to Station 0+070.64)

ITEM P-154-5.1 Aggregate Base Course

This Item covers the furnishing, placing and compacting of aggregate base coarse on a prepared subbase in accordance with specifications and shall conform to the lines, grade and cross section shown on the approved plans. The base coarse shall consist of hard, durable particles or fragments of crushed stone, crushed slag or crushed or natural gravel and filler of natural or crushed sand or other finely divided mineral matter. The Contractor must ensure the base is compacted to 95% maximum density and secure material testing documents with the approval of Project-in-Charge.

- Required Aggregate base coarse volume = 757.00 cu.m.
with 15% Shrinkage Factor = 113.55 cu.m.
- Total Loose Aggregate Base Coarse Volume = 870.55 cu.m.

(from Station 0+023.03 to Station 0+070.64)

ITEM P-501-8.1b Cement Concrete Pavement, 300mm thick

This item shall consist of pavement of 0.30 meters thick Portland Cement Concrete Pavement constructed on a prepared sub-base and also the provision of steel reinforcing dowel bars and formworks necessary for the complete widening of stopway in accordance with specifications and shall conform to the lines, grade, thickness and typical cross section shown on the approved plans. This item covers a total area of 2,427.60 sq. m.

- Volume of concrete = 728.44.00 cu.m.

Use Class AA Concrete Mixture (4,000psi)

ITEM P-606(1).a2 Pavement Marking (Flat Latex Paint – Yellow)

This item shall consist the supply of materials and labor for the painting of apron expansion, double coat (centerline and side markings) as shown on the approved plans. This item covers a total paint area of 95.04 sq. m.

PART V RUNWAY STRIP WIDTH CORRECTION

ITEM P-151-4.2 Clearing and Grubbing, 150mm thick

This item shall consist of clearing, grubbing, removing and disposing all vegetation and debris as designated on the approved plans, except those objects that are designated to remain in place or are to be removed in consonance with other provisions of this Specification. The work shall also include the preservation from injury or defacement of all objects designated to remain. This item covers a total area of 32,352.58 sq.m. from Station 0+000.00 to Station 1+244.33.

ITEM P-152-4.2b Embankment from Borrow Excavation

This Item covers embankment/backfilling of strip width as shown on the approved plans and in accordance with specifications and in conformity with the lines, grades and dimensions. The embankment shall be composed of common borrow (suitable materials). This item covers the following:

- Volume of Embankment = 1,033.18 cu.m. (*embankment for strip correction*)
from Station 0+000.00 to Station 1+244.33

plus 20% Compaction Factor = 206.64 cu.m.

Total Loose Volume of Embankment from borrow excavation = 1,239.82 cu.m.

PART V RUNWAY AND TAXIWAY ASPHALT OVERLAY

ITEM P-603-5.1 Emulsified Asphalt Tack Coat

This item shall consist of surface preparation and treating an existing bituminous surface including potholes with bituminous material in accordance with the Plans and Specifications, preparatory to the construction of a bituminous surface course. The Contractor shall cover the material testing prior to application and with the approval of the CAAP Project-in-Charge. This Item covers the following:

- Runway A width, 34m x 1,144.33m = 116,721.66 sq.m. (3 layers)
- Runway B width, 40.40m x 100m = 12,120.00 sq.m. (3 layers)
- Runway C width, 34m x 90m = 9,180.00 sq.m. (3 layers)
- Transition A, 34m x 4.50m = 3,442.50 sq.m. (45 layers)
- Transition B, 40.40m x 4.50m = 545.40 sq.m. (6 layers)
- Transition C, 34m x 4.50m = 229.50 sq.m. (3 layers)
- West Taxiway, 8.43m x 22.25m = 562.70 sq.m. (3 layers)
- East Taxiway, 7.88m x 22.62m = 534.74 sq.m. (3 layers)

Total length of Runway Asphalt Overlay = 1,334.33 linear meters

Total length of Taxiway Asphalt Overlay = 44.87 linear meters

Material Specifications:

- Asphalt Overlay (Bituminuos Tack Coat)

Runway: Station -0+090.00 to Station 1+244.33

West and East Taxiway total length = 44.87 ln.m.

- Specific Gravity = 1,010.00 kgs/cu.m. (0.00101 tons/liter)
- Area covered per meter = 0.60 liter/sq.m.
- Total Weight of Bituminous Tack Coat, SS-1 = 115.00 M.T.
- Total Volume of Excavation for CHB Fence = 511.80 cu.m.

ITEM P-403-8.1a Asphalt Mix Pavement Surface (Bituminous Hot Laid)

This item shall consist of constructing bituminous concrete surface coarse composed of aggregates, mineral filler, and bituminous material mixed in a central plant, constructed and laid hot on the prepared existing bituminous surface including pot holes in accordance with the specification and in conformity with lines, grades, thickness and typical cross-section shown on the Plans. The Contractor shall cover the material testing prior to application and with the approval of the CAAP Project-in-Charge. This Item covers the following:

- Total length of Runway Asphalt Overlay = 1,334.33 linear meters
- Total length of Taxiway Asphalt Overlay = 44.87 linear meters
- Asphalt Overlay = 4,118.96 cu.m.
- Asphalt Transition = 210.87 cu.m.
- Total Volume of Runway and Taxiway Asphalt Overlay= 4,329.83 cu.m.
- West Taxiway, 8.43m x 22.25m = 562.70 sq.m. (3 layers)
- East Taxiway, 7.88m x 22.62m = 534.74 sq.m. (3 layers)

Material Specifications:

Runway: Station -0+090.00 to Station 1+244.33

West and East Taxiway total length = 44.87 ln.m.

- Specific Gravity = 2.33 M.T./cu.m.

Total Weight of Hot-laid BCSC = 10,089.00 M.T.

ITEM P-101-5.1b Pavement Removal (Asphalt Temporary Transitions)

This item shall consist of removal of temporary transitions at every end of approximate asphalt overlay per day. This item also covers the hauling and disposal of the temporary transition. The temporary transitions must conform to the dimensions, lines, and grades shown in the approved plans and with the approval of the CAAP Project-in-Charge.

Material Specifications:

Runway: Station -0+090.00 to Station 1+244.33

West and East Taxiway total length = 44.87 ln.m.

Total area of Pavement Removal (Asphalt Temporary Transitions) = 4,217.40 sq.m.

ITEM P-606(1).a3 Pavement Marking (Flat Latex Paint – White)

This item shall consist the supply of materials and labor for the painting of runway and taxiway, double coat (centerline and side markings) as shown on the approved plans. This item covers a total paint area of 7,411.71 sq. m.

All Scopes of Work for the project must be in accordance with the approved Plans and Specifications. Quality and types of materials must be approved by the CAAP Project-in-Charge.

GENERAL PROVISIONS

Provisions for staff house, service vehicles, laptops, printers, cameras, plotters, furniture and other materials, devices and equipment under Special Item or Temporary Facilities shall not include OCM & CP.

The contractor shall be responsible in providing safety perimeter fence or security fences, personal protective equipment (PPE) for staffs and workers on site while construction is ongoing. Safety reports should be prepared regularly.

The contractor shall be responsible for all laboratory, material testing, building and safety permits and survey instruments necessary in the project implementation. These expenses shall be incorporated in the contractor's overhead cost and shall not be considered as pay item.

SPECIFICATIONS

Section 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.

**

The Owner may include additional posted notices as required by local and State law.

**

105-2 Basis of measurement and payment. Based upon the contract lump sum price for “Mobilization” partial payments will be allowed as follows:

- a. With first pay request, 25%.
- b. When 25% or more of the original contract is earned, an additional 25%.
- c. When 50% or more of the original contract is earned, an additional 40%.

d. After Final Inspection, Staging area clean-up and delivery of all Project Closeout materials as required by 90-11, the final 10%.

**

Item Mobilization may be added to project at Owner’s discretion. Rather than paying Contractor 100% of mobilization on first pay request, many Sponsors have found a payment schedule to be an effective way to reimburse Contractor for mobilization and demobilization. It is not required but it is recommended that the final 10% of this bid item not be paid until the Contractor has cleaned up the project staging area. The payment schedule can be altered, e.g., on small projects may not be appropriate to have more than two (2) payments.

**

END OF SECTION 105

Item P-101 Preparation/Removal of Existing Pavements

The Engineer may add or edit this item as necessary to address project requirements.

Coordinate modifications in accordance with Order 5300.1.

DESCRIPTION

101-1 This item shall consist of preparation of existing pavement surfaces for overlay, surface treatments, removal of existing pavement, and other miscellaneous items. The work shall be accomplished in accordance with these specifications and the applicable plans.

EQUIPMENT AND MATERIALS

101-2 All equipment and materials shall be specified here and in the following paragraphs or approved by the Resident Project Representative (RPR). The equipment shall not cause damage to the pavement to remain in place.

CONSTRUCTION

101-3.1 Removal of existing pavement.

The Contractor's removal operation shall be controlled to not damage adjacent pavement structure, and base material, cables, utility ducts, pipelines, or drainage structures which are to remain under the pavement.

a. Concrete pavement removal. Full depth saw cuts shall be made perpendicular to the slab surface. The Contractor shall saw through the full depth of the slab including any dowels at the joint, removing the pavement and installing new dowels as shown on the plans and per the specifications. Where the perimeter of the removal limits is not located on the joint and there are no dowels present, the perimeter shall be saw cut the full depth of the pavement. The pavement inside the saw cut shall be removed by methods 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 of [____]. Concrete slabs that are damaged by under breaking shall be repaired or removed and replaced as directed by the RPR.

The edge of existing concrete pavement against which new pavement abuts shall be protected from damage at all times. Spall and underbreak repair shall be in accordance with the plans. Any underlying material that is to remain in place, shall be recompact and/or replaced as shown on the plans. Adjacent areas damaged during repair shall be repaired or replaced at the Contractor's expense.

**

Indicate repair details for spalls, underbreaks, and remaining underlaying materials on the plans.

Select the maximum size for materials wasted on the airport site.

**

b. Asphalt pavement removal. Asphalt pavement to be removed shall be cut to the full depth of the asphalt pavement around the perimeter of the area to be removed. If the material is to be [wasted on the airport site] [incorporated into embankment], it shall be [broken to a maximum size of [] inches (mm) .] [meet the following gradation: []].

**

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.

The Engineer shall designate the maximum size or insert the gradation required.

**

c. Repair or removal of Base, Subbase, and/or Subgrade. All failed material including surface, base course, subbase course, and subgrade shall be removed and repaired as shown on the plans or as directed by the RPR. Materials and methods of construction shall comply with the applicable sections of these specifications. Any damage caused by Contractor's removal process shall be repaired at the Contractor's expense.

101-3.2 Preparation of joints and cracks prior to overlay/surface treatment. 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 RPR. Fill all cracks greater than 1/4 inch (6 mm) wide) with a crack sealant [per ASTM D6690]. The crack sealant, preparation, and application shall be compatible with the surface treatment/overlay to be used. To minimize contamination of the asphalt with the crack sealant, underfill the crack sealant a minimum of 1/8 inch (3 mm), not to exceed 1/4 inch (6 mm). Any excess joint or crack sealer shall be removed from the pavement surface.

[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.

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 (4.75 mm)	100
No. 8 (2.36 mm)	90-100
No. 16 (1.18 mm)	65-90
No. 30 (600 µm)	40-60
No. 50 (300 µm)	25-42
No. 100 (150 µm)	15-30
No. 200 (75 µm)	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 RPR.

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 to within +0 to -1/8 inches (+0 to -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.]

**

Then Engineer may also include the option for the emulsified asphalt and aggregate and allow the Contractor to use either option.

Guidance on crack repair materials and procedures is available in advisory circular (AC) 150/5380-6, Guidelines and Procedures for Maintenance of Airport Pavements.

**

101-3.3 Removal of Foreign Substances/contaminates prior to [overlay] [seal-coat] [remarking]. Removal of foreign substances/contaminates from existing pavement that will affect the bond of the new treatment shall consist of removal of rubber, fuel spills, oil, crack sealer, at least 90% of paint, and other foreign substances from the surface of the pavement. Areas that require removal are designated on the plans and as directed by the RPR in the field during construction.

[Chemicals] [high-pressure water] [heater scarifier (asphaltic concrete only)] [cold milling] [rotary grinding] [sandblasting] may be used. If chemicals are used, they shall comply with the state's environmental protection regulations. Removal methods used shall not cause major damage to the pavement, or to any structure or utility within or adjacent to the work area. Major damage is defined as changing the properties of the pavement, removal of asphalt causing the aggregate to ravel, or removing

pavement over 1/8 inch (3 mm) deep. If it is deemed by the RPR that damage to the existing pavement is caused by operational error, such as permitting the application method to dwell in one location for too long, the Contractor shall repair the damaged area without compensation and as directed by the RPR.

Removal of foreign substances shall not proceed until approved by the RPR. Water used for high-pressure water equipment shall be provided by the Contractor at the Contractor's expense. No material shall be deposited on the pavement shoulders. All wastes shall be disposed of in areas indicated in this specification or shown on the plans.

Designate the areas and methods for removal of foreign substances/contaminates on the project plans.

Select the method of paint and rubber removal and designate where the wastes will be disposed.

This specification shall not be used for removal of rubber deposits to improve skid resistance or obliterate traffic markings where a new overlay is not constructed.

Refer to AC 150/5320-12, Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces, for guidance on removing contaminants.

**

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

a. Repair of concrete spalls in areas to be overlaid with asphalt. The Contractor shall repair all spalled concrete as shown on the plans or as directed by the RPR. 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 asphalt mixture with aggregate sized appropriately for the depth of the patch. The material shall be compacted with equipment approved by the RPR 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.

**

Asphalt mix pavement repair of concrete pavement should only be allowed to depths less than 1/3 of the PCC pavement thickness.

**

b. Asphalt pavement repair. The Contractor shall repair all spalled concrete as shown on the plans or as directed by the RPR. 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. Materials and methods of construction shall comply with the applicable sections of these specifications.

**

Designate the areas and methods for asphalt pavement repair on the project plans.

**

101-3.5 Cold milling. Milling shall be performed with a power-operated milling machine or grinder, capable of producing a uniform finished surface. The milling machine or grinder shall operate without tearing or gouging the underlaying surface. The milling machine or grinder shall be equipped with grade and slope controls, and a positive means of dust control. All millings shall be removed and disposed [off Airport property] [in areas designated on the plans]. If the Contractor mills or grinds deeper or wider than the plans specify, the Contractor shall replace the material removed with new material at the Contractor's Expense.

**

The Engineer must consider the overall weight of milling equipment proposed by the Contractor to ensure there is no damage to the existing pavements and pavement remaining after milling due to the weight of the equipment.

Sufficient information must be obtained to determine available pavement structure and prior construction lift thickness. The limits of milling must consider leaving or taking sufficient material to minimize the potential for delamination or the entire layer may require removal or consider full depth reclamation in lieu of cold milling. Delamination potential exist anytime cold milling depth is approximately equal to the layer placed.

**

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 RPR 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 be repaired by the Contractor at the Contractor's Expense.

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 specified. The tolerances shall be maintained within +0 inch and -1/4 inch (+0 mm and -6mm) of the specified grade. The machine must cut vertical edges and have a positive method of dust control. The machine must have the ability to [windrow the millings or cuttings] [remove the millings or cuttings from the pavement and load them into a truck]. All millings shall be removed and disposed of [off the airport] [in areas designated on the plans].

c. Clean-up. The Contractor shall sweep the milled surface daily and immediately after the milling until all residual materials 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 loose residual material. Waste materials shall be collected and removed from the pavement surface and adjacent areas by sweeping or vacuuming. Waste materials shall be removed and disposed [off Airport property] [in areas designated on the plans].

101-3.6. Preparation of asphalt pavement surfaces prior to surface treatment. Existing asphalt pavements 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 pavement similar to that of the existing pavement in accordance with paragraph 101-3.4b.

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 scrubbing with a detergent and washing thoroughly with clean water. After cleaning, treat these areas with an oil spot primer. []

**

Provide primer requirements if required.

**

d. Clean pavement surface immediately prior to placing the surface treatment 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 RPR. 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 prior to resealing. Prior to application of sealant material, clean and dry the joints of all scale, dirt, dust, old sealant, curing compound, moisture and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method used cleans the joint and does not damage the joint.

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.

101-3.8.2 Cleaning prior to sealing. Immediately before sealing, joints shall be cleaned by removing any remaining laitance and other foreign material. Allow sufficient time to dry out joints prior to sealing. Joint surfaces will be surface-dry prior to installation of sealant.

101-3.8.3 Joint sealant. Joint material and installation will be in accordance with [Item P-605][Item P-604].

101-3.9 Preparation of Cracks in Flexible Pavement prior to sealing. Prior to application of sealant material, clean and dry the joints of all scale, dirt, dust, old sealant, curing compound, moisture and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method used cleans the cracks and does not damage the 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, cracks will be blown out with a hot air lance combined with oil and water-free compressed air.

101-3.9.2 Removal of Existing Crack 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.

101-3.9.3 Crack Sealant. Crack sealant material and installation will be in accordance with [Item P-605].

101-3.9.4 Removal of Pipe and other Buried Structures.

a. Removal of Existing Pipe Material. [Remove the types of pipe as indicated on the plans. The pipe material shall be legally disposed of off-site in a timely manner following removal. Trenches shall be backfilled with material equal to or better in quality than adjacent embankment. Trenches under paved areas must be compacted to [95%] of ASTM [D1557] [D698]. [Not used.]]

b. Removal of Inlets/Manholes. [Where indicated on the plans or as directed by the RPR, inlets and/or manholes shall be removed and legally disposed of off-site in a timely fashion after removal. Excavations after removal shall be backfilled with material equal or better in quality than adjacent embankment. When under paved areas must be compacted to [95%] of ASTM [D1557] [D698], when outside of paved areas must be compacted to [95%] of ASTM D698. [Not used.]]

c. Removal of [____].

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. No direct measurement or payment shall be made for saw cutting. Saw cutting shall be incidental to pavement removal. Dowel bar installation shall be incidental to pavement removal.

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 Removal of Foreign Substances/contaminates. The unit of measurement for foreign Substances/contaminates removal shall be the square foot (meter).

101-4.4 Spalled and failed asphalt pavement repair. The unit of measure for failed asphalt pavement repair shall be square foot (square meter).

101-4.5 Concrete Spall Repair. 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 RPR and the Contractor.

101-4.6 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 as shown on the plans. If the initial cut does not correct the condition, the Contractor shall re-mill the area and will be paid for the total depth of milling.]

101-4.7 Removal of Pipe and other Buried Structures. [Not require.][The unit of measurement for removal of pipe and other buried structures will be [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.][made at the contract unit price for each completed and accepted item. This price shall be full compensation for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with paragraph 101-3.9.4.]]

**

The Engineer shall select the applicable items above for each project and delete the others. Items such as cold milling may be specified multiple times.

**

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 Removal - [Lump sum] [per square yard (square meter)]
Item P 101-5.2 Joint and Crack Repair - per linear foot (meter)
Item P 101-5.3 Removal of Foreign Substances/contaminates - per square foot (square meter)
Item P-101-5.4 Spalled and Failed Asphalt Pavement Repair - per square foot (square meter)
Item P-101-5.5 Concrete Spall Repair - per square foot (square meter)
Item P-101-5.6 Cold Milling-per square yard (square meter)]
Item P-101-5.7 Removal of Pipe and other Buried Structures -[Lump sum] [per each] [Not required.]

**

The Engineer shall coordinate paragraphs 101-4.1 and 101-5.1 for each project.

For a lump sum contract, replace paragraph 101-5.1 Payment with the following:

101-5.1 Payment. The work covered by this section shall be considered as a subsidiary obligation of the Contractor covered under the other contract items. No separate payment will be made. This 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.

**

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5380-6	Guidelines and Procedures for Maintenance of Airport Pavements.
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ASTM International (ASTM)

ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
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END OF ITEM P-101

Item P-151 Clearing and Grubbing

DESCRIPTION

151-1.1 This item shall consist of clearing or clearing and grubbing, including the disposal of materials, for all areas within the limits designated on the plans or as required by the Resident Project Representative (RPR).

a. Clearing shall consist of the cutting and removal of all trees, stumps, brush, logs, hedges, the removal of fences and other loose or projecting material from the designated areas. The grubbing of stumps and roots will not be required.

b. Clearing and grubbing shall consist of clearing the surface of the ground of the designated areas of all trees, stumps, down timber, logs, snags, brush, undergrowth, hedges, heavy growth of grass or weeds, fences, structures, debris, and rubbish of any nature, natural obstructions or such material which in the opinion of the RPR is unsuitable for the foundation of strips, pavements, or other required structures, including the grubbing of stumps, roots, matted roots, foundations, and the disposal from the project of all spoil materials resulting from clearing and grubbing.

c. Tree Removal. Tree Removal shall consist of the cutting and removal of isolated single trees or isolated groups of trees, and the grubbing of stumps and roots. The removal of all the trees of this classification shall be in accordance with the requirements for the particular area being cleared.

CONSTRUCTION METHODS

151-2.1 General. The areas denoted on the plans to be [cleared] [cleared and grubbed] shall be staked on the ground by the [RPR] [Contractor as indicated on the plans].

The removal of existing structures and utilities required to permit orderly progress of work shall be accomplished by local agencies, unless otherwise shown on the plans. Whenever a telephone pole, pipeline, conduit, sewer, roadway, or other utility is encountered and must be removed or relocated, the Contractor shall advise the RPR who will notify the proper local authority or owner to secure prompt action.

151-2.1.1 Disposal. All materials removed by clearing or by clearing and grubbing shall be disposed of [in the designated waste disposal area] [outside the Airport's limits at the Contractor's responsibility] [by burning], except when otherwise directed by the RPR. [When burning of material is permitted, it shall be burned under the constant overseeing of a watchman to assure the surrounding vegetation and other adjacent property is not jeopardized. Burning shall be done in accordance with all applicable federal, state and local laws, ordinances, and regulations. The Contractor shall notify the agency having jurisdiction and obtain all approvals in writing before starting any burning operations.] As far as practicable, waste concrete and masonry shall be placed on slopes of embankments or channels. When embankments are constructed of such material, this material shall be placed in accordance with requirements for formation of embankments. Any broken concrete or masonry that cannot be used in construction and all other materials not considered suitable for use elsewhere, shall be disposed of by the Contractor. In no case, shall any discarded materials be left in windrows or piles adjacent to or within the airport limits. The manner and location of disposal of materials shall be subject to the approval of the RPR and shall not create an unsightly or objectionable

view. When the Contractor is required to locate a disposal area outside the airport property limits, the Contractor shall obtain and file with the RPR permission in writing from the property owner for the use of private property for this purpose.

151-2.1.2 Blasting. [Blasting shall not be allowed.] [Blasting and explosive storage shall be in accordance with Section 70, paragraph 70-09 and all federal, state, and local safety regulations. Submit notice 15 days prior to starting work. Submit a Blasting Plan, prepared and sealed by a registered professional Engineer, that includes calculations for overpressure and debris hazard. Obtain written approval prior to performing any blasting and notify the RPR 24 hours prior to blasting. Include provisions for storing, handling and transporting explosives as well as for the blasting operations in the plan. The Contractor is responsible for damage caused by blasting operations.]

151-2.2 Clearing. The Contractor shall clear the staked or indicated area of all materials as indicated on the plans. Trees unavoidably falling outside the specified clearing limits must be cut up, removed, and disposed of in a satisfactory manner. To minimize damage to trees that are to be left standing, trees shall be felled toward the center of the area being cleared. The Contractor shall preserve and protect from injury all trees not to be removed. The trees, stumps, and brush shall be cut flush with the original ground surface. The grubbing of stumps and roots will not be required.

Fences shall be removed and disposed of as directed by the RPR. Fence wire shall be neatly rolled and the wire and posts stored on the airport if they are to be used again, or stored at a location designated by the RPR if the fence is to remain the property of a local owner or authority.

151-2.3 Clearing and grubbing. In areas designated to be cleared and grubbed, all stumps, roots, buried logs, brush, grass, and other unsatisfactory materials as indicated on the plans, shall be removed, except where embankments exceeding 3-1/2 feet (105 cm) in depth will be constructed outside of paved areas. For embankments constructed outside of paved areas, all unsatisfactory materials shall be removed, but sound trees, stumps, and brush can be cut off flush with the original ground and allowed to remain. Tap roots and other projections over 1-1/2 inches (38 mm) in diameter shall be grubbed out to a depth of at least 18 inches (0.5 m) below the finished subgrade or slope elevation.

Any buildings and miscellaneous structures that are shown on the plans to be removed shall be demolished or removed, and all materials shall be disposed of by removal from the site. The cost of removal is incidental to this item. The remaining or existing foundations, wells, cesspools, and like structures shall be destroyed by breaking down the materials of which the foundations, wells, cesspools, etc., are built to a depth at least 2 feet (60 cm) below the existing surrounding ground. Any broken concrete, blocks, or other objectionable material that cannot be used in backfill shall be removed and disposed of at the Contractor's expense. The holes or openings shall be backfilled with acceptable material and properly compacted.

All holes in embankment areas remaining after the grubbing operation shall have the sides of the holes flattened to facilitate filling with acceptable material and compacting as required in Item P-152. The same procedure shall be applied to all holes remaining after grubbing in areas where the depth of holes exceeds the depth of the proposed excavation.

Indicate extent of grading required after clearing, or clearing and grubbing, on the plans including any required surface tolerances.

METHOD OF MEASUREMENT

151-3.1 The quantities of clearing as shown by the limits on the plans shall be [the number of acres (square meters) or fractions thereof,] [per lump sum] of land specifically cleared.

151-3.2 The quantities of clearing and grubbing as shown by the limits on the plans shall be [the number of acres (square meters) or fractions thereof] [per lump sum] of land specifically cleared and grubbed.

151-3.3 The quantity of tree removal as shown on the plans shall be the [number of individual trees] [number of acres (square meters) or fractions thereof] [per lump sum] of land specifically cleared.

BASIS OF PAYMENT

151-4.1 Payment shall be made at the contract unit price [per acre (square meter) or fractions thereof] [per lump sum] for clearing. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

151-4.2 Payment shall be made at the contract unit price [per acre (square meter)] [per lump sum] for clearing and grubbing. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

151-4.3 Payment shall be made at the contract unit price [per number of individual trees] [per acre (square meter)] [per lump sum] for tree removal. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

- | | |
|----------------|--|
| Item P-151-4.1 | Clearing – [per acre (square meter) or fractions thereof]
[per lump sum] |
| Item P-151-4.2 | Clearing and grubbing - [per acre (square meter) or fractions
thereof] [per lump sum] |
| Item P-152-4.3 | Tree Removal – [per number of individual trees] [per acre
(square meter) or fractions thereof] [per lump sum] |

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.”]

[**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.]

[**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.]

[**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 Resident Project Representative (RPR) within the limits of the airport property but outside the normal limits of necessary grading, or from areas outside the airport boundaries.]

[**Other.**]]

All material excavated shall be considered “unclassified” unless the Engineer specifies other classifications in the project specifications.

Add or delete the classifications not applicable for the project.

152-1.3 Unsuitable excavation. Unsuitable material shall be disposed in designated waste areas as shown on the plans. Materials 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 RPR.

CONSTRUCTION METHODS

152-2.1 General. Before beginning excavation, grading, and embankment operations in any area, the area shall be cleared or 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 RPR. All unsuitable material shall be disposed of in waste areas as shown on the plans. All waste areas shall be graded to allow positive drainage of the area and adjacent areas. The surface elevation of waste areas shall be specified on the plans or approved by the RPR.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the RPR notified per Section 70, paragraph 70-20. At the direction of the RPR, 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.

Areas outside the limits of the pavement areas where the top layer of soil 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. 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.

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 RPR, who shall arrange for their removal if necessary. The Contractor, at their own 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.

a. Blasting. [Blasting shall not be allowed.] [Blasting will be permitted as directed by the RPR and in accordance with the following:

Blasting will be permitted only when proper precautions are taken for the safety of all persons, work, and 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 RPR. Any approval will not relieve the Contractor of their responsibility in blasting operations.

Where blasting is approved, the Contractor shall employ a vibration consultant, approved by the RPR, 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 RPR 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 RPR.

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.

Blasting and explosive storage shall be in accordance with Section 70, paragraph 70-09 and all federal, state, and local safety regulations.

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

152-2.2 Excavation. No excavation shall be started until the work has been staked out by the Contractor and the RPR has obtained from the Contractor, the survey notes of the elevations and measurements of the ground surface. The Contractor and RPR shall agree that the original ground lines shown on the original topographic mapping are accurate, or agree to any adjustments made to the original ground lines.

[Digital terrain model (DTM) files of the existing surfaces, finished surfaces and other various surfaces were used to develop the design plans.

[Volumetric quantities were calculated by comparing DTM files of the applicable design surfaces and generating Triangle Volume Reports. Electronic copies of DTM files and a paper copy of the original topographic map will be issued to the successful bidder.]

[Volumetric quantities were calculated using design cross sections which were created for this project using the DTM files of the applicable design surfaces and generating End Area Volume Reports. Paper copies of design cross sections and a paper copy of the original topographic map will be issued to the successful bidder.]

Existing grades on the design cross sections or DTM's, where they do not match the locations of actual spot elevations shown on the topographic map, were developed by computer interpolation from those spot elevations. Prior to disturbing original grade, Contractor shall verify the accuracy of the existing ground surface by verifying spot elevations at the same locations where original field survey data was obtained as indicated on the topographic map. Contractor shall recognize that, due to the interpolation process, the actual ground surface at any particular location may differ somewhat from the interpolated surface shown on the design cross sections or obtained from the DTM's. Contractor's verification of original ground surface, however, shall be limited to verification of spot elevations as indicated herein, and no adjustments will be made to the original ground surface unless the Contractor demonstrates that spot elevations shown are incorrect. For this purpose, spot elevations which are within [0.1 foot (30 mm)] of the stated elevations for ground surfaces, or within [0.04 foot (12 mm)] for hard surfaces (pavements, buildings, foundations, structures, etc.) shall be considered "no change". Only deviations in excess of these will be considered for adjustment of the original ground surface. If Contractor's verification identifies discrepancies in the topographic map, Contractor shall notify the RPR in writing at least [two weeks] before disturbance of existing grade to allow sufficient time to verify the submitted information and make adjustments to the design cross sections or DTM's. Disturbance of existing grade in any area shall constitute acceptance by the Contractor of the accuracy of the original elevations shown on the topographic map for that area.]

Delete bracketed DTM paragraphs if DTM not used.

***** 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 RPR. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes as shown on the plans. All unsuitable material shall be disposed of as shown on the plans.

The grade shall be maintained so that the surface is well drained at all times.

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

During the design phase, perform subsurface investigations to identify existing subsurface conditions to minimize the potential for unforeseen conditions arising during excavation such as the need for dewatering or removal of unsuitable materials.

a. Selective grading. When selective grading is indicated on the plans, the more suitable material designated by the RPR 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 until it can be placed. The more suitable material shall then be placed and compacted as specified. Selective grading shall be considered incidental to the work involved. The cost of stockpiling and placing the material shall be included in the various pay items of work involved.

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 RPR. 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 [____]. 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. Undercutting will be paid as [unclassified excavation] [rock excavation].

The Engineer shall specify the appropriate class of excavation. If rock or muck excavation is not included under paragraph 152-1.2, unclassified excavation should be specified.

The plans shall show details for draining pockets created in rock cuts.

c. Over-break. Over-break, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the RPR. All over-break shall be graded or removed by the Contractor and disposed of as directed by the RPR. The RPR shall determine if the displacement of such material was unavoidable and their own decision shall be final. Payment will not be made for the removal and disposal of over-break that the RPR determines as avoidable. Unavoidable over-break 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] [by the Contractor as indicated 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 RPR. All foundations thus excavated shall be backfilled with suitable material and compacted as specified for embankment or as shown on the plans.

152-2.3 Borrow excavation. [Borrow areas are not required.] [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 RPR. All unsuitable material shall be disposed of by the Contractor as shown on the plans. All borrow pits shall be opened to expose the various strata of acceptable material to allow obtaining a uniform product. Borrow areas shall be drained and left in a neat, presentable condition with all slopes dressed uniformly. Borrow areas shall not create a hazardous wildlife attractant. []]

[There are no borrow sources within the boundaries of the airport property. The Contractor shall locate and obtain borrow sources, subject to the approval of the RPR. The Contractor shall notify the RPR at least [15] days prior to beginning the excavation so necessary measurements and tests can be made by the RPR. All borrow pits shall be opened to expose the various strata of acceptable material to allow obtaining a uniform product. Borrow areas shall be drained and left in a neat, presentable condition with all slopes dressed uniformly. Borrow areas shall not create a hazardous wildlife attractant. []]

For on-site borrow areas, the Engineer must determine the acceptability of the borrow material before identifying the area on the plans.

For off-site borrow areas obtained by the Contractor, the RPR must determine the acceptability of the borrow material before its use on the project.

Address hazardous wildlife attractants when opening borrow sites on or near an airport. Add references and sources addressing standing water, permitting, approvals, and zoning. Reference AC 150/5200-33, Hazardous Wildlife Attractants on or near Airports.

152-2.4 Drainage excavation. Drainage excavation shall consist of excavating drainage ditches including intercepting, inlet, or outlet ditches; or other types as shown on the plans. The

work shall be performed in sequence with the other construction. 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 RPR. 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 cut areas or areas where existing pavement has been removed. In those areas on which a subbase or base course is to be placed, the top [12 inches (300 mm)] of subgrade shall be compacted to not less than [100 %] of maximum density for non-cohesive soils, and [95%] of maximum density for cohesive soils as determined by ASTM [____]. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

For subgrade under flexible and rigid pavements, the Engineer shall specify the required compaction depth and density as determined from the geotechnical report and the FAARFIELD Airport Pavement Design compaction recommendations. The current version of FAARFIELD is available at: www.faa.gov/airports/engineering/design_software/

Specify ASTM D698 for areas designated for aircraft with gross weights of 60,000 pounds (27200 kg) or less and ASTM D1557 for areas designated for aircraft with gross weights greater than 60,000 pounds (27200 kg).

For soils with expansive characteristics, the maximum density should be determined in accordance with ASTM D698 regardless of aircraft weight.

152-2.6 Preparation of embankment area. 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 per paragraph 152-2.10.

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.

The Engineer shall include benching details on the plans based on the type of material, degree of consolidation of the material, and the degree of homogeneity of the material. The minimum width of the bench shall be sufficient to accommodate construction equipment.

The Engineer should consider the consolidation of embankments over 4 feet (1.2 m) and consider installation of monitoring equipment such as settlement plates and inclinometers for deep fills.

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.

152-2.7 Control Strip. The first half-day of construction of subgrade and/or embankment shall be considered as a control strip for the Contractor to demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of this specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches (300 mm) upon the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The RPR must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted, or removed and replaced at the Contractor's expense. Full operations shall not begin until the control strip has been accepted by the RPR. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved in advance by the RPR.

152-2.8 Formation of embankments. The material shall be constructed in lifts as established in the control strip, but not less than 6 inches (150 mm) nor more than 12 inches (300 mm) of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications.

The lifts shall be placed, to produce a soil structure as shown on the typical cross-section or as directed by the RPR. 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 due to 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 lift shall be within $\pm 2\%$ of optimum moisture content before rolling to obtain the prescribed compaction. The material shall be moistened or aerated as necessary to achieve a uniform moisture content throughout the lift. Natural drying may be accelerated by blending in dry material or manipulation alone to increase the rate of evaporation.

The Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

The [RPR][contractor] will take samples of excavated materials which will be used in embankment for testing and develop a Moisture-Density Relations of Soils Report (Proctor) in accordance with [ASTM D698] [D 1557]. A new Proctor shall be developed for each soil type based on visual classification.

Density tests will be taken by the [RPR][contractor] for every [3,000] square yards of compacted embankment for each lift which is required to be compacted, or other appropriate frequencies as determined by the RPR.

If the material has greater than 30% retained on the 3/4-inch (19.0 mm) sieve, follow AASHTO T-180 Annex Correction of maximum dry density and optimum moisture for oversized particles.

It is recommended that density tests be made for each 3,000 square yards (2500 square meters) of material placed per lift. Testing frequency should be determined by the Geotechnical Engineer. The Engineer may specify other frequencies as appropriate to the job size. If necessary to apply special controls to the moisture content of the soil during or after compaction to ensure strength because of the presence of expansive soils or other unusually sensitive soils), the Engineer must specify the appropriate moisture content. The moisture limitations shall be specified using acceptable moisture ranges as determined by ASTM D698 or ASTM D1557. Refer to FAA RD-76-66, Design and Construction of Airport Pavements on Expansive Soils, for additional guidance.

If the material has greater than 30% retained on the 3/4-inch (19.0 mm) sieve, follow the methods in the ASTM D698 or D1557; or AASHTO T180 Annex for correction of maximum dry density and optimum moisture for oversized particles.

If nuclear density machines are to be used for density determination, the machines shall be calibrated in accordance with ASTM D6938.

Include testing frequencies per square yard for density and moisture acceptance tests.

Rolling operations shall be continued until the embankment is compacted to not less than [100%] of maximum density for non-cohesive soils, and [95%] of maximum density for cohesive soils as determined by ASTM [____]. Under all areas to be paved, the embankments shall be compacted to a depth of [____] and to a density of not less than [____] percent of the maximum density as determined by ASTM [____]. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

For subgrade under flexible and rigid pavements, the Engineer shall specify the required compaction depth and density as determined from the geotechnical report and the FAARFIELD Airport Pavement Design compaction recommendations. The current version of FAARFIELD is available at: www.faa.gov/airports/engineering/design_software/

Specify ASTM D698 for areas designated for aircraft with gross weights of 60,000 pounds (27200 kg) or less and ASTM D1557 for areas designated for aircraft with gross weights greater than 60,000 pounds (27200 kg).

For soils with expansive characteristics, the maximum density should be determined in accordance with ASTM D698 regardless of aircraft weight.

On all areas outside of the pavement areas, no compaction will be required on the top [4 inches (100 mm)] which shall be prepared for a seedbed in accordance with [Item T-901] [T-906].

The in-place field density shall be determined in accordance with [ASTM D1556] [ASTM 6938 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.]. The [RPR shall perform all density tests] [Contractor's laboratory shall perform all density tests in the RPR's presence and provide the test results upon completion to the RPR for acceptance]. If the specified density is not attained, the area represented by the test or as designated by the RPR shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

Compaction areas shall be kept separate, and no lift shall be covered by another lift 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 lift is placed. Lift placement shall begin in the deepest portion of the embankment fill. As placement progresses, the lifts shall be constructed approximately parallel to the finished pavement grade line.

When rock, concrete pavement, asphalt pavement, and other embankment material are excavated at approximately the same time as the subgrade, the material shall be incorporated into the outer portion of the embankment and the subgrade material shall be incorporated under the future paved areas. Stones, fragmentary rock, and recycled pavement larger than 4 inches (100 mm) in their greatest dimensions will not be allowed in the top 12 inches (300 mm) of the subgrade. Rockfill shall be brought up in lifts as specified or as directed by the RPR and the finer material shall be used to fill the voids forming a dense, compact mass. Rock, cement concrete pavement, asphalt pavement, and other embankment material shall not be disposed of except at places and in the manner designated on the plans or by the RPR.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in lifts of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in lifts not exceeding 2 feet (60 cm) in thickness. Each lift shall be leveled and smoothed with suitable equipment by distribution of spalls and finer fragments of rock. The lift 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 lifts, 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.]

152-2.9 Proof rolling. [Not Used] The purpose of proof rolling the subgrade is to identify any weak areas in the subgrade and not for compaction of the subgrade. [Before start of embankment,] [and] [After compaction is completed,] the subgrade area shall be proof rolled with a [[20 ton (18.1 metric ton)] Tandem axle Dual Wheel Dump Truck loaded to the legal limit with tires inflated to [80/100/150 psi (0.551 MPa/0.689 MPa/1.034 MPa)]] [[] ton Proof Roller with tires spaced not more than 32 inches (0.8 m) on-center with tires inflated to [100/125/150 psi (0.689 MPa/0.861 MPa/1.034 MPa)]] in the presence of the RPR. Apply a minimum of [] coverage, or as specified by the RPR, under pavement 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. Removal and replacement of soft areas is incidental to this item.

The Engineer shall select the proof-rolling method and number of coverages.

Drawings should be checked to ensure that any supplementary information required by this paragraph has been shown and that there is no conflict between the drawings and the specifications.

When proof rolling not used, delete all text from Paragraph 152-2.9 and insert Not Used.

152-2.10 Compaction requirements. The subgrade under areas to be paved shall be compacted to a depth of [12 inches (300 mm)] and to a density of not less than [100] percent of the maximum dry density as determined by ASTM [D1557] [D698]. The subgrade in areas outside the limits of the pavement areas shall be compacted to a depth of [12 inches (300 mm)] and to a density of not less than [95] percent of the maximum density as determined by ASTM [D698].

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). When the material has greater than 30 percent retained on the $\frac{3}{4}$ inch (19.0 mm) sieve, follow the [methods in [ASTM D698] [ASTM D1557]] [procedures in AASHTO T180 Annex for correction of maximum dry density and optimum moisture for oversized particles.] Tests for moisture content and compaction will be taken at a minimum of [] S.Y. of subgrade. All quality assurance testing shall be done by [the RPR.] [the Contractor's laboratory in the presence of the RPR, and density test results shall be furnished upon completion to the RPR for acceptance determination.]

The Engineer shall specify the required compaction depths and densities as determined from FAARFIELD Airport Pavement Design Report. The current version of FAARFIELD is available at: https://www.faa.gov/airports/engineering/design_software/

The Engineer shall specify ASTM D698 for areas designated for aircraft with gross weights of 60,000 pounds (27200 kg) or less, and ASTM D1557 for areas designated for aircraft with gross weights greater than 60,000 pounds (27200 kg).

If the material has greater than 30% retained on the 3/4-inch (19.0 mm) sieve, follow the methods in the ASTM D698 or D1557; or AASHTO T180 Annex for correction of maximum dry density and optimum moisture for oversized particles.

Include testing frequencies per square yard (square meter) for density and moisture acceptance tests.

The in-place field density shall be determined in accordance with [ASTM D1556] [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 within 12 months prior to its use on this contract. The gage shall be field standardized daily.]

Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

If the specified density is not attained, the entire lot shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

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 RPR and the finished subgrade shall be maintained.

152-2.11 Finishing and protection of subgrade. Finishing and protection of the subgrade is incidental to this item. Grading and compacting of the subgrade shall be performed so that it will drain readily. All low areas, holes or depressions in the subgrade shall be brought to grade. 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. All ruts or rough places that develop in the completed subgrade shall be graded, re-compacted, and retested. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes.

The Contractor shall maintain the completed course in satisfactory condition throughout placement of subsequent layers. No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been accepted by the RPR.

152-2.12 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.

The Contractor's equipment shall not cause damage to any excavated surface, compacted lift or to the subgrade as a result of hauling operations. Any damage caused as a result of the Contractor's hauling operations shall be repaired at the Contractor's expense.

The Contractor shall be responsible for providing, maintaining and removing any haul roads or routes within or outside of the work area, and shall return the affected areas to their former condition, unless otherwise authorized in writing by the Owner. No separate payment will be made for any work or materials associated with providing, maintaining and removing haul roads or routes.

152-2.13 Surface Tolerances. In those areas on which a subbase or base course is to be placed, 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 re-compacted to grade until the required smoothness and accuracy are obtained and approved by the RPR. The Contractor shall perform all final smoothness and grade checks in the presence of the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense.

- a. Smoothness.** The finished surface shall not vary more than +/- ½ inch (12 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 forward 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. Grade.** The grade and crown shall be measured on a 50-foot (15-m) grid and shall be within +/-0.05 feet (15 mm) of the specified grade.

On safety areas, turfed areas and other designated areas within the grading limits where no subbase or base is to be placed, grade shall not vary more than 0.10 feet (30 mm) from specified grade. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

152-2.14 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 be located as shown on the plans and the approved CSPP, and shall not be placed on areas that subsequently will require any excavation or embankment fill. If, in the judgment of the RPR, 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 re-handling.

Refer to AC 150/5370-2, Operational Safety on Airports During Construction when developing the Construction Safety and Phasing Plan (CSPP).

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as shown on the plans and as required in Item T-905. Topsoil shall be paid for as provided in Item T-905. No direct payment will be made for topsoil under Item P-152.

METHOD OF MEASUREMENT

152-3.1 Measurement for payment specified by the cubic yard (cubic meter) shall be computed by the [average end areas of design cross sections] [the comparison of digital terrain model (DTM) surfaces] for computation of neat line design quantities]. The end area is that bound by the original ground line established by field cross-sections and the final theoretical pay line established by cross-sections shown on the plans, subject to verification by the RPR.

The Engineer may edit method of volume calculations. The method of calculating volumes must meet or exceed the accuracy of the average end area method. The method of field verification should be described and must meet or exceed what is currently specified for the average end area method.

152-3.1 [The quantity of [unclassified] [rock] [muck] [drainage] 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** The quantity of embankment in place shall be the number of cubic yards (cubic meters) measured in its final position.]

[**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.] [Stockpiled material shall not be measured for payment in the stockpiled position.]]

BASIS OF PAYMENT

152-4.1 [Unclassified excavation] [Rock Excavation] [Muck Excavation] [Drainage Excavation] [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.

[**152-4.2** 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.]

[**152-4.3** Stockpiled material shall be paid for on the basis of the number of cubic yards (cubic meters) measured in the stockpiled position.]

Payment will be made under:

[Item P-152-4.1 [[Unclassified] [Rock] [Muck] [Drainage] [Excavation] [Stockpiled material]] - per cubic yard (cubic meter)]

[Item P-152-4.2 Embankment in place - per cubic yard (cubic meter)]

[Item P-152-4.3 Stockpiled material – per cubic yard (cubic meter)]

Item P-154 Subbase Course

DESCRIPTION

154-1.1 This item shall consist of a subbase course composed of granular materials constructed on a prepared subgrade or underlying course in accordance with these specifications, and in conformity with the dimensions and typical cross-section shown on the plans.

MATERIALS

154-2.1 Materials. The subbase material shall consist of hard durable particles or fragments of granular aggregates. This material will be mixed or blended with fine sand, clay, stone dust, or other similar binding or filler materials produced from approved sources. This mixture must be uniform and shall comply with the requirements of these specifications as to gradation, soil constants, and shall be capable of being compacted into a dense and stable subbase. The material shall be free from vegetative matter, lumps or excessive amounts of clay, and other objectionable or foreign substances. Pit-run material may be used, provided the material meets the gradation requirements specified.

Where environmental conditions (temperature and availability of free moisture) indicate non-frost susceptible material is not required to prevent potential damage from frost action, the paragraph regarding the 0.02 mm and maximum passing 5% passing the No. 200 sieve should be deleted. The Engineer should reference the geotechnical report.

Gradation Requirements

Sieve designation (square openings) as per ASTM C136 and ASTM D422	Percentage by weight passing sieves
3 inch (75 mm)	100
No. 10 (2.0 mm)	20-100
No. 40 (0.450 mm)	5-60
No. 200 (0.075 mm)	0-8

The portion of the material passing the No. 40 (0.450 mm) sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than six (6) when tested in accordance with ASTM D4318.

[The material finer than 0.02 mm shall be limited to a maximum of 3% and the maximum allowable material passing the No. 200 sieve shall be reduced from 0-8% to 0-5%. Testing per ASTM D422 will be required for the percentage passing the 0.02 mm particle size once per lot.]

154-2.2 Sampling and testing. Material used on the project shall be sampled per ASTM D75 and tested per ASTM C136 and ASTM C117. Results shall be furnished to the Engineer by the Contractor prior to the start of construction and once per day during construction.

**

Include testing frequencies for the particle size distribution for preliminary and minimum of one per day during construction.

**

CONSTRUCTION METHODS

154-3.1 General. The subbase course shall be placed where designated on the plans or as directed by the Engineer. The material shall be shaped and thoroughly compacted within the tolerances specified.

Granular subbases which, due to grain sizes or shapes, are not sufficiently stable to support the construction equipment without movement, shall be mechanically stabilized to the depth necessary to provide stability as directed by the Engineer. The mechanical stabilization shall include the addition of a fine-grained medium to bind the particles of the subbase material sufficiently to furnish a bearing strength, so the course will not deform under construction equipment traffic. The addition of the binding medium to the subbase material shall not increase the soil constants of that material above the specified limits.

154-3.2 Operation in pits. The subbase material shall be obtained from pits or sources that have been approved by the Engineer. The material in the pits shall be excavated and handled to produce a uniform and satisfactory product. All work involved in clearing and stripping pits and handling unsuitable material encountered shall be performed by the Contractor. The cost of this work is incidental to this item.

154-3.3 Preparing underlying course. Prior to constructing the subbase course, clean the underlying course or subgrade of all foreign substances. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. Correct ruts, or soft yielding spots, in the underlying courses and subgrade areas having inadequate compaction and deviations of the surface from the specified requirements by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses or subgrades containing sands or gravels, as defined in ASTM D2487, the surface shall be stabilized prior to placement of the overlying course. Accomplish stabilization by mixing the overlying course material into the underlying course, and compacting by approved methods. [The stabilized material shall be considered as part of the underlying course and shall meet all requirements for the underlying course.] The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until the overlying course is placed. The course shall be checked and accepted by the Engineer before placing and spreading operations are started.

To protect the subgrade and to ensure proper drainage, the spreading of the subbase shall begin along the centerline of the pavement on a crowned section or on the high side of pavements with a one-way slope.

154-3.4 Materials acceptance in existing condition. When the entire subbase material is in a uniform and satisfactory condition at approximately the required moisture content, the approved material may be moved directly to the spreading equipment for placing. The material may be obtained from gravel pits, stockpiles, or may be produced from a crushing and screening plant with proper blending. The materials from these sources shall meet the requirements for gradation, quality, and consistency. The intent of the specifications is to secure materials that will not require further mixing. The moisture content of the material shall be approximately that required to obtain maximum density. Any minor deficiency or excess in moisture content may be corrected by surface sprinkling or by aeration. Some mixing or aeration may be required prior to rolling to obtain the required moisture content. Blading or dragging, if necessary, shall be performed to obtain a smooth uniform surface true to line and grade.

154-3.5 Plant mixing. When materials from several sources will be blended and mixed, the subbase material shall be processed in a [central] [travel] mixing plant. The subbase material, together with any blended material, shall be thoroughly mixed with the required amount of water. After the mixing is complete, the material shall be transported to and spread on the underlying course without undue loss of moisture content.

[**154-3.5.1 Mixed in place.** When materials from different sources are to be proportioned and mixed or blended in place, the relative proportions of the components of the mixture shall be as designated by the Engineer.

The subbase material shall be deposited and spread evenly to a uniform thickness and width. Then the binder, filler or other material shall be deposited and spread evenly over the first layer. There shall be as many layers of materials added as the Engineer may direct to obtain the required subbase mixture.

When the required amount of materials have been placed, they shall be thoroughly mixed and blended by means of graders, discs, harrows, rotary tillers, supplemented by other suitable equipment if necessary. The mixing shall continue until the mixture is uniformly blended. Areas of segregated material shall be corrected by the addition of binder or filler material and by thorough remixing. Water shall be uniformly applied prior to and during the mixing operations, if necessary, to maintain the material at its required moisture content. When the mixing and blending has been completed, the material shall be spread in a uniform layer which, when compacted, will meet the requirements of thickness and typical cross-section.]

**

If mixing in place will not provide a consistent subbase material, delete paragraph 154-3.5.1.

**

154-3.6 General methods for placing. The subbase course shall be constructed in layers of not less than inches (75 mm) nor more than 8 inches (200 mm) of compacted thickness. The subbase material shall be deposited and spread evenly to a uniform thickness and width. The material, as spread, shall be of uniform gradation with no pockets of fine or coarse materials. The subbase, 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 this limit. No material shall be placed in snow or on a soft, muddy, or frozen course.

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

During the placing and spreading, sufficient caution shall be exercised to prevent the incorporation of subgrade, shoulder, or foreign material in the subbase course mixture.

154-3.7 Finishing and compacting. After spreading or mixing, the subbase material shall be thoroughly compacted by rolling and sprinkling, when necessary. Sufficient rollers shall be furnished to adequately handle the rate of placing and spreading of the subbase course.

The field density of the compacted material shall be at least 100% of the maximum density of laboratory specimens prepared from samples of the subbase material delivered to the jobsite. The laboratory specimens shall be compacted and tested in accordance with [____]. The in-place field density shall be determined in accordance with [ASTM D1556. Test in accordance with ASTM D4718 if greater than 30% is retained on the 3/4" sieve.][or][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.]. The moisture content of the material at the start of compaction shall be within $\pm 2\%$ of the optimum moisture content. All testing shall be done by [the Engineer.][the Contractor's laboratory in the presence of the Engineer, and density test results shall be furnished upon completion to the Engineer for acceptance determination.]

**

The Engineer shall specify ASTM D698 for areas designated for aircraft with gross weights of 60,000 pounds (27200 kg) or less and ASTM D1557 for areas designated for aircraft with gross weights greater than 60,000 pounds (27200 kg).

Include testing frequencies per square yard or cubic yard for density and moisture acceptance tests.

Material meeting the requirements of Item P-154 may be free-draining which may prevent the material from retaining sufficient moisture to meet the

compaction moisture requirements of this paragraph. If this situation occurs during field operations, minimum moisture content should be established for placement of the material.

**

The course shall not be rolled when the underlying course is soft or yielding or when the rolling causes undulation in the subbase. When the rolling develops irregularities that exceed 3/8 inch (9 mm) when tested with a 12 feet (3.7 m) straightedge, the irregular surface shall be loosened and then refilled with the same kind of material as that used in constructing the course and again rolled as required above.

Along places inaccessible to rollers, the subbase material shall be tamped thoroughly with mechanical or hand tampers.

Sprinkling during rolling, if necessary, shall be by equipment approved by the Engineer. Water shall not be added in manner or quantity that allows free water to reach the underlying layer and cause it to become soft.

154-3.8 Surface tolerance. The surface of the top layer shall show no deviations in excess of 3/8 inch (9 mm) when tested with a 12-foot (3.7-m) straightedge. Take measurements in successive positions parallel to the centerline of the area to be paved. Measurements shall also be taken perpendicular to the centerline at [50] [] foot [15] [] meter intervals. Correct deviations exceeding this amount by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

154-3.9 Thickness control. The completed thickness of the course(s) shall be in accordance with the thickness and grade indicated on the drawings. The completed course shall not be more than 1/2 inch (12 mm) deficient in thickness nor more than 1/2 inch (12 mm) above or below the established grade. Where any of these tolerances are exceeded, correct such areas by scarifying, adding new material of proper gradation or removing material, and compacting, as directed. Where the measured thickness is 1/2 inch (12 mm) or more thicker than shown, the course will be considered as conforming with the specified thickness requirements plus 1/2 inch (12 mm). The average job thickness shall be the average of the job measurements as specified above but within 1/4 inch (6 mm) of the thickness shown. The thickness of the completed subbase course shall be determined by [depth tests or sample holes taken at intervals so each test shall represent no more than 500 square yards (420 sq m)] [by survey].

**

When subbase or rigid pavement base courses are constructed less than 6 inches (150 mm) in total thickness, a deficiency of 1/2 inch (12 mm) in the thickness of any area of such paving is considered excessive. Applicable to job conditions, the thickness tolerance provisions will be modified as required, restricting all deficiencies to less than 1/4 inch (6 mm).

**

154-3.10 Protection. Work on subbase course shall not be conducted during freezing temperatures nor when the subgrade is wet. When the subbase material contains frozen material or when the underlying course is frozen, the construction shall be stopped. The Contractor shall protect and maintain the subgrade from yielding until the subbase is accepted.

154-3.11 Maintenance. The Contractor shall maintain the completed course in a satisfactory condition until accepted by the Engineer.

METHOD OF MEASUREMENT

154-4.1 Subbase course shall be measured by the number of [square yards (meters)] [cubic yards (cubic meters)] of subbase course material placed, compacted, and accepted in the completed course. The quantity of subbase course material shall be measured in final position based upon [depth tests or cores taken as directed by the Engineer, at the rate of one (1) depth test for each 500 square yard (420 sq m) of subbase course] [by means of average end areas on the complete work computed from elevations to the nearest 0.01 foot (3 mm)]. On individual depth measurements, thicknesses more than 1/2 inch (12 mm) in excess of that shown on the plans shall be considered as the specified thickness plus 1/2 inch (12 mm) in computing the yardage for payment. Subbase materials shall not be included in any other excavation quantities.

BASIS OF PAYMENT

154-5.1 Payment shall be made at the contract unit price per [square yard (meter)] [cubic yard (cubic meter)] for subbase course. This price shall be full compensation for furnishing all materials; for all preparation, hauling, and placing of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-154-5.1	Subbase Course - per [square yard (meter)] [cubic yard (cubic meter)]
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TESTING REQUIREMENTS

ASTM C117	Standard Test Method for Materials Finer Than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing
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 (2,700 kN-m/m ³))

ASTM D2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D4253	Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4718	Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
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-154

Item P-208 Aggregate Base Course

208-1.1 This item shall consist of a base course composed of course aggregate bonded with fine aggregate base. It shall be constructed on a prepared subgrade or subbase course per these specifications and shall conform to the dimensions and typical cross-section shown on the plans.

MATERIALS

208-2.1 Aggregate base. The aggregate base material shall consist of both fine and coarse aggregate. Material shall be clean, sound, durable particles and fragments of stone or gravel, crushed stone, [crushed slag,] or crushed gravel mixed or blended with sand, screenings, or other similar materials produced from approved sources. The aggregate shall be free from lumps of clay, organic matter, and other objectionable materials or coatings.

[Crushed slag shall be air-cooled, blast furnace product consisting of angular fragments reasonably uniform in density and quality and shall be reasonably free from thin, elongated, or soft pieces, dirt, and other objectionable matter. It shall weigh not less than 70 pounds per cubic foot (1.12 Mg/cubic meter) as determined by ASTM C29.]

Crushed aggregate shall consist of clean, sound, durable stones and rock crushed to specified size and shall be free from excess soft or disintegrated pieces, dirt, or other objectionable matter. The method used to produce the crushed gravel shall result in the fractured particles in the finished product as nearly constant and uniform as practicable.

The coarse aggregate portion, defined as the portion retained on the No. 4 sieve, shall not have a loss of greater than 50% 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 have at least 60% by weight of particles with at least two fractured faces and 75% 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. 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 three (3); an elongated particle is one having a ratio of length to width greater than three (3).

The fine aggregate portion, defined as the portion passing the No. 4 sieve, produced in crushing operations shall be incorporated in the base material to the extent permitted by the gradation requirements.

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 208-2.1 and 208-2.2. This sampling and testing will be the basis for approval of the aggregate base quality requirements. []

The Engineer may require additional sampling points for quality requirements. The Engineer shall define when additional sampling points are needed in the above paragraph.

208-2.2 Gradation requirement. 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. The portion of the filler and binder, including any blended material, passing the No. 40 (0.45 mm) sieve shall have a liquid limit not more than 25 and a plasticity index not more than five (5) when tested per ASTM D4318.

[The material finer than 0.02 mm shall be limited to a maximum of 3% and the maximum allowable material passing the No. 200 sieve shall be reduced from 0-8% to 0-5%. Testing per ASTM D422 will be required for the percentage passing the 0.02 mm particle size once per lot.]

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)	*		0
1-1/2 inch (38 mm)	*		±5
1 inch (25 mm)	*		±8
3/4 inch (19 mm)	*		±8
No. 4 (4.75 mm)	*		±8
No. 40 (0.45 mm)	*		±5
No. 200 (0.075 mm)	*		±3

For areas subject to frost, the Engineer shall include the bracketed statement above.

The Engineer shall select the required gradation from the following table and replace the asterisks in the column titled “Design Range Percentage by Weight.” Leave the column titled “Contractor’s Final Gradation” blank. The Contractor’s Final Gradation approved by the Engineer will be used to populate this column and the “Job Control Grading Band Tolerances for Contractor’s Final Gradation” will apply to this column for the project duration.

Requirements for Gradation of Aggregate Base

Sieve Designation	Percentage by weight passing sieves		
	2" maximum	1-1/2" maximum	1" maximum
2 inch (50 mm)	100	--	--
1-1/2 inch (38 mm)	70-100	100	--
1 inch (25 mm)	55-85	70-100	100
3/4 inch (19 mm)	50-80	55-85	70-100
No. 4 (4.75 mm)	30-60	30-60	35-65
No. 40 (0.45 mm)	10-30	10-30	10-25
No. 200 (0.075 mm)	5-15	5-15	5-15

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. 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

208-3.1 Operations in pits and quarries. All work involved in clearing and stripping pits and quarries, including handling of unsuitable material, shall be performed by the Contractor. All material shall be handled in a manner that shall secure a uniform and satisfactory base product. The base course material shall be obtained from sources that have been approved by the Engineer.

208-3.2 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.

208-3.3 Production. The aggregate shall be uniformly blended and, when at a satisfactory moisture content per paragraph 208-3.5, the approved material may be transported directly to the spreading equipment.

208-3.4 Placing. The aggregate base material shall be placed and spread 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 here shall apply similarly to each layer.

208-3.5 Compaction. Immediately upon 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. The moisture content of the material during placing operations shall be within ± 2 percentage points of the optimum moisture content as determined by ASTM [____].

If nuclear density machines are to be used for density determination, the field density shall be determined in accordance with 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 per ASTM D6938.

208-3.6 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 2400 square yards (2000 sq m). A lot will consist of one-half day's production if a day's production is between 2400 and 4800 square yards (2000 and 4000 sq m). The [Engineer shall perform all density tests][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].

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 shall be accepted for density when the field density is at least 100% of the maximum density of laboratory specimens compacted and tested per ASTM [____]. The in-place field density shall be determined per [ASTM D1556. Test in accordance with ASTM D4718 if greater than 30% is retained on the 3/4" sieve.][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.]. If the specified density is not attained, the entire lot shall be reworked and/or recompacted and two additional random tests made. This procedure shall be followed until the specified density is reached.

The Engineer may specify ASTM D698 for areas designated for aircraft with gross weights of less than 60,000 pounds (27200 kg). The Engineer shall specify ASTM D1557 for areas designated for aircraft with gross weights of 60,000 pounds (27200 kg) or greater.

208-3.7 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 forward 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.

208-3.8 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. 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. The Contractor shall replace, at his expense, base material where depth tests have been taken.

The Engineer may modify the above thickness control paragraph to permit the thickness determination by survey. Survey shall be required before and after placement of the base. The survey interval should be specified based on the size of the project.

208-3.9 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.

208-3.10 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

208-4.1 The quantity of aggregate base course shall be measured by the number of [square yards (square meters)] [cubic yards (cubic 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

208-5.1 Payment shall be made at the contract unit price per [square yards (square meters)][cubic yard (cubic meter)] for aggregate base course. This price shall be full compensation for furnishing all materials and for all operations, hauling, placing, and compacting of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-208-5.1	Aggregate Base Course - per [square yards (square meters)][cubic yard (cubic 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 D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
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-208

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, crushed gravel, [or crushed slag] and shall be free from coatings of clay, silt, organic material, clay lumps or balls or other deleterious materials or coatings. The method used to produce the crushed gravel shall result in the fractured particles in the finished product as consistent and uniform as practicable. Fine aggregate portion, defined as the portion passing the No. 4 (4.75 mm) sieve shall consist of fines from the coarse aggregate crushing operation. The fine aggregate shall be produced by crushing stone, gravel, [or slag] that meet the coarse aggregate requirements for wear and soundness. Aggregate base material requirements are listed in the following table.

Crushed Aggregate Base Material Requirements

Material Test	Requirement	Standard
Coarse Aggregate		
Resistance to Degradation	Loss: 45% maximum	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Percentage of Fractured Particles	Minimum 90% by weight of particles with at least two fractured faces and 98% with at least one fractured face ¹	ASTM D5821
Flat Particles, Elongated Particles, or Flat and Elongated Particles	10% maximum, by weight, of flat, elongated, or flat and elongated particles ²	ASTM D4791
[Bulk density of slag	Weigh not less than 70 pounds per cubic foot (1.12 Mg/cubic meter)	ASTM C29]
[Clay lumps and friable particles	Less than or equal to 3 percent	ASTM C142]
Fine Aggregate		
Liquid limit	Less than or equal to 25	ASTM D4318
Plasticity Index	Not more than five (5)	ASTM D4318

¹ 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.

² A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

Delete bracketed reference to crushed slag in above paragraph and table if slag will not be used in the project.

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 and shall not vary from the lower limit on one sieve to the high limit on an adjacent sieve or vice versa.

Gradation of Aggregate Base

Sieve Size	Design Range Percentage by Weight passing	Contractor's Final Gradation	Job Control Grading Band Tolerances ¹ (Percent)
2 inch (50 mm)	100		0
1-1/2 inch (37.5 mm)	95-100		±5
1 inch (25.0 mm)	70-95		±8
3/4 inch (19.0 mm)	55-85		±8
No. 4 (4.75 mm)	30-60		±8
No. 40 ² (425 µm)	10-30		±5
No. 200 ² (75 µm)	[0-10]		±3

¹ 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.

² The fraction of material passing the No 200 (75 µm) sieve shall not exceed two-thirds the fraction passing the No 40 (425 µm) sieve.

When non frost susceptible material is required, the maximum material passing the No. 200 (75 µm) sieve shall be reduced to 0-5%. For areas subject to substantial frost penetration into base and subgrade layers, a separation filter layer or geosynthetic separation layer is recommended.

Leave the column titled “Contractor’s Final Gradation” blank in the above table. The Contractor’s Final Gradation approved by the Engineer/RPR will be used to populate this column and the “Job Control Grading Band Tolerances for Contractor’s Final Gradation” will apply to this column for the project duration, and these limits establish quality control action limits for the Contractor.

209-2.3 Sampling and Testing.

a. Aggregate base materials. The Contractor shall take samples of the aggregate base in accordance with ASTM D75 to verify initial aggregate base requirements and gradation. Material shall meet the requirements in paragraph 209-2.1. This sampling and testing will be the basis for approval of the aggregate base quality requirements. []

b. Gradation requirements. The Contractor shall take at least [two] aggregate base samples per day in the presence of the Resident Project Representative (RPR) to check the final gradation. Sampling shall be per ASTM D75. Material shall meet the requirements in paragraph 209-2.2. The samples shall be taken from the in-place, un-compacted material at sampling points and intervals designated by the RPR.

The Engineer may require additional sampling points for quality requirements. The Engineer shall define when additional sampling points are needed in the above paragraph.

On large projects and/or projects that span multiple construction seasons, additional aggregate tests may be necessary to validate consistency of aggregate produced and delivered for the project.

209-2.4 Separation Geotextile. [Not used.] [Separation geotextile shall be [Class 2], [0.02 sec^{-1}] permittivity per ASTM D4491, Apparent opening size per ASTM D4751 with [0.60 mm] maximum average roll value.]

The use of a geotextile to prevent mixing of a subgrade soil and an aggregate subbase/base is appropriate for pavement structures constructed over soils with a California Bearing Ratio greater than 3.

Generally, on airport projects, a Class 2 geotextile with a permittivity of 0.02 and AOS of 0.6 mm will be sufficient.

See AASHTO M288 for additional notes regarding separation geotextiles.

CONSTRUCTION METHODS

209-3.1 Control strip. The first half-day of construction shall be considered the control strip. The Contractor shall demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of the specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches (300 mm) upon the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The RPR must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted or removed and replaced at the Contractor's expense. Full operations shall not continue until the control strip has been accepted by the RPR. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved by the RPR.

209-3.2 Preparing underlying subgrade and/or subbase. The underlying subgrade and/or subbase shall be checked and accepted by the RPR before base course placing and spreading

operations begin. Re-proof rolling of the subgrade or proof rolling of the subbase in accordance with Item P-152, at the Contractor's expense, may be required by the RPR 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.

209-3.3 Production. The aggregate shall be uniformly blended and, when at a satisfactory moisture content per paragraph 209-3.5, the approved material may be transported directly to the placement.

209-3.4 Placement. The aggregate shall be placed and spread on the prepared underlying layer by spreader boxes or other devices as approved by the RPR, to a uniform thickness and width. The equipment shall have positive thickness controls to minimize the need for additional manipulation of the material. Dumping from vehicles that require re-handling shall not be permitted. Hauling over the uncompacted base course shall not be permitted.

The aggregate shall meet gradation and moisture requirements prior to compaction. The base course shall be constructed in lifts as established in the control strip, but not less than 4 inches (100 mm) nor more than 12 inches (300 mm) of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications at the Contractor's expense.

209-3.5 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 field density of each compacted lift of material shall be at least [100%] of the maximum density of laboratory specimens prepared from samples of the base material delivered to the jobsite. The laboratory specimens shall be compacted and tested in accordance with [ASTM D1557]. The moisture content of the material during placing operations shall be within ± 2 percentage points of the optimum moisture content as determined by ASTM [____]. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

Material meeting the requirements of P-209 may be free-draining and to achieve compaction may need to be compacted on the wet-side of optimum.

The Engineer may specify ASTM D698 for areas designated for aircraft with gross weights of 60,000 pounds (27200 kg) or less and ASTM D1557 for areas designated for aircraft with gross weights greater than 60,000 pounds (27200 kg).

If the material has greater than 30% retained on the 3/4-inch (19.0 mm) sieve, ASTM D1557 or D698 has suggested procedures for dealing with oversize material.

209-3.6 Weather limitations. Material shall not be placed unless the ambient air temperature is at least 40°F (4°C) and rising. Work on base course shall not be conducted when the subgrade or subbase is wet or frozen or the base material contains frozen material.

209-3.7 Maintenance. The base course shall be maintained in a condition that will meet all specification requirements. When material has been exposed to excessive rain, snow, or freeze-thaw conditions, prior to placement of additional material, the Contractor shall verify that materials still meet all specification requirements. Equipment may be routed over completed sections of base course, provided that no damage results and the equipment is routed over the full width of the completed base course. Any damage resulting to the base course from routing equipment over the base course shall be repaired by the Contractor at the Contractor's expense.

209-3.8 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 RPR. 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 forward 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. Grade. 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.

209-3.9 Acceptance sampling and testing. Crushed aggregate base course shall be accepted for density and thickness on an area basis. Two tests shall be made for density and thickness for each [1200 square yds (1000 m²)]. Sampling locations will be determined on a random basis per ASTM D3665

a. Density. The [RPR shall perform all density tests] [Contractor's laboratory shall perform all density tests in the RPR's presence and provide the test results upon completion to the RPR for acceptance].

Each area shall be accepted for density when the field density is at least [100%] of the maximum density of laboratory specimens compacted and tested per ASTM [1557] [D698]. The in-place field density shall be determined per [ASTM D1556.] [or] [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.]. If the specified density is not attained, the area represented by the failed test must be reworked and/or recompacted and two additional random tests made.

This procedure shall be followed until the specified density is reached. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

The Engineer may specify ASTM D698 or ASTM D1557 for areas designated for aircraft with gross weights of less than 60,000 pounds (27200 kg). The Engineer shall specify ASTM D1557 for areas designated for aircraft with gross weights of 60,000 pounds (27200 kg) or greater.

b. Thickness. Depth tests shall be made by test holes at least 3 inches (75 mm) in diameter that extend through the base. 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 RPR for each area. 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. The Contractor shall replace, at his expense, base material where depth tests have been taken.

The Engineer may modify the above thickness control paragraph to permit the thickness determination by survey. Survey shall be required before and after placement of the base. The survey interval should be specified based on the size of the project.

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)] [cubic yards (cubic meters)] of material actually constructed and accepted by the RPR as complying with the plans and specifications. Base materials shall not be included in any other excavation quantities.

[**209-4.2** Separation geotextile shall be measured by the number of [square yards] [square meters] of materials placed and accepted by the RPR as complying with the plans and specifications excluding seam overlaps and edge anchoring.]

BASIS OF PAYMENT

209-5.1 Payment shall be made at the contract unit price per [square yard (square meter)] [cubic yard (cubic 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.

[**209-5.2** Payment shall be made at the contract unit price per [square yard] [square meter] for separation geotextile. The price shall be full compensation for furnishing all labor, equipment, material, anchors, and incidentals necessary.]

Payment will be made under:

Item P-209-5.1	Crushed Aggregate Base Course - per [square yard (square meter) [cubic yard (cubic meter)]
[Item P-209-5.2	Separation geotextile per [square yard] [square meter]]

Item P-403 Asphalt Mix Pavement [Base] [Leveling] [Surface] Course

**

Specify base and/or leveling course. Surface course may also be specified but only for those pavements designed to accommodate aircraft of gross weights less than or equal to 30,000 pounds (13,600 kg) or for surface course of shoulders, blast pads, service roads, etc. Item P-401 shall be specified for surface courses for pavements designed to accommodate aircraft gross weights greater than 30,000 pounds (13,600 kg). For airfield pavement projects at non primary airports, serving aircraft less than 60,000 pounds (27216 kg), state highway specifications may be used in states where the state has requested and received FAA approval to use state highway specifications.

For small maintenance and repair projects less than 3000 tons (2720 tonnes), P-403 may be used for the surface course.

This specification is to be used as a base or leveling course for pavements designed to accommodate aircraft of gross weights greater than 30,000 pounds (13,600 kg).

When used as a stabilized base course under P-501, include a bond breaker.

This specification contains job mix formula options for both Marshall and Gyratory Mix Design Methods. The Engineer shall select the method to be used for the project, considering the prevalent method in use in the local project area.

State highway department specifications may be used in lieu of this specification for access roads, perimeter roads, stabilized base courses under Item P-501, and other pavements not subject to aircraft loading, or for pavements designed for aircraft gross weights of 30,000 pounds (13,600 kg) or less. When state highway department material specification are used:

- The state specification must have a demonstrated satisfactory performance record under equivalent loadings and exposure.
- When a density requirement is not specified by a state specification, it shall be modified to include the language found in paragraphs 403-6.1, 403-6.2, 403-6.3, and 403-6.4
- When state highway specifications are approved, include all applicable/approved state specifications in the contract documents.
- Update any references to State Department of Transportation (DOT), State Materials Laboratory, etc., to "Owner," "Engineer," etc. as appropriate for project.

The use of state highway department specifications for airfield pavements subject to aircraft loading by aircraft greater than 30,000 pounds and less than 60,000 pounds requires a modification to standards in accordance with FAA Order 5300.1, Modifications to Agency Airport Design, Construction, and Equipment Standards.

**

DESCRIPTION

403-1.1 This item shall consist of pavement courses composed of mineral aggregate and 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

403-2.1 Aggregate. Aggregates shall consist of crushed stone, crushed gravel, crushed slag, screenings, natural sand and mineral filler, as required. The aggregates should have no known history of detrimental pavement staining due to ferrous sulfides, such as pyrite. Coarse aggregate is the material retained on the No. 4 (4.75 mm) sieve. Fine aggregate is the material passing the No. 4 (4.75 mm) sieve.

**

Some aggregates may contain ferrous sulfides and iron oxides which can cause stains on exposed surfaces. In areas where staining has been a problem or is suspected, the Engineer should verify that producers and aggregate suppliers have taken steps to minimize the inclusion of any ferrous sulfides or iron oxides in aggregate to be used in the project.

On large projects and/or projects that span multiple construction seasons, additional aggregate tests may be necessary to validate consistency of aggregate produced and delivered for the project.

**

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 asphalt material and free from organic matter and other deleterious substances. Coarse aggregate material requirements are given in the table below.

Coarse Aggregate Material Requirements

Material Test	Requirement	Standard
Resistance to Degradation	Loss: 40% maximum for surface, asphalt binder, and leveling course Loss: 50% maximum for base course	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Clay lumps and friable particles	1.0 % maximum	ASTM C142
Percentage of Fractured Particles	For pavements designed for aircraft gross weights of 60,000 pounds (27200 kg) or more: Minimum 75% by weight of particles with at least two fractured faces and 85% with at least one fractured face ¹	ASTM D5821
	For pavements designed for aircraft gross weights less than 60,000 pounds (27200 kg): Minimum 50% by weight of particles with at least two fractured faces and 65% with at least one fractured face ¹	
Flat, Elongated, or Flat and Elongated Particles	8% maximum, by weight, of flat, elongated, or flat and elongated particles with a value of 5:1 ²	ASTM D4791
Bulk density of slag ³	Weigh not less than 70 pounds per cubic foot (1.12 Mg/cubic meter)	ASTM C29.

¹ 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.

² A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

³ Only required if slag is specified.

b. Fine aggregate. Fine aggregate shall consist of clean, sound, tough, durable, angular shaped particles produced by crushing stone, slag, or gravel and shall be free from coatings of clay, silt, or other objectionable matter. Natural (non-manufactured) sand may be used to obtain the gradation of the aggregate blend or to improve the workability of the mix. Fine aggregate material requirements are listed in the table below.

Fine Aggregate Material Requirements

Material Test	Requirement	Standard
Liquid limit	25 maximum	ASTM D4318
Plasticity Index	4 maximum	ASTM D4318
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 10% maximum using Sodium sulfate - or - 15% maximum using magnesium sulfate	ASTM C88
Clay lumps and friable particles	1.0 % maximum	ASTM C142
Sand equivalent	[45 minimum]	ASTM D2419
Natural Sand	[0 to 15%] maximum by weight of total aggregate	ASTM D1073

**

The addition of natural sand to a mix containing all crushed coarse and fine aggregates will normally increase its workability and compactability. The addition of natural sand tends to decrease the stability of the mixture, therefore, it is recommended to not use natural sand. However, if natural sand is used, use the minimum amount necessary to achieve a workable mixture.

**

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

403-2.2 Mineral filler. Mineral filler (baghouse fines) may be added in addition to material naturally present in the aggregate. Mineral filler shall meet the requirements of ASTM D242.

Mineral filler Requirements

Material Test	Requirement	Standard
Plasticity Index	4 maximum	ASTM D4318

403-2.3 Asphalt binder. Asphalt binder shall conform to ASTM D6373 Performance Grade (PG) [____].

[

Asphalt Binder PG Plus Test Requirements

Material Test	Requirement	Standard
Elastic Recovery	[75%] minimum	ASTM D6084 ¹

¹ Follow procedure B on RTFO aged binder.]

**

Use the following guidance in selecting the asphalt binder PG to include in the above paragraph.

Prior to bumping for traffic, the initial PG asphalt binder should be consistent with the recommendations of the applicable State Department of Transportation requirements for pavement environmental conditions.

Additional guidance on selecting the asphalt binder PG include the following:

- Asphalt Institute MS-26, The Asphalt Binder Handbook.
- The Asphalt Institute's State Binder Specification Database at: <http://www.asphaltinstitute.org/specification-databases/us-state-binder-specification-database/The Long Term Pavement Performance Binder program at https://infopave.fhwa.dot.gov/>
- Using the initial PG selected, apply the applicable grade bump in accordance with the table below to determine the PG that will be inserted in the above paragraph.

Required Grade Bump

Aircraft Gross Weight	High Temperature Adjustment to Asphalt Binder Grade	
	All Pavement Types	Pavement area with slow or stationary aircraft
≤ 12,500 lbs (5670 kg)	--	1 Grade
< 100,000 lbs (45360 kg)	1 Grade	2 Grade
≥ 100,000 lbs (45360 kg)	2 Grade	3 Grade

Typically, when the PG spread between the high and low temperature is 92 or more, the asphalt binder has been modified. The Engineer may use the PG Plus Test found in the Asphalt Institute's State Binder Specification Database for the project location which requires modification of the table. If the PG spread is less than 92, delete the Asphalt Binder PG Plus Test Requirements table.

Note asphalt industry is in a state of change regarding binder designations. Some States are following ASTM D6373, while others are following AASHTO M332. Ensure that binder supplied meets minimum requirements of ASTM D6373.

**

403-2.4 Anti-stripping agent. Any anti-stripping agent or additive (anti-strip) shall be heat stable and shall not change the asphalt binder grade beyond specifications. Anti-strip shall be an approved material of the Department of Transportation of the State in which the project is located.

[**403-2.5 Bond Breaker.** [Choke stone shall be an ASTM C33 Number 89 stone.] [Fabric shall meet the requirements of AASHTO M 288 Class I fabric with elongation not less than 50% at the specified strengths, and a weight not less than 14.5 oz/sy. A certificate of compliance (COC) shall be provided by the fabric manufacturer that the material

may be used as a bond breaker.] [Liquid membrane forming compound shall be [].]

**

Delete paragraph 403-2.5 if asphalt pavement will be placed directly above the lean concrete base.

The Engineer must select the bond breaker when concrete pavement will be placed directly above the lean concrete base. Coordinate with P-501.

**

COMPOSITION

403-3.1 Composition of mixture. The asphalt plant 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).

403-3.2 Job mix formula (JMF) laboratory. The laboratory used to develop the JMF shall possess a current certificate of accreditation, listing D3666 from a national accrediting authority and all test methods required for developing the JMF, and listed on the accrediting authority's website. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the RPR prior to start of construction.

403-3.3 Job mix formula (JMF). No asphalt mixture shall be placed until an acceptable mix design has been submitted to the RPR for review and accepted in writing. The RPR's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

When the project requires asphalt mixtures of differing aggregate gradations and/or binders, a separate JMF shall be submitted for each mix. Add anti-stripping agent to meet tensile strength requirements.

The JMF shall be prepared by an accredited laboratory that meets the requirements of paragraph 403-3.2. The asphalt mixture shall be designed using procedures contained in Asphalt Institute MS-2 Mix Design Manual, 7th Edition. [Samples shall be prepared and compacted using a Marshall compactor in accordance with ASTM D6926.] [Samples shall be prepared and compacted using the gyratory compactor in accordance with ASTM D6925.]

Should a change in sources of materials be made, a new JMF must be submitted to the RPR for review and accepted in writing before the new material is used. After the initial production JMF has been approved by the RPR and a new or modified JMF is required for whatever reason, the subsequent cost of the new or modified JMF, including a new control strip when required by the RPR, will be borne by the Contractor.

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

**

Select the method for mix design, Marshall Method, ASTM D6926 or Gyratory method, ASTM D6925.

The design criteria in Table 1 are target values necessary to meet the acceptance requirements contained in paragraph 403-6.2. The criteria is based on a production process which has a material variability with the following standard deviations Air Voids = 0.65%.

**

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 proposed for project use.

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

- Manufacturer's Certificate of Analysis (COA) for the asphalt binder used in the JMF in accordance with paragraph 403-2.3. Certificate of asphalt performance grade is with modifier already added, if used and must indicate compliance with ASTM D6373. For plant modified asphalt binder, certified test report indicating grade certification of modified asphalt binder.
- Manufacturer's Certificate of Analysis (COA) for the anti-stripping agent if used in the JMF in accordance with paragraph 403-2.4.
- Certified material test reports for the course and fine aggregate and mineral filler in accordance with paragraphs 403-2.1 and 403-2.2.
- Percent passing each sieve size for individual gradation of each aggregate cold feed and/or hot bin; percent by weight of each cold feed and/or hot bin used; and the total combined gradation in the JMF.
- Specific Gravity and absorption of each course and fine aggregate.
- Percent natural sand.
- Percent fractured faces.
- Percent by weight of flat particles, elongated particles, and flat and elongated particles (and criteria).
- Percent of asphalt.
- Number of blows or gyrations.
- Laboratory mixing and compaction temperatures.
- Supplier recommended mixing and compaction temperatures.
- Plot of the combined gradation on the 0.45 power gradation curve.
- Graphical plots of air voids, voids in the mineral aggregate (VMA), and unit weight versus asphalt content. To achieve minimum VMA during production, the mix design needs to account for material breakdown during production.

- Tensile Strength Ratio (TSR).
- Type and amount of Anti-strip agent when used.
- Asphalt Pavement Analyzer (APA) results.
- Date the JMF was developed. Mix designs that are not dated or which are from a prior construction season shall not be accepted.
- [Percentage and properties (asphalt content, asphalt binder properties, and aggregate properties) of reclaimed asphalt pavement (RAP) in accordance with paragraph 403-3.4, Reclaimed Hot-Mix Asphalt, if RAP is used.]
- []

**

Delete if RAP is not allowed per paragraph 403-3.4.

The Owner may add additional testing to meet local conditions with FAA concurrence.

**

Table 1. Asphalt Design Criteria

Test Property	Value	Test Method
Number of blows/gyrations	[75]	
Air voids (%)	3.5	ASTM D3203
Percent voids in mineral aggregate (VMA), minimum	See Table 2	ASTM D6995
TSR ¹	not less than [80] at a saturation of 70-80%	ASTM D4867
[Asphalt Pavement Analyzer (APA) ^{2,3}]	[Less than 10 mm @ 4000 passes]	[AASHTO T340 at 250 psi hose pressure at 64°C test temperature]

¹ Test specimens for TSR shall be compacted at 7 ± 1.0 % air voids. In areas subject to freeze-thaw, use freeze-thaw conditioning in lieu of moisture conditioning per ASTM D4867.

² AASHTO T340 at 100 psi hose pressure at 64°C test temperature may be used in the interim. If this method is used the required Value shall be less than 5 mm @ 8000 passes

³ Where APA not available, use Hamburg wheel test (AASHTO T 324) 10 mm@ 20,000 passes at 50°C.

**

75 blows or gyrations shall be specified for airports serving aircraft greater than 60,000 pounds. 50 blows or gyrations may be specified for airports serving aircraft 60,000 pounds or less.

The APA procedure has shown that mixes that meet the requirements above perform well under aircraft loading. If APA is not available in an area, compacted mix design samples may be sent to a laboratory that has an APA or

the Hamburg wheel test (AASHTO T 324) 10mm @ 20,000 passes at 50°C may be used with FAA approval. The use of APA or Hamburg is not required for pavements serving aircraft less than 60,000 pounds.

Specify a TSR of not less than 85 in areas with aggregate that have a history of stripping.

**

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 2 when tested in accordance with ASTM C136 and ASTM C117.

The gradations in Table 2 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 2. Aggregate - Asphalt Pavements

Sieve Size	Percentage by Weight Passing Sieve
1 inch (25.0 mm)	*
3/4 inch (19.0 mm)	*
1/2 inch (12.5 mm)	*
3/8 inch (9.5 mm)	*
No. 4 (4.75 mm)	*
No. 8 (2.36 mm)	*
No. 16 (1.18 mm)	*
No. 30 (600 µm)	*
No. 50 (300 µm)	*
No. 100 (150 µm)	*
No. 200 (75 µm)	*
Voids in Mineral Aggregate (VMA)¹	*
Asphalt Percent:	
Stone or gravel	*
Slag	*
Recommended Minimum Construction Lift Thickness	

¹To achieve minimum VMA during production, the mix design needs to account for material breakdown during production.

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.

**

The aggregate gradation shall be specified by the Engineer from the gradations shown in this note. The gradation shall be inserted into Table 2. Asterisks denote insert points.

Where locally-available aggregates cannot be economically blended to meet the grading requirements of the gradations shown, the gradations may be modified to fit the characteristics of such local aggregates with approval of the FAA. The modified gradation must produce a paving mixture that satisfies the mix design requirements.

Table 2. Aggregate - Asphalt Pavements

Sieve Size	Percentage by Weight Passing Sieves		
	Gradation 1	Gradation 2	Gradation 3 ¹
1 inch (25.0 mm)	100	--	--
3/4 inch (19.0 mm)	90-100	100	--
1/2 inch (12.5 mm)	68-88	90-100	100
3/8 inch (9.5 mm)	60-82	72-88	90-100
No. 4 (4.75 mm)	45-67	53-73	58-78
No. 8 (2.36 mm)	32-54	38-60	40-60
No. 16 (1.18 mm)	22-44	26-48	28-48
No. 30 (600 µm)	15-35	18-38	18-38
No. 50 (300 µm)	9-25	11-27	11-27
No. 100 (150 µm)	6-18	6-18	6-18
No. 200 (75 µm)	3-6	3-6	3-6
Voids in Mineral Aggregate (VMA)	14	15	16
Asphalt percent by total weight of mixture:			
Stone or gravel	4.5-7.0	5.0-7.5	5.5-8.0
Slag	5.0-7.5	6.5-9.5	7.0-10.5
Recommended Minimum Construction Lift Thickness	3 inch	2 inch	1 1/2 inch

¹Gradation 3 is intended for leveling courses. FAA approval is required for use in other locations.

403-3.4 Reclaimed Asphalt Pavement (RAP). [Reclaimed asphalt pavement shall consist of reclaimed asphalt pavement (RAP), coarse aggregate, fine aggregate, mineral filler, and asphalt. Recycled asphalt shingles (RAS) shall not be allowed. The RAP shall be of a consistent gradation and asphalt content and properties. When RAP is fed into the plant, the maximum RAP chunk size shall not exceed 1-1/2 inches (38 mm). The reclaimed asphalt mix shall

be designed using procedures contained in the Asphalt Institute MS-2 Mix Design Manual, 7th Edition. The percentage of asphalt in the RAP shall be established for the mixture design according to ASTM D2172 using the appropriate dust correction procedure. The JMF shall meet the requirements of paragraph 403-3.3. RAP should only be used for shoulder surface course mixes and for any intermediate courses. The use of RAP containing Coal Tar shall not be allowed. Coal Tar surface treatments must be removed prior to recycling underlying asphalt material. The amount of RAP shall be limited to [] percent.

In addition to the requirements of paragraph 403-3.3, the JMF shall indicate the percent of reclaimed asphalt pavement and the percent and grade of new asphalt binder.

For the PG graded asphalt binder selected in paragraph 403-2.3, adjust as follows:

a. For 0-20% RAP, there is no change in virgin asphalt binder content.

b. For >20 to 30% RAP, select asphalt binder one grade softer, i.e., PG 64-22 would soften to PG 58-28.]

[RAP shall not be used.]

**

Engineer will determine if RAP is/is not allowed and make appropriate selection.

RAP should not be used for surface mixes, except on shoulders. It can be used very effectively in lower layers or for shoulders. Engineer to specify the maximum percentage of reclaimed asphalt allowed in the mix. The amount of RAP shall be limited to 30%, as long as the resulting reclaimed mix meets all requirements that are specified for virgin mixtures. The Contractor may obtain the RAP from the job site or an existing source.

**

403-3.5 Control strip. [A control strip is not required.] [Full production shall not begin until an acceptable control strip has been constructed and accepted in writing by the RPR. The Contractor shall prepare and place a quantity of asphalt according to the JMF. The underlying grade or pavement structure upon which the control strip is to be constructed shall be the same as the remainder of the course represented by the control strip.

The Contractor will not be allowed to place the control strip until the Contractor quality control program (CQCP), showing conformance with the requirements of paragraph 403-5.1, has been accepted, in writing, by the RPR.

The control strip will consist of at least 250 tons (227 metric tons) or 1/2 subplot, whichever is greater. The control strip shall be placed in two lanes of the same width and depth to be used in production with a longitudinal cold joint. The cold joint must be cut back in accordance with paragraph 403-4.13 using the same procedure that will be used during production. The cold joint for the control strip will be an exposed construction joint at least four (4) hours old or when the mat has cooled to less than 160°F (71°C). The equipment used in construction of the control strip shall be the same type, configuration and weight to be used on the project.

The control strip shall be evaluated for acceptance as a single lot in accordance with the acceptance criteria in paragraph 403-6.1 and 403-6.2.

The control strip will be considered acceptable by the RPR if the gradation, asphalt content, and VMA are within the action limits specified in paragraph 403-5.5a; and Mat density greater than or equal to 94%, air voids 3.5% +/- 1%, and joint density greater than or equal to 92%.

If the control strip is unacceptable, necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made and another control strip shall be placed. Unacceptable control strips shall be removed at the Contractor's expense.

The control strip will be considered one lot for payment based upon the average of a minimum of 3 samples (no sublots required for control strip). Payment will only be made for an acceptable control strip in accordance with paragraph 403-8.1.]

For small projects, less than 3,000 tons (2722 metric tons), a control strip is not required.

**

CONSTRUCTION METHODS

403-4.1 Weather limitations. The asphalt 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 RPR, if requested; however, all other requirements including compaction shall be met.

Table 4. Surface Temperature Limitations of Underlying Course

Mat Thickness	Base Temperature (Minimum)	
	Degrees F	Degrees 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

403-4.2 Asphalt plant. Plants used for the preparation of asphalt shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M156 including the following items:

a. Inspection of plant. The RPR, or RPR'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.

b. Storage bins and surge bins. The asphalt mixture stored in storage and/or surge bins shall meet the same requirements as asphalt mixture loaded directly into trucks. Asphalt mixture shall not be stored in storage and/or surge bins for a period greater than twelve (12) hours. If the RPR determines there is an excessive heat loss, segregation or oxidation of the asphalt mixture due to temporary storage, temporary storage shall not be allowed.

403-4.3 Aggregate stockpile management. Aggregate 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.

A continuous supply of materials shall be provided to the work to ensure continuous placement.

403-4.4 Hauling equipment. Trucks used for hauling asphalt shall have tight, clean, and smooth metal beds. To prevent the asphalt 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 RPR. 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.

403-4.4.1 Material transfer vehicle (MTV). [A material transfer vehicle is not required.] [Material transfer Vehicles shall be required due to the improvement in smoothness and decrease in both physical and thermal segregation. To transfer the material from the hauling equipment to the paver, 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.]

**

An MTV is required for runway and taxiway construction on pavements designed for aircraft weighing 100,000 lbs (45360 kg) or more. The MTV is recommended for all pavements where the weight of the MTV will not damage the pavement structure. The use of an MTV is optional for shoulder construction.

**

403-4.5 Asphalt pavers. Asphalt pavers shall be self-propelled with an activated heated screed, capable of spreading and finishing courses of asphalt 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 asphalt paver shall be equipped with a control system capable of automatically maintaining the specified screed grade and elevation.

If 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.

The paver shall be capable of paving to a minimum width specified in paragraph 401-4.11.

403-4.6 Rollers. The number, type, and weight of rollers shall be sufficient to compact the asphalt to the required density while it is still in a workable condition without crushing of the aggregate, depressions or other damage to the pavement surface. Rollers shall be in good condition, capable of operating at slow speeds to avoid displacement of the asphalt. All rollers shall be specifically designed and suitable for compacting asphalt 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.

403-4.6.1 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 density gauge and obtain accurate density readings for all new asphalt. These densities shall be supplied to the RPR upon request at any time during construction. No separate payment will be made for supplying the density gauge and technician.

403-4.7 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 material to the mixer at a uniform temperature. The temperature of the 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.

403-4.8 Preparation of mineral aggregate. The aggregate for the asphalt 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.

403-4.9 Preparation of asphalt mixture. 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 asphalt upon discharge shall not exceed 0.5%.

**

For batch plants, wet mixing time begins with the introduction of asphalt binder into the mixer and ends with the opening of the mixer discharge gate. Mixing time should be the shortest time required to obtain uniform distribution of aggregate sizes and thorough coating of aggregate particles with asphalt binder.

**

403-4.10 Application of Prime and Tack Coat. Immediately before placing the asphalt mixture, the underlying course shall be cleaned of all dust and debris.

[A prime coat in accordance with Item P-602 shall be applied to aggregate base prior to placing the asphalt mixture.]

A tack coat shall be applied in accordance with Item P-603 to all vertical and horizontal asphalt and concrete surfaces prior to placement of the first and each subsequent lift of asphalt mixture.

403-4.11 Laydown plan, transporting, placing, and finishing. Prior to the placement of the asphalt, the Contractor shall prepare a laydown plan with the sequence of paving lanes and width to minimize the number of cold joints; the location of any temporary ramps; laydown temperature; and estimated time of completion for each portion of the work (milling, paving, rolling, cooling, etc.). The laydown plan and any modifications shall be approved by the RPR.

Deliveries shall be scheduled so that placing and compacting of asphalt 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 approximately ambient temperature. The Contractor, at their expense, shall be responsible for repair of any damage to the pavement caused by hauling operations.

Contractor shall survey each lift of asphalt surface course and certify to RPR that every lot of each lift meets the grade tolerances of paragraph 401-6.2e before the next lift can be placed.

Edges of existing asphalt pavement abutting the new work shall be saw cut and the cut off material and laitance removed. Apply a tack coat in accordance with P-603 before new asphalt material is placed against it.

The speed of the paver shall be regulated to eliminate pulling and tearing of the asphalt mat. Placement of the asphalt mix shall begin along the centerline of a crowned section or on the high side of areas with a one way slope unless shown otherwise on the laydown plan as accepted by the RPR. The asphalt mix shall be placed in consecutive adjacent lanes having a minimum width of [] feet (m) except where edge lanes require less width to complete the area. Additional screed sections attached to widen the paver to meet the minimum lane width requirements must include additional auger sections to move the asphalt mixture uniformly along the screed extension. []

**

The Engineer should specify the widest paving lane practicable in an effort to hold the number of longitudinal joints to a minimum. Additional job specific construction limitations may be added as necessary covering such items as echelon paving, hot joint construction, etc.

**

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 asphalt may be spread and luted by hand tools.

The RPR may at any time, reject any batch of asphalt, on the truck or placed in the mat, which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or overheated asphalt mixture. 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 RPR, and if it can be demonstrated in the laboratory, in the presence of the RPR, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

Areas of segregation in the surface course, as determined by the RPR, shall be removed and replaced at the Contractor's expense. The area shall be removed by saw cutting and milling a minimum of the construction lift thickness as specified in paragraph 401-3.3, Table 2 for the approved mix design. The area to be removed and replaced shall be a minimum width of the paver and a minimum of 10 feet (3 m) long.

403-4.12 Compaction of asphalt mixture. After placing, the asphalt mixture shall be thoroughly and uniformly compacted by self-propelled rollers. The surface shall be compacted as soon as possible when the asphalt 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 surface defects and/or displacement occurring as a result of the roller, or from any other cause, shall be corrected at the Contractor's expense.

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 asphalt to the roller, the wheels shall be equipped with a scraper and kept moistened with water as necessary.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with approved power tampers.

Any asphalt 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.

403-4.13 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 asphalt 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 asphalt 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 with a cutting wheel or pavement saw a maximum of 3 inches (75 mm) to expose a clean, sound, uniform vertical surface for the full depth of the course. All cutback material and any laitance produced from cutting joints shall be removed from the project. An asphalt tack coat or other product approved by the RPR shall be applied to the clean, dry joint prior to placing any additional fresh asphalt against the joint. The cost of this work shall be considered incidental to the cost of the asphalt.

**

Cut back of all cold joints is required as specified above.

The Contractor may provide additional joint density QC by use of joint heaters at the Contractor's expense. Electrically powered infrared heating equipment should consist of one or more low-level radiant energy heaters to uniformly heat and soften the pavement joints. The heaters should be configured to uniformly heat an area up to 18 inches (0.5 m) in width and 3 inches (75 mm) in depth. Infrared equipment shall be thermostatically controlled to provide a uniform, consistent temperature increase throughout the layer being heated up to a maximum temperature range of 200°F to 300°F (93°C to 150°C).

Propane powered infrared heating equipment shall be attached to the paving machine and the output of infrared energy shall be in the one to six-micron

range. Converters shall be arranged end to end directly over the joint to be heated in sufficient numbers to continuously produce, when in operation, a minimum of 240,000 BTU per hour. The joint heater shall be positioned not more than one inch (25 mm) above the pavement to be heated and in front of the paver screed and shall be fully adjustable. Heaters will be required to be in operation at all times.

The heaters shall be operated so they do not produce excessive heat when the units pass over new or previously paved material.

**

403-4.14 Saw-cut grooving. [Saw-cut grooving is not required.][Saw-cut grooves shall be provided as specified in Item P-621.]

403-4.15 Diamond grinding. Diamond grinding shall be completed prior to pavement grooving. Diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive.

Diamond grinding shall be performed with a machine designed specifically for diamond grinding capable of cutting a path at least 3 feet (0.9 m) wide. The saw blades shall be 1/8-inch (3-mm) wide with a minimum of 55 to 60 blades per 12 inches (300 mm) of cutting head width; grooves between 0.090 and 0.130 inches (2 and 3.5 mm) wide; and peaks and ridges approximately 1/32 inch (1 mm) higher than the bottom of the grinding cut. The actual number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Equipment or grinding procedures that causes ravels, aggregate fractures, spalls or disturbance to the pavement will not be permitted.

Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The slurry resulting from the grinding operation shall be continuously removed and the pavement left in a clean condition. The Contractor shall apply a surface treatment per P-608 to all areas that have been subject to grinding.

403-4.16 Nighttime Paving Requirements. The Contractor shall provide adequate lighting during any nighttime construction. A lighting plan shall be submitted by the Contractor and approved by the RPR prior to the start of any nighttime work. All work shall be in accordance with the approved CSPP and lighting plan.

CONTRACTOR QUALITY CONTROL (CQC)

All federally funded projects over \$500K dollars where paving is the major work item must have a CQCP. It is strongly encouraged that a Contractor Quality Control Program (CQCP) be developed for all projects.

For projects that do not include a formal CQCP, this section can be edited to remove reference to a CQCP. However, QC testing is still required regardless of project size.

403-5.1 General. [The Contractor shall develop a CQCP in accordance with Item C-100. No partial payment will be made for materials that are subject to specific QC requirements without an approved CQCP.]

403-5.2 Contractor quality control (QC) facilities. [The Contractor shall provide or contract for testing facilities in accordance with Item C-100. The RPR shall be permitted unrestricted access to inspect the Contractor's QC facilities and witness QC activities. The RPR will advise the Contractor in writing of any noted deficiencies concerning the QC 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.]

403-5.3 Quality Control (QC) testing. The Contractor shall perform all QC tests necessary to control the production and construction processes applicable to these specifications [and as set forth in the approved CQCP. 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 QC Testing Plan shall be developed as part of the CQCP].

a. Asphalt content. A minimum of two tests shall be performed per day in accordance with ASTM D6307 or ASTM D2172 for determination of asphalt content. When using ASTM D6307, the correction factor shall be determined as part of the first test performed at the beginning of plant production; and as part of every tenth test performed thereafter. The asphalt content for the day 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 and 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 asphalt. The moisture content of the asphalt shall be determined once per lot in accordance with AASHTO T329 or ASTM D1461.

**

ASTM D1461 may be replaced with AASHTO T329 when moisture content will be determined by conventional oven or microwave.

**

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 asphalt at the plant, and the asphalt 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. Smoothness for Contractor Quality Control.

**

Note change in deviations on final surface course that require grinding, limited to deviations > 1/4 inch that trap water, intent here is to focus on areas that may cause issues with the safe operation of aircraft and to minimize grinding if it will not improve safety.

**

The Contractor shall perform smoothness testing in transverse and longitudinal directions daily to verify that the construction processes are producing pavement with variances less than 1/4 inch in 12 feet, identifying areas that may pond water which could lead to hydroplaning of aircraft. If the smoothness criteria is not met, appropriate changes and corrections to the construction process shall be made by the Contractor before construction continues

The Contractor may use a 12-foot (3.7 m) "straightedge, a rolling inclinometer meeting the requirements of ASTM E2133 or rolling external reference device that can simulate a 12-foot (3.7m) straightedge approved by the RPR. Straight-edge testing shall start 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. Testing shall be continuous across all joints. The 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 the two high points. If the rolling inclinometer or external reference device is used, the data may be evaluated using the FAA profile program, ProFAA, using the 12-foot straightedge simulation function.

Smoothness readings shall not be made across grade changes or cross slope transitions. The transition between new and existing pavement and between the start and stop of lanes place shall be evaluated separately for conformance with the plans.

**

Include detail for transition between new and existing pavement including smoothness and grade limitations.

**

(1) Transverse measurements. Transverse measurements shall be taken for each day's production placed. Transverse measurements will be taken perpendicular to the pavement centerline each 50 feet (15 m) or more often as determined by the RPR. The joint between lanes shall be tested separately to facilitate smoothness between lanes.

(2) Longitudinal measurements. Longitudinal measurements shall be taken for each day's production 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 (6 m); and at the third points of paving lanes when widths of paving lanes are 20 ft (6 m) or greater. When placement abuts previously placed material the first measurement shall start with one half the length of the straight edge on the previously placed material.

Deviations on the final surface course in either the transverse or longitudinal direction that will trap water greater than 1/4 inch (6 mm) shall be corrected with diamond grinding per paragraph 403-4.15 or by removing and replacing the surface course to full depth. Grinding shall be tapered in all directions to provide smooth transitions to areas not requiring grinding. All areas in which diamond grinding has been performed shall be subject to the final pavement thickness tolerances

specified in paragraph 401-6.1d(3) Areas that have been ground shall be sealed with a surface treatment in accordance with Item P-608. To avoid the surface treatment creating any conflict with runway or taxiway markings, it may be necessary to seal a larger area.

Control charts shall be kept to show area of each day's placement and the percentage of corrective grinding required. Corrections to production and placement shall be initiated when corrective grinding is required. If the Contractor's machines and/or methods produce significant areas that need corrective actions in excess of 10 percent of a day's production, production shall be stopped until corrective measures are implemented by the Contractor.

h. Grade. Grade shall be evaluated daily to allow adjustments to paving operations when grade measurements do not meet specifications. As a minimum, grade shall be evaluated prior to the placement of the first lift and then prior to and after placement of the surface lift.

Measurements will be taken at appropriate gradelines (as a minimum at center and edges of paving lane) and longitudinal spacing as shown on cross-sections and plans. The final surface of the pavement will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch (12 mm) vertically [and 0.1 feet (30 mm) laterally]. The documentation will be provided by the Contractor to the RPR [within 24 hours] [by the end of the following working day].

Areas with humps or depressions that exceed grade or smoothness criteria and that retain water on the surface must be ground off provided the course thickness after grinding is not more than 1/2 inch (12 mm) less than the thickness specified on the plans. Grinding shall be in accordance with paragraph 403-4.15.

The Contractor shall repair low areas or areas that cannot be corrected by grinding by removal of deficient areas to the depth of the final course plus 1/2 inch and replacing with new material. Skin patching is not allowed.

403-5.4 Sampling. When directed by the RPR, 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.

403-5.5 Control charts. The Contractor shall maintain linear control charts both for individual measurements and range (i.e., difference between highest and lowest measurements) for aggregate gradation, asphalt content, and VMA. The VMA for each day shall be calculated and monitored by the QC laboratory.

Control charts shall be posted in a location satisfactory to the RPR and 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 RPR 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 JMF 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 (19.0 mm)	±6%	±9%
1/2 inch (12.5 mm)	±6%	±9%
3/8 inch (9.5 mm)	±6%	±9%
No. 4 (4.75 mm)	±6%	±9%
No. 16 (1.18 mm)	±5%	±7.5%
No. 50 (300 µm)	±3%	±4.5%
No. 200 (75 µm)	±2%	±3%
Asphalt Content	±0.45%	±0.70%
Minimum VMA	-0.5%	-1.0%

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 ($n = 2$)

Sieve	Suspension Limit
1/2 inch (12.5 mm)	11%
3/8 inch (9.5 mm)	11%
No. 4 (4.75 mm)	11%
No. 16 (1.18 mm)	9%
No. 50 (300 µm)	6%
No. 200 (75 µm)	3.5%
Asphalt Content	0.8%

c. Corrective action. [The CQCP 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.]

403-5.6 Quality control (QC) reports. The Contractor shall maintain records and shall submit reports of QC activities daily [, in accordance with the CQCP described in Item C-100].

MATERIAL ACCEPTANCE

403-6.1. Quality Assurance 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 RPR at no cost to the Contractor except that coring as required in this section shall be completed and paid for by the Contractor.

a. Quality Assurance (QA) testing laboratory. The QA testing laboratory performing these acceptance tests will be accredited in accordance with ASTM D3666. The QA laboratory accreditation will be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing will be listed on the lab accreditation.

b. Lot Size. A standard lot will be equal to one day's production divided into approximately equal sublots of between 400 to 600 tons. When only one or two sublots are produced in a day's production, the sublots will be combined with the production lot from the previous or next day.

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

**

For large projects with high production rates, the Engineer may adjust the lot size to be ½ days production.

For small projects, with multiple small placements or if the total project size is less than 3000 tons (2270 metric tons), acceptable material will be paid for by the ton (metric ton) placed per day.

**

c. Asphalt air voids. Plant-produced asphalt will be tested for air voids on a subplot basis.

(1) Sampling. Material from each subplot shall be sampled in accordance with ASTM D3665. Samples shall be taken from material deposited into trucks at the plant or at the job site in accordance with ASTM D979. The sample of asphalt 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 maintain the material at or above the compaction temperature as specified in the JMF.

**

Engineer should increase hold times to not less than 60 minutes and not more than 90 minutes when absorptive aggregates are used.

**

(2) Testing. Air voids will be determined for each subplot in accordance with ASTM D3203 for a set of three compacted specimens prepared in accordance with [ASTM D6926] [ASTM D6925].

d. In-place asphalt mat and joint density. Each subplot will be tested for in-place mat and joint density as a percentage of the theoretical maximum density (TMD).

(1) Sampling. The [Contractor] [RPR] will cut minimum 5 inches (125 mm) diameter samples in accordance with ASTM D5361. The Contractor shall furnish all tools, labor, and materials for cleaning, and filling the cored pavement. Laitance produced by the coring operation shall

be removed immediately after coring, and core holes shall be filled within one day after sampling in a manner acceptable to the RPR.

(2) Bond. Each lift of asphalt shall be bonded to the underlying layer. If cores reveal that the surface is not bonded, additional cores shall be taken as directed by the RPR to determine the extent of unbonded areas. Unbonded areas shall be removed by milling and replaced at no additional cost as directed by the RPR.

(3) Thickness. Thickness of each lift of surface course will be evaluated by the RPR for compliance to the requirements shown on the plans after any necessary corrections for grade. Measurements of thickness will be made using the cores extracted for each subplot for density measurement. The maximum allowable deficiency at any point will not be more than 1/4 inch (6 mm) less than the thickness indicated for the lift. Average thickness of lift, or combined lifts, will 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 RPR to circumscribe the deficient area.

(4) Mat density. One core shall be taken from each subplot. Core locations will be determined by the RPR in accordance with ASTM D3665. Cores for mat density shall not be taken closer than one foot (30 cm) from a transverse or longitudinal joint. The bulk specific gravity of each cored sample will be determined in accordance with ASTM D2726. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each subplot sample by the TMD for that subplot.

(5) Joint density. One core centered over the longitudinal joint shall be taken for each subplot which contains a longitudinal joint. Core locations will be determined by the RPR in accordance with ASTM D3665. The bulk specific gravity of each core sample will be determined in accordance with ASTM D2726. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each joint density sample by the average TMD for the lot. The TMD used to determine the joint density at joints formed between lots will be the lower of the average TMD values from the adjacent lots.

403-6.2 Acceptance criteria.

a. General. Acceptance will be based on the implementation of the Contractor Quality Control Program (CQCP) and the following characteristics of the asphalt and completed pavements: air voids, mat density, joint density, grade [and Profilograph smoothness]

**

Only include profilograph smoothness for runway and/or taxiway pavement projects greater than 500 feet (150 m) in length.

**

b. Air voids. Acceptance of each lot of plant produced material for air voids will be based upon the average air void from the sublots. If the average air voids of the lot are equal to or greater than 2% and equal to or less than 5%, then the lot will be acceptable. If the average is below 2% or greater than 5%, the lot shall be removed and replaced at the Contractor's expense.

c. Mat density. Acceptance of each lot of plant produced material for mat density will be based on the average of all of the densities taken from the sublots. If the average mat density of the lot so established equals or exceeds 94%, the lot will be acceptable. If the average mat density of the lot is below 94%, the lot shall be removed and replaced at the Contractor's expense.

d. Joint density. Acceptance of each lot of plant produced asphalt for joint density will be based on the average of all of the joint densities taken from the sublots. If the average joint density of the lot

so established equals or exceeds 92%, the lot will be acceptable. If the average joint density of the lot is less than 92%, the Contractor shall stop production and evaluate the method of compacting joints. Production may resume once the reason for poor compaction has been determined and appropriate measures have been taken to ensure proper compaction.

e. Grade. The final finished surface of the pavement of the completed project shall be surveyed to verify that the grade elevations and cross-sections shown on the plans do not deviate more than 1/2 inch (12 mm) vertically [or 0.1 feet (30 mm) laterally].

Cross-sections of the pavement shall be taken at a minimum [50-foot (15-m)] longitudinal spacing and at all longitudinal grade breaks. Minimum cross-section grade points shall include grade at centerline, [\pm 10 feet of centerline], and edge of [runway] [taxiway] pavement.

The survey and documentation shall be stamped and signed by a licensed surveyor. Payment for sublots that do not meet grade for over 25% of the subplot shall not be more than 95%.

[**f. Profilograph roughness for QA Acceptance.** The final profilograph shall be the full length of the project to facilitate testing of roughness between lots. The [Contractor, in the presence of the RPR shall] [RPR will] perform a profilograph roughness test on the completed project with a profilograph meeting the requirements of ASTM E1274 or a Class I inertial profiler meeting ASTM E950. Data and results shall be provided within [48 hrs] of profilograph roughness tests.

The pavement shall have an average profile index less than 15 inches per mile per 1/10 mile. 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). Profilograph shall be performed one foot right and left of project centerline and 15 feet (4.5 m) right and left of project centerline. Any areas that indicate "must grind" shall be corrected with diamond grinding per paragraph 401-4.15 or by removing and replacing full depth of surface course. as directed by the RPR. Where corrections are necessary, a second profilograph run shall be performed to verify that the corrections produced an average profile index of 15 inches per mile per 1/10 mile or less.]

**

Profilograph roughness and acceptance adjustment paragraphs only apply when the overall project is a new and/or reconstructed runway(s) and/or taxiway(s) greater than 500 feet (152 m) in length.

Profilograph roughness is not applicable to aprons and should be used with caution on projects to rehabilitate runways and/or taxiways unless the project includes provisions to correct existing deficiencies.

Any changes to the profilograph roughness acceptance limits requires a modification to standards in accordance with FAA Order 5300.1, Modifications to Agency Airport Design, Construction, and Equipment Standards.

The Engineer must select who will provide the specified equipment and the timeframe for receiving the test data. The Airport should retain a copy of the profilograph roughness test and reports for inclusion in the Airport's Pavement Maintenance Management Program (PMP).

**

403-6.3 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 RPR. A retest will consist of all the sampling and testing procedures contained in paragraphs 403-6.1. Only one resampling per lot will be permitted.

(1) A redefined mat density will be calculated for the resampled lot. The number of tests used to calculate the redefined mat density will 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 mat density for a resampled lot will be used to evaluate the acceptance of that lot in accordance with paragraph 403-6.2.

c. Outliers. Check for outliers in accordance with ASTM E178, at a significance level of 5%. Outliers will be discarded and density determined using the remaining test values.

[**403-6.4 Leveling course.** The leveling course is the first variable thickness lift placed to correct surface irregularities prior to placement of subsequent courses. The leveling course shall meet the aggregate gradation in Table 2, paragraph 403-3.3. The leveling course shall meet the requirements of paragraph 403-3.3, 403-6.1b for air voids, but shall not be subject to the density requirements of paragraph 403-6.1c. The leveling course shall be compacted with the same effort used to achieve density of the control strip. The leveling course shall not exceed the lift thickness associated with each gradation in Table 2, paragraph 403-3.3.]

**

Use this paragraph only when there is a need to restore proper cross-section prior to overlaying. Areas of the pavement requiring a leveling course shall be shown on the plans.

**

METHOD OF MEASUREMENT

403-7.1 Measurement. Plant mix asphalt mix pavement shall be measured by the number of tons (kg) of asphalt pavement 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

403-8.1 Payment. Payment for a lot of asphalt mixture meeting all acceptance criteria as specified in paragraph 403-6.2 shall be made at the contract unit price per ton (kg) for asphalt. 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.

Payment will be made under:

Item P-403-8.1 Asphalt Mixture [] [Surface] [Base] [Binder]
[Leveling] Course - per ton (kg)

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

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 C142	Standard Test Method for Clay Lumps and Friable Particles in 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 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 D979	Standard Practice for Sampling Bituminous Paving Mixtures
ASTM D1073	Standard Specification for Fine Aggregate for Bituminous Paving Mixtures

ASTM D1074	Standard Test Method for Compressive Strength of Bituminous 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 D2172	Standard Test Method for Quantitative Extraction of Bitumen from 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 D3381	Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction
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 D4125	Standard Test Methods for Asphalt Content of Bituminous mixtures by the Nuclear Method
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4552	Standard Practice for Classifying Hot-Mix Recycling Agents
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 D5581	Standard Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus (6 inch-Diameter Specimen)
ASTM D5821	Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
ASTM D6307	Standard Test Method for Asphalt Content of Hot-Mix Asphalt by Ignition Method
ASTM D6373	Standard Specification for Performance Graded Asphalt Binder
ASTM D6752	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method

ASTM D6925	Standard Test Method for Preparation and Determination of the Relative Density of Hot Mix Asphalt (HMA) Specimens by Means of the SuperPave Gyratory Compactor
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 D6995	Standard Test Method for Determining Field VMA based on the Maximum Specific Gravity of the Mix (Gmm)
ASTM E11	Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
ASTM E178	Standard Practice for Dealing with Outlying Observations
ASTM E2133	Standard Test Method for Using a Rolling Inclinator to Measure Longitudinal and Transverse Profiles of a Traveled Surface
American Association of State Highway and Transportation Officials (AASHTO)	
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
AASHTO T 340	Standard Method of Test for Determining the Rutting Susceptibility of Hot Mix Asphalt (APA) Using the Asphalt Pavement Analyzer (APA)
Asphalt Institute (AI)	
MS-2	Mix Design Manual, 7th Edition
MS-26	Asphalt Binder Handbook AI State Binder Specification Database
FAA Orders	
5300.1	Modifications to Agency Airport Design, Construction, and Equipment Standards
Federal Highway Administration (FHWA)	
Long Term Pavement Performance Binder program	
Software	
FAARFIELD	
END OF ITEM P-403	

Item P-501 Cement Concrete Pavement

DESCRIPTION

501-1.1 This work shall consist of pavement composed of cement concrete [with reinforcement] [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. The terms cement concrete, hydraulic cement concrete, and concrete are interchangeable in this specification.

The Engineer shall specify with or without reinforcement. Item P-610, Cement Concrete shall be used for sign bases and other formed concrete structures.

The dimensions and depth of the concrete shall be as defined by the Engineer's pavement design performed in accordance with advisory circular (AC) 150/5320-6, Airport Pavement Design and Evaluation and FAARFIELD. The current version of FAARFIELD is available at: www.faa.gov/airports/engineering/design_software/

MATERIALS

501-2.1 Aggregates.

a. Reactivity. Fine and Coarse aggregates to be used in PCC on this project shall be tested and evaluated by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and ASTM C1567. Tests must be representative of aggregate sources which will be providing material for production. ASTM C1260 and ASTM C1567 tests may be run concurrently.

(1) Coarse aggregate and fine aggregate shall be tested separately in accordance with ASTM C1260, however, the length of test shall be extended to 28 days (30 days from casting). Tests must have been completed within 6 months of the date of the concrete mix submittal.

(2) The 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 the expansion does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion 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.

(3) 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 in lieu of ASTM C1567. If lithium nitrate admixture is used, it shall be nominal 30% \pm 0.5% weight lithium nitrate in water. If the expansion does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion 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. Grading of the fine aggregate, as delivered to the mixer, shall conform to the requirements of ASTM C33 and the parameters identified in the fine aggregate material requirements below. Fine aggregate material requirements and deleterious limits are shown in the table below.

Fine Aggregate Material Requirements		
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 10% maximum using Sodium sulfate - or - 15% maximum using magnesium sulfate	ASTM C88
Sand Equivalent	[45] minimum	ASTM D2419
Fineness Modulus (FM)	$2.50 \leq FM \leq 3.40$	ASTM C136
Limits for Deleterious Substances in Fine Aggregate for Concrete		
Clay lumps and friable particles	1.0% maximum	ASTM C142
Coal and lignite	0.5% using a medium with a density of Sp. Gr. of 2.0	ASTM C123
Total Deleterious Material	1.0% maximum	

c. Coarse aggregate. The maximum size coarse aggregate shall be [____].

Aggregates delivered to the mixer shall be clean, hard, uncoated aggregates consisting of crushed stone, crushed or uncrushed gravel, air-cooled iron blast furnace slag, crushed recycled concrete pavement, or a combination. The aggregates shall have no known history of detrimental pavement staining. Steel blast furnace slag shall not be permitted. Coarse aggregate material requirements and deleterious limits are shown in the table below; washing may be required to meet aggregate requirements.

Select maximum aggregate size (typically 1-1/2-inch, 1-inch, or 3/4-inch) based on what is locally available and considering freeze-thaw vulnerability.

Dust and other coatings may need to be removed from the aggregate by washing in order to meet material requirements.

On large projects and/or projects that span multiple construction seasons, additional aggregate tests may be necessary to validate consistency of aggregate produced and delivered for the project.

Some aggregates may contain ferrous sulfides and iron oxides which can cause stains on exposed concrete surfaces. In areas where staining has been

a problem or is suspected, the Engineer should verify that producers and aggregate suppliers have taken steps to minimize the inclusion of any ferrous sulfides or iron oxides in aggregate to be used in the project.

If there is a concern that these may exist, a known indicator to identify staining particles is to immerse the aggregate in a lime slurry. If staining particles are present, a blue-green gelatinous precipitate will form within five (5) to 10 minutes, rapidly changing to a brown color on exposure to air and light. The reaction should be complete in 30 minutes. If no brown gelatinous precipitate forms, there is little chance of reaction in concrete. (Portland Concrete Association, Design and Control of Concrete Mixtures)

Coarse Aggregate Material Requirements

Material Test	Requirement	Standard
Resistance to Degradation	Loss: 40% maximum	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Flat, Elongated, or Flat and Elongated Particles	8% maximum, by weight, of flat, elongated, or flat and elongated particles at 5:1 for any size group coarser than 3/8 (9.5 mm) sieve ¹	ASTM D4791
Bulk density of slag ²	Weigh not less than 70 pounds per cubic foot (1.12 Mg/cubic meter)	ASTM C29
[D-cracking (Freeze-Thaw) ³	Durability factor ≥ 95	ASTM C666]

¹ A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

² Only required if slag is specified.

[³ Coarse aggregate may only be accepted from sources that have a 20-year service history for the same gradation to be supplied with no history of D-Cracking. Aggregates that do not have a 20-year record of service free from major repairs (less than 5% of slabs replaced) in similar conditions without D-cracking shall not be used unless the material currently being produced has a durability factor greater than or equal to 95 per ASTM C666. The Contractor shall submit a current certification and test results to verify the aggregate acceptability. Test results will only be accepted from a State Department of Transportation (DOT) materials laboratory or an accredited laboratory. Certification and test results which are not dated or which are over one (1) year old or which are for different gradations will not be accepted.]

In areas where D-cracking is not a concern, delete the D-cracking (ASTM C666) and corresponding footnote in the above table.

Crushed granite, calcite cemented sandstone, quartzite, basalt, diabase, rhyolite or trap rock are considered to meet the D-cracking test requirements but must meet all other quality tests specified in Item P-501.

In areas of freeze-thaw that have had problems with Chert popouts, prior to reducing the limit on Chert verify that aggregate sources are available that can meet specification. Very rare for sedimentary deposits to meet requirements less than 1%. Elimination of Chert may require that contractor utilize non sedimentary aggregates.

The amount of deleterious material in the coarse aggregate shall not exceed the following limits:

Limits for Deleterious Substances in Coarse Aggregate

Deleterious material	ASTM	Percentage by Mass
Clay Lumps and friable particles	ASTM C142	1.0
Material finer than No. 200 sieve (75 µm)	ASTM C117	1.0 ¹
Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Chert ² (less than 2.40 Sp Gr.)	ASTM C123 using a medium with a density of Sp. Gr. of 2.40)	[0.1] ³

¹ The limit for material finer than 75-µm is allowed to be increased to 1.5% for crushed aggregates consisting of dust of fracture that is essentially free from clay or shale. Test results supporting acceptance of increasing limit to 1.5% with statement indicating material is dust of fracture must be submitted with Concrete mix. Acceptable techniques to characterizing these fines include methylene blue adsorption or X-ray diffraction analysis.

² Chert and aggregates with less than 2.4 specific gravity.

³ The limit for chert may be increased to 1.0 percent by mass in areas not subject to severe freeze and thaw.

d. Combined aggregate gradation. This specification is targeted for a combined aggregate gradation developed following the guidance presented in United States Air Force Engineering Technical Letter (ETL) 97-5: Proportioning Concrete Mixtures with Graded Aggregates for Rigid Airfield Pavements. Base the aggregate grading upon a combination of all the aggregates (coarse and fine) to be used for the mixture proportioning. Three aggregate sizes may be required to achieve an optimized combined gradation that will produce a workable concrete mixture for its intended use. Use aggregate gradations that produce concrete mixtures with well-graded or optimized aggregate combinations. The Contractor shall submit complete

mixture information necessary to calculate the volumetric components of the mixture. The combined aggregate grading shall meet the following requirements:

(1) 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 paragraph 501-2.1d(4) below, the point thus determined shall fall within the parallelogram described therein.

(2) The CF shall be determined from the following equation:

$$CF = \frac{(\text{cumulative percent retained on the } 3/8 \text{ in. (9.5 mm) sieve})(100)}{(\text{cumulative percent retained on the No. 8 (2.36 mm) sieve})}$$

(3) The 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).

(4) 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. The point determined by the plotting of the CF and WF may be adjusted during production ± 3 WF and ± 5 CF. Adjustments to gradation may not take the point outside of the parallelogram.

e. Contractors combined aggregate gradation. The Contractor shall submit their combined aggregate gradation using the following format:

Contractor's Combined Aggregate Gradation

Sieve Size	Contractor's Concrete mix Gradation (Percent passing by weight)
2 inch (50 mm)	*
1-1/2 inch (37.5 mm)	*
1 inch (25.0 mm)	*
3/4 inch (19.0 mm)	*
1/2 inch (12.5 mm)	*
3/8 inch (9.5 mm)	*
No. 4 (4.75 mm)	*
No. 8 (2.36 mm)	*
No. 16 (1.18 mm)	*
No. 30 (600 μ m)	*
No. 50 (300 μ m)	*
No. 100 (150 μ m)	*

Table remains blank until the Contractor submits the concrete mix.

Reference United States Air Force Engineering Technical Letter (ETL) 97-5: Proportioning Concrete Mixtures with Graded Aggregates for Rigid Airfield Pavements. The ETL is available at the following website:

<https://www.wbdg.org/ffc/dod/supplemental-technical-criteria/tspwg-m-3-250-04-97-05>

501-2.2 Cement. Cement shall conform to the requirements of ASTM [] Type [].

The Engineer shall specify all of the following that are acceptable for use on the project:

ASTM C150 - Type I, II, or V.

ASTM C595 - Type IP, IS, IL.

ASTM C1157 – Types GU, HS, MH.

Other cements may be specified with concurrence of the FAA.

Low alkali cements (less than 0.6% equivalent alkali, the low reactivity option in ASTM C595, or Option R in ASTM C1157) shall be specified.

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 shall have a Calcium Oxide (CaO) content of less than 15% and a total alkali content less than 3% per ASTM C311. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the concrete mix, 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 Resident Project Representative (RPR).

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 or ASTM D1752 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 RPR. 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 RPR.

501-2.6 Steel reinforcement. Reinforcing shall consist of [] conforming to the requirements of ASTM [].

The Engineer shall designate one of the following:

ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

ASTM A706 Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

ASTM A775 Standard Specification for Epoxy-Coated Steel Reinforcing Bars

ASTM A934 Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars

ASTM A1064 Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

ASTM A184 or A704 Bar mats

ASTM A1035 Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement

ASTM A884 Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement

Welded wire fabric shall be furnished in flat sheets only.

Delete this paragraph when not applicable to the project.

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.

a. Dowel Bars. Before delivery to the construction site each dowel bar shall be epoxy coated per ASTM A1078, Type 1, with a coating thickness after curing greater than 10 mils. Patched ends are not required for Type 1 coated dowels. 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.

b. Tie Bars. 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.

After coordination with the FAA regarding need and eligibility of additional corrosion protection, the Engineer may require additional corrosion protection or resistance such as chromium dowel and tie bars meeting ASTM A1035; or stainless steel dowel and tie bars meeting ASTM A955.

501-2.8 Water. Water used in mixing or curing shall be potable. If water is taken from other sources considered non-potable, it shall meet 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 A, or Class B.

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. Admixtures shall conform to the following specifications:

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-entraining 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.

c. Other admixtures. The use of set retarding and set-accelerating admixtures shall be approved by the RPR prior to developing the concrete mix. Retarding admixtures shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating admixtures 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:

Lithium Admixture

Constituent	Limit (Percent by Mass)
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)

The lithium nitrate admixture dispensing and mixing operations shall be verified and certified by the lithium manufacturer's representative.

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 Bond Breaker. [Choke stone shall be an ASTM C33 Number 89 stone.] [Fabric shall meet the requirements of AASHTO M 288 Class I fabric with elongation not less than 50% at the specified strengths, with a weight not less than 14.5 oz/sy. A certificate of compliance (COC) shall be provided by the fabric manufacturer that the material may be used as a bond breaker.] [Liquid membrane forming compound shall be in accordance with paragraph 501-2.7.] [Not required.]

The Engineer must select the bond breaker when concrete pavement will be placed directly above the lean concrete base. Coordinate with paragraph 501-.

CONCRETE MIX

501-3.1. General. No concrete shall be placed until an acceptable concrete mix has been submitted to the RPR for review and the RPR has taken appropriate action. The RPR's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

501-3.2 Concrete Mix Laboratory. The laboratory used to develop the concrete mix 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 must be included in the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the RPR prior to start of construction.

501-3.3 Concrete Mix Proportions. Develop the mix using the procedures contained in Portland Cement Association (PCA) publication, "Design and Control of Concrete Mixtures." Concrete shall be proportioned to achieve a 28-day flexural strength that meets or exceeds the acceptance criteria contained in paragraph 501-6.6 for a flexural strength of [] psi per ASTM C78.

The Engineer shall specify a minimum contractual acceptance flexural strength for airport pavements sufficient to assure that the pavement achieves the design flexural strength prior to being placed in service. Note the design strength used in FAARFIELD structural analysis is approximately 5% higher than the construction acceptance strength e.g. if structural design strength is 650 psi (4482 kPa), then the construction acceptance strength would be approximately 620 psi (4275 kPa).

If local materials utilized consistently produce above the design strength limit with the minimum amount of cementitious material, the Engineer may allow a reduction in the minimum amount of cementitious material with approval of the FAA.

Due to variations in materials, operations, and testing, the average strength of concrete furnished by a supplier should be higher than the specified strength to ensure a good statistical chance of meeting the acceptance criteria throughout the duration of the job. The strength necessary to meet specification requirements depends on the producer's standard deviation of flexural test results and the accuracy that the value can be estimated from historic data for the same or similar materials.

For pavements designed to accommodate aircraft gross weights of 60,000 pounds (27215 kg) or less, this section may be modified to indicate that concrete shall be designed to achieve a 28-day compressive strength that meets or exceeds the acceptance criteria for a compressive strength of 4,400 psi (30337 kPa) per ASTM C39.

The use of materials that meet state highway specifications for airfield pavement construction materials is permitted at non-primary airports serving aircraft that do not exceed 60,000 pounds gross weight.

The use of State highway specifications for materials requires a Modification of Standards in accordance with FAA Order 5300.1. The project specification must include a copy of all referenced state specifications.

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 [____] pounds per cubic yard ([____] 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 be between 0.38 – 0.45 by weight.

A minimum total cementitious material content of 470 pounds per cubic yard (280 kg per cubic meter) should be specified. A higher minimum may be necessary to meet the specified strength when other cementitious materials are substituted or to meet durability requirements for severe freeze/thaw, deicer, or sulfate exposure.

The minimum total cementitious requirement should not be less than 517 pounds per cubic yard (310 kg per cubic meter) where severe freeze-thaw, deicer, or sulfate exposure is expected. The Engineer shall specify a maximum water/cementitious ratio of 0.45 unless a lower water/cementitious ratio is necessary for severe freeze/thaw, deicer, sulfate exposure, or other local conditions. A water/cementitious ratio of less than 0.38 shall be subject to approval by the Engineer and the FAA.

Flexural strength test specimens shall be prepared in accordance with ASTM C192 and tested in accordance with ASTM C78. At the start of the project, the Contractor shall determine an allowable slump as determined by ASTM C143 not to exceed 2 inches (50 mm) for slip-form placement. For fixed-form placement, the slump shall not exceed 3 inches (75 mm). For hand placement, the slump shall not exceed 4 inches (100 mm).

When the flexural design strength in paragraph 501-3.3 is to be accepted on the basis of compressive strength, the following procedure establishes the correlation between compressive and flexural strength for the concrete mix. Each concrete mix will require a separate correlation.

Cylinders/Beams

- a. Fabricate all beams and cylinders for each mixture from the same batch or blend of batches. Fabricate and cure all beams and cylinders in accordance with ASTM C192, using 6 × 6-inch (150 ×**

150 mm) steel beam forms and 6 × 12-inch (150 × 300 mm) single-use cylinder forms.

b. Cure test beams from each mixture for 3, 7, 14, [28] and [90]-day flexural tests; three (3) beams to be tested per age.

c. Cure test cylinders from each mixture for 3, 7, 14, [28] and [90]-day compressive strength tests; three (3) cylinders to be tested per age.

d. Test beams in accordance with ASTM C78, cylinders in accordance with ASTM C39.

e. Using the average strength for each age, plot all results on separate graphs for each w/c versus:

- 3-day flexural strength
- 7-day flexural strength
- 14-day flexural strength
- [28-day flexural strength]
- [90-day flexural strength]
- 3-day compressive strength
- 7-day compressive strength
- 14-day compressive strength
- [28-day compressive strength]
- [90-day compressive strength]

f. From the above expected strengths for the selected mixture determine the following Correlation Ratios:

(1) Ratio of the 14-day compressive strength of the selected mixture to the [28] [90]-day flexural strength of the mixture (for acceptance).

(2) Ratio of the 7-day compressive strength of the selected mixture to the [28] [90]-day flexural strength of the mixture (for Contractor QC control).

g. If there is a change in materials, additional mixture design studies shall be made using the new materials and new Correlation Ratios shall be determined.

h. No concrete pavement shall be placed until the Engineer has approved the Contractor's mixture proportions. The approved water-cementitious materials ratio shall not exceed the maximum value specified.

The results of the concrete mix 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.

If a change in source(s) is made, or admixtures added or deleted from the mix, a new concrete mix must be submitted to the RPR for approval.

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

501-3.4 Concrete Mix submittal. The concrete mix shall be submitted to the RPR at least [30] days prior to the start of operations. The submitted concrete mix shall not be more than 180 days old and must use the materials to be used for production for the project. Production shall not begin until the concrete mix is approved in writing by the RPR.

Each of the submitted concrete mixes (i.e, slip form, side form machine finish and side form hand finish) shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items and quantities as a minimum:

- Certified material test reports for aggregate in accordance with paragraph 501-2.1. Certified reports must include all tests required; reporting each test, test method, test result, and requirement specified (criteria).
- Combined aggregate gradations and analysis; and including plots of the fine aggregate fineness modulus.
- Reactivity Test Results.
- Coarse aggregate quality test results, including deleterious materials.
- Fine aggregate quality test results, including deleterious materials.
- Mill certificates for cement and supplemental cementitious materials.
- Certified test results for all admixtures, including Lithium Nitrate if applicable.
- Specified flexural strength, slump, and air content.
- Recommended proportions/volumes for proposed mixture and trial water-cementitious materials ratio, including actual slump and air content.
- Flexural and compressive strength summaries and plots, including all individual beam and cylinder breaks.
- Correlation ratios for acceptance testing and Contractor QC testing, when applicable.
- Historical record of test results documenting production standard deviation, when applicable.

501-3.5 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.

c. Raw or calcined natural pozzolan. Natural pozzolan may be used in the concrete mix. 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 concrete mix with the RPR'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 7% and 16% by weight of the total cementitious material.]

501-3.6 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 [____]. 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.

The Engineer must specify the appropriate air content for the exposure level for the project location at the maximum aggregate size specified in paragraph 501-2.1(c).

Recommended Air Content (Percent)

Exposure Level	Maximum Size Aggregate				
	2 inch (50 mm)	1-1/2 inch (37.5 mm)	1 inch (25.0 mm)	3/4 inch (19.0 mm)	1/2 inch (12.5 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%

1. Mild exposure - When desired for other than durability, such as to improve workability. Used where pavement will not be exposed to freezing or to deicing agents.
2. Moderate exposure - Service in a climate where freezing is expected but where the concrete will not be continually exposed to moisture or free water for long periods

prior to freezing and will not be exposed to deicing agents or other aggressive chemicals.

3. Severe exposure - Concrete which is exposed to deicing chemicals or other aggressive agents or where the concrete may become highly saturated by continual contact with moisture or free water prior to freezing.

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 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 with the materials to be used in the work, in accordance with ASTM C494.

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.

CONSTRUCTION METHODS

501-4.1 Control Strip. The control strip(s) shall be to the next planned joint after the initial 250 feet (75 m) of each type of pavement construction (slip-form pilot lane, slip-form fill-in lane, or fixed form). The Contractor shall demonstrate, in the presence of the RPR, that the materials, concrete mix, equipment, construction processes, and quality control processes meet the requirements of the specifications. The concrete mixture shall be extruded from the paver meeting the edge slump tolerance and with little or no finishing. Pilot, fill-in, and fixed-form control strips will be accepted separately. Minor adjustments to the mix design may be required to place an acceptable control strip. The production mix will be the adjusted mix design used to place the acceptable control strip. Upon acceptance of the control strip by the RPR, the Contractor must use the same equipment, materials, and construction methods for the remainder of concrete paving. Any adjustments to processes or materials must be approved in advance by the RPR. Acceptable control strips will meet edge slump tolerance and surface acceptable with little or no finishing, air content within action limits, strength equal or greater than requirements of P501-3.3. The control strip will be considered one lot for payment (no sublots required for control strip). Payment will only be made for an acceptable control strip in accordance with paragraph 501-8.1 using a lot pay factor equal to 100.

501-4.2 Equipment. The Contractor is responsible for the proper operation and maintenance of all equipment necessary for handling materials and performing all parts of the work to meet this specification.

a. Plant and equipment. The plant and mixing equipment shall conform to the requirements of ASTM C94 and/or ASTM C685. Each truck 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. The truck mixers 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.

Equipment for transferring and spreading concrete from the transporting equipment to the paving lane in front of the finishing equipment shall be provided. The equipment shall be specially manufactured, self-propelled transfer equipment which will accept the concrete outside the paving lane and will 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.

b. Finishing equipment.

(1) Slip-form. The standard method of constructing concrete pavements shall be with an approved slip-form paving equipment designed and operated to spread, consolidate, screed, and 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.

(2) Fixed-form. On projects requiring less than [10,000 cubic yards (7650 cubic meters)] of concrete pavement or irregular areas at locations inaccessible to slip-form paving equipment, concrete pavement may be placed with equipment specifically designed for placement and finishing using stationary side forms. Methods and equipment shall be reviewed and accepted by the RPR. Hand screeding and float finishing may only be used on small irregular areas as allowed by the RPR.

The Engineer may reduce the quantity of concrete when fixed forms are allowed.

c. Vibrators. Vibrator shall be the internal type. The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without segregation or voids. 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) 309R, 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 RPR.

Hand held vibrators may only be used in irregular areas and shall meet the recommendations of ACI 309R, Guide for Consolidation of Concrete.

d. 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.

e. Fixed forms. Straight side fixed forms shall be made of steel and shall be furnished in sections not less than 10 feet (3 m) in length. 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 RPR. 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 RPR. The forms shall extend the full depth of the pavement section.

501-4.3 Form setting. Forms shall be set to line and grade as shown on the plans, sufficiently in advance of the concrete placement, to ensure continuous paving operation. Forms shall be set to 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 concrete placement.

501-4.4 Base surface preparation prior to placement. Any damage to the prepared base, subbase, and subgrade shall be corrected full depth by the Contractor prior to concrete placement. The underlying surface shall be entirely free of frost when concrete is placed. The prepared grade shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from concrete. [Bond breaker shall be applied in accordance with 501-2.12.]

The Engineer should ensure the plans show that the appropriate prepared base, subbase, and subgrade extend a width sufficient to support the paving machine track without any noticeable displacement of the paver. Typical widths up to 3 feet (1 m) are required to support the paver track.

The Engineer will determine if a bond breaker is required and insert the appropriate P-specification for the project.

501-4.5 Handling, measuring, and batching material. Aggregate stockpiles shall be constructed and managed 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. Store and maintain all aggregates at a uniform moisture content prior to use. A continuous supply of materials shall be provided to the work to ensure continuous placement.

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 are placed into the drum until the drum is emptied into the truck. All concrete shall be mixed and delivered to the site in accordance with the requirements of ASTM C94 or ASTM C685.

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 discharged from the truck should 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. In no case shall the temperature of the concrete when placed exceed 90°F (32°C). 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 is not exceeded.

Depending on the location of the batch plant, this time can be adjusted. Batch plant location must be provided to ensure that the time limit is reasonable to allow for delivery and placement of concrete within the allotted time.

501-4.7 Weather 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 RPR, 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.

Curing during cold weather shall be in accordance with paragraph 501-4.13d.

Information regarding cold weather concreting practices may be found in ACI 306R, Cold Weather Concreting.

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 concrete placement shall be protected from exceeding an evaporation rate 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. If the Contractor's measures are not effective in preventing plastic cracking, paving operations shall be immediately stopped.

Curing during hot weather shall be in accordance with paragraph 501-4.13e.

**Information regarding hot weather concreting practices may be found in
ACI 305R, Hot Weather Concreting.**

c. Temperature management program. Prior to the start of paving operation for each day of paving, the Contractor shall provide the RPR with a Temperature Management Program for the concrete to be placed to assure that uncontrolled cracking is avoided. (Federal Highway Administration HIPERPAV 3 is one example of a temperature management program.) 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 19-9, 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.

**Federal Highway Administration HIPERPAV 3 is one example of a
temperature management program. The software is available at
<http://www.hiperpav.com/>**

d. Rain. 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.

501-4.8 Concrete Placement. 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 (3.8 MPa)] [a compressive strength of 3,100 psi (21.4 MPa)], based on the average of four field cured specimens per 2,000 cubic yards (1,530 cubic meters) of concrete placed. The Contractor must determine that the above minimum strengths are adequate to protection the pavement from overloads due to the construction equipment proposed for the project.

The Engineer shall choose flexural or compressive strength based on concrete mix requirement. The strength needed for construction traffic is dependent upon the loads it will be exposed to. The strength needed for a thin pavement at a small airport may be more than is needed for a thick pavement at a large airport. Coordinate the strength in 501-4.8, 501-4.17 and 501-4.18. Engineer must determine strength required to accommodate construction loads (e.g. hauling, placing, etc.) without damaging pavement, for each project. Strength needed can be adjusted during construction if contractor provides detailed engineering calculations supporting actual construction loads.

The Contractor shall have available materials for the protection of the concrete during cold, hot and/or inclement weather in accordance with paragraph 501-4.7.

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 sufficient to consolidate the pavement without, segregation, voids, or vibrator trails 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 should be adjusted 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 (150 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 (150 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 (150 m) of paving lane originally constructed as a separate lane will have 1,000 feet (300 m) of free edge, 500 feet (150 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 will be removed the full width of the slip form lane and replaced at the expense of the Contractor as directed by the RPR.

b. Fixed-form construction. Forms shall be drilled in advance of being placed to line and grade to accommodate tie bars / dowel 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 coated with a release agent each time they are used and before concrete is placed against them.

Concrete shall be spread, screed, 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. The equipment must be specifically designed for placement and finishing using stationary side forms. Methods and equipment shall be reviewed and accepted by the RPR.

Concrete for the full paving width shall be effectively consolidated by internal vibrators. The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without segregation, voids, or leaving vibrator trails.

Power to vibrators shall be connected so that vibration ceases when forward or backward motion of the machine is stopped.

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 2 inches (50 mm). Vibrators shall not be used to transport or spread the concrete. 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) or over-consolidation (vibrator trails, segregation, or any other evidence) shall require the immediate stopping of the paving operation and adjustment of the equipment or procedures as approved by the RPR.

If a lack of consolidation of the hardened concrete is suspected by the RPR, referee testing may be required. Referee testing of hardened concrete will be performed by the RPR by cutting cores from the finished pavement after a minimum of 24 hours curing. The RPR shall visually examine the cores for evidence of lack of consolidation. Density determinations will be made by the RPR 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 m²) 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 concrete mix density, with no cores having a density of less than 96% of the original concrete mix 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 screed. 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 (12 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-foot (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. The filler shall be fastened uniformly along the hardened joint face with no buckling or debris between the filler and the concrete interface, including a temporary filler for the sealant reservoir at the top of the slab. The edges of the joint shall be finished and tooled while the concrete is still plastic

An isolation joint is primarily used to separate structures with different foundations and pavements with different joint patterns. It does not

provide for expansion by the material compressing, but rather allowing the joint to slip. There should rarely be an occasion to dowel an isolation joint since it defeats the purpose of the joint and does not permit isolation and slippage. A thickened-edge is the preferred load transfer method for isolation joints.

d. Dowels and Tie Bars for Joints

(1) 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 and within the tolerances in paragraph 501-4.10(f.). 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.

(2) Dowel bars. Dowel bars shall be placed across joints in the proper horizontal and vertical alignment as shown on the plans. The dowels shall be coated with a bond-breaker or other lubricant recommended by the manufacturer and approved by the RPR. Dowels bars at longitudinal construction joints shall be bonded in drilled holes.

(3) Placing dowels and tie bars. Horizontal spacing of dowels shall be within a tolerance of $\pm 3/4$ inch (19 mm). The vertical location on the face of the slab shall be within a tolerance of $\pm 1/2$ inch (12 mm). The method used to install dowels shall ensure that the horizontal and vertical alignment will not be greater than $1/4$ inch per foot (6 mm per 0.3 m), 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 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.

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 and/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 and/or tie bar length, but not closer than 6 inches (150 mm) to its nearest neighbor.

(a) Contraction joints. Dowels and tie bars in longitudinal and transverse contraction joints within the paving lane shall be held securely in place 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, dowels and tie bars in contraction joints may be installed by insertion into the plastic concrete using approved equipment and procedures per the paver manufacturer's design. Approval of installation methods will be based on the results of the control strip showing that the dowels and tie bars are installed within specified tolerances as verified by cores or non-destructive rebar location devices approved by the RPR.

Non-destructive rebar location devices include the MIT scanner, Pachometer, R-Meter, etc.

(b) 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.

(c) Joints in hardened concrete. Install dowels in hardened concrete by bonding the dowels into holes drilled into the concrete. The concrete shall have cured for seven (7) days or reached a minimum [compressive strength of 3100 psi ((21.4 MPa))][flexural strength of 450 psi (3.1 MPa)] before drilling begins. 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. Spalling beyond the limits of the grout retention ring will require modification of the equipment and operation. 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 by means of a suitable metal or plastic grout retention ring fitted around the dowel.

e. Sawing of joints. 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. 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 saw-cut and maintained for the remaining cure period.

Joints shall be cut in locations as shown on the plans. The initial joint cut shall be a minimum 1/8 inch (3 mm) wide and to the depth shown on the plans. Prior to placement of joint sealant or seals, the top of the joint shall be widened by sawing as shown on the plans.

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, edging of joints, and then texturing. 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. Equipment, mixture, and/or procedures which produce more than 1/4 inch (6 mm) of mortar-rich surface shall be immediately modified as necessary to eliminate this condition or operations shall cease. 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. Fog (mist) sprays or other surface applied finishing aids specified to prevent plastic shrinkage cracking, approved by the RPR, may be used in accordance with the manufacturers requirements.

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. Equipment, mixture, and/or procedures which produce more than 1/4 inch (6 mm) of mortar-rich surface shall be immediately modified as necessary to eliminate this condition or operations shall cease. Remove excessive slurry from the surface with a cutting straightedge and wipe off the edge. 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 RPR'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.

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 12-foot (3.7-m) finishing straightedge swung from handles capable of spanning at least 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. 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.

501-4.12 Surface texture. The surface of the pavement shall be finished as designated below for all newly constructed concrete pavements. It is important that the texturing equipment not tear or unduly roughen the pavement surface during the operation. The texture shall be uniform in appearance and approximately 1/16 inch (2 mm) in depth. Any imperfections resulting from the texturing operation shall be corrected to the satisfaction of the RPR.

a. Brush or broom finish. [Shall be applied when the water sheen has practically disappeared. The equipment shall operate transversely across the pavement surface.] [Not used.]

b. Burlap drag finish. [Burlap, at least 15 ounces per square yard (555 grams per square meter), will typically produce acceptable texture. 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.] [Not used.]

c. Artificial turf finish. [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. Approval of the artificial turf 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.] [Not used.]

The Engineer shall specify the type(s) of finishes to be used on project.

501-4.13 Curing. Immediately after finishing operations are completed and bleed water is gone from the surface, all exposed surfaces 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-saw-cut method is used to construct the contraction joint, the curing compound shall be applied to the saw-cut 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.

The Engineer shall delete cure types that may not be feasible in operating areas subject to aircraft jet blast.

The use of supplementary cementitious materials (for example, fly ash, slag cement) or set-retarding admixtures may delay the occurrence of bleed water.

a. Impervious membrane method. Curing with liquid membrane compounds should not occur until bleed and surface moisture has evaporated. All exposed surfaces 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 square feet (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 RPR, a double application rate shall be used to ensure coverage. 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.

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. Maintain the concrete at a 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 7-day curing period. 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 RPR.

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 in accordance with paragraph 501-4.13.

If honeycombed areas are evident when the forms are removed, materials, placement, and consolidation methods must be reviewed and appropriate adjustments made to assure adequate consolidation at the edges of future concrete placements. Honeycombed areas that extend into the slab less than approximately 1 inch (25 mm), shall be repaired with an approved grout, as directed by the RPR. Honeycombed areas that extend into the slab greater than a depth of 1 inch (25 mm) shall be considered as defective work and shall be removed and replaced in accordance with paragraph 501-4.19.

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][P-605].

The Engineer shall include the applicable specifications.

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 RPR. 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 RPR.

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, the joints are protected, the concrete has attained a minimum field cured flexural strength of [450 psi (3100 kPa)], and the slab edge is protected.

All new and existing pavement carrying construction traffic or equipment shall be kept clean and spillage of concrete and other materials shall be cleaned up immediately.

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 [450 pounds per square inch (3100 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.

When the design strength in paragraph 501-3.3 is based on compressive strength, a strength of 3,100 psi (21400 kPa) shall be specified. Testing shall be in accordance with ASTM C39. See note with paragraph 501-4.8 for guidance on editing 501-4.17 and 501-4.18.

501-4.19 Repair, removal, or replacement of slabs. New pavement slabs that are broken or contain cracks or are otherwise defective or unacceptable as defined by acceptance criteria in paragraph 501-6.6 shall be removed and replaced or repaired, as directed by the RPR, at the Contractor's expense. 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 RPR 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 have a diameter of 2 inches (50 mm) to 4 inches (100 mm), 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 a bonding agent, using approved procedures. Drilling of cores and refilling holes shall be at no expense to the Owner. Repair of cracks as described in this section shall not be allowed if in the opinion of the RPR 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.

a. Shrinkage cracks. Shrinkage cracks which do not exceed one-third of the pavement depth shall be cleaned and either high molecular weight methacrylate (HMWM) applied; or epoxy resin (Type IV, Grade 1) pressure injected using procedures recommended by the

manufacturer and approved by the RPR. Sandblasting of the surface may be required following the application of HMWM to restore skid resistance. Care shall be taken to ensure that the crack is not widened during epoxy resin injection. All epoxy resin injection shall take place in the presence of the RPR. Shrinkage cracks which exceed one-third the pavement depth shall be treated as full depth cracks in accordance with paragraphs 501-4.19b and 501-19c.

b. 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 one-third the pavement depth, that extend into the interior area.

c. Cracks close to and parallel to joints. All full-depth cracks within 6 inches (150 mm) either side of the joint and essentially parallel to the original joints, shall be treated as follows.

(1) Full depth cracks and original joint not cracked. The full-depth crack shall be treated as the new joint and the original joint filled with an epoxy resin.

i. Full-depth crack. The joint sealant reservoir for 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). The crack shall be sawed with equipment specially designed to follow random cracks. Any equipment or procedure which causes raveling or spalling along the crack shall be modified or replaced to prevent raveling or spalling. The joint shall be sealed with sealant in accordance with P-605 or as directed by the RPR.

ii. Original joint. If the original 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.

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 and original joint cracked. 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.

d. Removal and replacement of full slabs. Make a full depth cut perpendicular to the slab surface along all edges of the slab with a concrete saw cutting any dowels or tie-bars. Remove damaged slab protecting adjacent pavement from damage. Damage to adjacent slabs may result in removal of additional slabs as directed by the RPR at the Contractor's expense.

The underlying material shall be repaired, re-compacted and shaped to grade.

Dowels of the size and spacing specified for other joints in similar pavement on the project shall be installed along all four (4) edges of the new slab in accordance with paragraph 501-4.10d.

Placement of concrete shall be as specified for original construction. The joints around the new slab shall be prepared and sealed as specified for original construction.

e. Spalls along joints.

(1) Spalls less than one inch wide and less than the depth of the joint sealant reservoir, shall be filled with joint sealant material.

(2) Spalls larger than one inch and/or deeper than the joint reservoir, but less than ½ the slab depth, and less than 25% of the length of the adjacent joint shall be repaired as follows:

i. Make a vertical saw cut at least one inch (25 mm) outside the spalled area and to a depth of at least 2 inches (50 mm). Saw cuts shall be straight lines forming rectangular areas surrounding the spalled area.

ii. Remove unsound concrete and at least 1/2 inch (12 mm) of visually sound concrete between the saw cut and the joint or crack with a light chipping hammer.

iii. Clean cavity with high-pressure water jets supplemented with compressed air as needed to remove all loose material.

iv. Apply a prime coat of epoxy resin, Type III, Grade I, to the dry, cleaned surface of all sides and bottom of the cavity, except any joint face.

v. Fill the cavity with low slump concrete or mortar or with epoxy resin concrete or mortar.

vi. An insert or other bond-breaking medium shall be used to prevent bond at all joint faces.

vii. 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.

(3) Spalls deeper than 1/2 of the slab depth or spalls longer than 25% of the adjacent joint require replacement of the entire slab.

f. Diamond grinding of Concrete surfaces. Diamond grinding shall be completed prior to pavement grooving. Diamond grinding of the hardened concrete should not be performed until the concrete is at least 14 days old and has achieved full minimum strength. Equipment that causes ravels, aggregate fractures, spalls or disturbance to the joints will not be permitted. The depth of diamond grinding shall not exceed 1/2 inch (13 mm) and all areas in which diamond grinding has been performed will be subject to the final pavement thickness tolerances specified.

Diamond grinding shall be performed with a machine specifically designed for diamond grinding capable of cutting a path at least 3 feet (0.9 m) wide. The saw blades shall be 1/8-inch (3-mm) wide with sufficient number of flush cut blades that create grooves between 0.090 and 0.130 inches (2 and 3.5 mm) wide; and peaks and ridges approximately 1/32 inch (1 mm) higher than the bottom of the grinding cut. The Contractor shall determine the number and type of blades based on the hardness of the aggregate. Contractor shall demonstrate to the RPR that the grinding equipment will produce satisfactory results prior to making corrections to surfaces.

Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The slurry resulting from the grinding operation shall be continuously removed and the pavement left in a clean condition. All grinding shall be at the expense of the Contractor.

CONTRACTOR QUALITY CONTROL (CQC)

All federally funded projects over \$500K dollars where paving is the major work item must have a CQCP. It is strongly encouraged that a Contractor Quality Control Program (CQCP) be developed for all projects.

For projects that do not include a formal CQCP, this section can be edited to remove reference to a CQCP. However, QC testing is still required regardless of project size.

501-5.1 Quality control program. [The Contractor shall develop a Quality Control Program in accordance with Item C-100. No partial payment will be made for materials that are subject to specific quality control requirements without an approved quality control program.]

501-5.2 Contractor Quality Control (CQC). [The Contractor shall provide or contract for testing facilities in accordance with Item C-100. The RPR shall be permitted unrestricted access to inspect the Contractor's QC facilities and witness QC activities. The RPR will advise the Contractor in writing of any noted deficiencies concerning the QC 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.]

501-5.3 Contractor QC testing. The Contractor shall perform all QC tests necessary to control the production and construction processes applicable to this specification [and as set forth in the CQCP. The testing program shall include, but not necessarily be limited to, tests for aggregate gradation, aggregate moisture content, slump, and air content. A QC Testing Plan shall be developed and approved by the RPR as part of the CQCP.

The RPR may at any time, notwithstanding previous plant acceptance, reject and require the Contractor to dispose of any batch of concrete mixture which is rendered unfit for use due to contamination, segregation, or improper slump. Such rejection may be based on only visual inspection. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the RPR, and if it can be demonstrated in the laboratory, in the presence of the RPR, that such material was erroneously rejected, payment will be made for the material at the contract unit price].

a. Fine aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily in accordance with ASTM C136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C70 or ASTM C566.

(3) Deleterious substances. Fine aggregate as delivered to the mixer shall be tested for deleterious substances in fine aggregate for concrete as specified in paragraph 501-2.1b, prior to production of the control strip, and a minimum of every 30-days during production or more frequently as necessary to control deleterious substances.

b. Coarse Aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily for each size of aggregate. Tests shall be made in accordance with ASTM C136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C566.

(3) Deleterious substances. Coarse aggregate as delivered to the mixer shall be tested for deleterious substances in coarse aggregate for concrete as specified in paragraph 501-2.1c, prior to production of the control strip, and a minimum of every 30-days during production or more frequently as necessary to control deleterious substances.

c. Slump. One test shall be made for each subplot. Slump tests shall be performed in accordance with ASTM C143 from material randomly sampled from material discharged from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

d. Air content. One test shall be made for each subplot. Air content tests shall be performed in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag or other porous coarse aggregate, from material randomly sampled from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

e. Unit weight and Yield. One test shall be made for each subplot. Unit weight and yield tests shall be in accordance with ASTM C138. The samples shall be taken in accordance with ASTM C172 and at the same time as the air content tests.

f. Temperatures. Temperatures shall be checked at least four times per lot at the job site in accordance with ASTM C1064.

g. Smoothness for Contractor Quality Control.

Note change in deviations on final surface course that require grinding, limited to deviations > 1/4 inch that trap water, intent here is to focus on areas that may cause issues with the safe operation of aircraft and to minimize grinding if it will not improve safety

The Contractor shall perform smoothness testing in transverse and longitudinal directions daily to verify that the construction processes are producing pavement with variances less than 1/4 inch in 12 feet, identifying areas that may pond water which could lead to hydroplaning of aircraft. If the smoothness criteria is not met, appropriate changes and corrections to the construction process shall be made by the Contractor before construction continues

The Contractor may use a 12-foot (3.7 m) “straightedge, a rolling inclinometer meeting the requirements of ASTM E2133 or rolling external reference device that can simulate a 12-foot (3.7m) straightedge approved by the RPR. Straight-edge testing shall start 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. Testing shall be continuous across all joints. The 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 the two high points. If the rolling inclinometer or external reference device is used, the data may be evaluated using either the FAA profile program, ProFAA, or FHWA profile program ProVal, using the 12-foot straightedge simulation function.

Smoothness readings shall not be made across grade changes or cross slope transitions. The transition between new and existing pavement shall be evaluated separately for conformance with the plans.

Include detail for transition between new and existing pavement including smoothness and grade limitations.

(1) Transverse measurements. Transverse measurements shall be taken for each day’s production placed. Transverse measurements shall be taken perpendicular to the pavement centerline each 50 feet (15 m) or more often as determined by the RPR. The joint between lanes shall be tested separately to facilitate smoothness between lanes.

(2) Longitudinal measurements. Longitudinal measurements shall be taken for each day’s production placed. Longitudinal tests shall be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet (6 m); and at the third points of paving lanes when widths of paving lanes are 20 ft (6 m) or greater. When placement abuts previously placed material the first measurement shall start with one half the length of the straight edge on the previously placed material.

Deviations on the final surface course in either the transverse or longitudinal direction that will trap water greater than 1/4 inch (6 mm) shall be corrected with diamond grinding per paragraph 501-4.19f or by removing and replacing the surface course to full depth. Grinding shall be tapered in all directions to provide smooth transitions to areas not requiring grinding. All areas in which diamond grinding has been performed shall be subject to the final pavement thickness tolerances specified in paragraph 501-6.6.

Control charts shall be kept to show area of each day’s placement and the percentage of corrective grinding required. Corrections to production and placement shall be initiated when corrective grinding is required. If the Contractor’s machines and/or methods produce significant areas that need corrective actions in excess of 10 percent of a day’s production, production shall be stopped until corrective measures are implemented by the Contractor.

h. Grade. Grade will be evaluated prior to and after placement of the concrete surface.

Measurements will be taken at appropriate gradelines (as a minimum at center and edges of paving lane) and longitudinal spacing as shown on cross-sections and plans. The final

surface of the pavement will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch (12 mm) vertically [and 0.1 feet (30 mm) laterally]. The documentation will be provided by the Contractor to the RPR [within 48 hours] [by the end of the following working day].

Areas with humps or depression that that exceed grade or smoothness and that retain water on the surface must be ground off provided the course thickness after grinding is not more than 1/2 inch (12 mm) less than the thickness specified on the plans. If these areas cannot be corrected with grinding then the slabs that are retaining water must be removed and replaced in accordance with paragraph 501-4.19d. Grinding shall be in accordance with paragraph 501-4.19f. All corrections will be at the Contractors expense.

501-5.4 Control charts. The Contractor shall maintain linear control charts for fine and coarse aggregate gradation, slump, and air content. The Contractor shall also maintain a control chart plotting the coarseness factor/workability factor from the combined gradations in accordance with paragraph 501-2.1d.

Control charts shall be posted in a location satisfactory to the RPR and shall be kept up to date at all times. 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, or Specification 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 potential problem and the Contractor is not taking satisfactory corrective action, the RPR may halt production or acceptance of the material.

a. Fine and coarse aggregate gradation. The Contractor shall record the running average of the last five gradation tests for each control sieve on linear control charts. Superimposed on the control charts shall be the action and suspension limits. Gradation tests shall be performed by the Contractor per ASTM C136. The Contractor shall take at least [two] samples per lot to check the final gradation. Sampling shall be per ASTM D75 from the flowing aggregate stream or conveyor belt.

b. Slump and air content. The Contractor shall maintain linear control charts both for individual measurements and range (that is, difference between highest and lowest measurements) for slump and air content in accordance with the following Action and Suspension Limits.

c. Combined gradation. The Contractor shall maintain a control chart plotting the coarseness factor and workability factor on a chart in accordance with paragraph 501-2.1d.

Control Chart Limits¹

Control Parameter	Individual Measurements	
	Action Limit	Suspension Limit
Gradation ²	*3	*3
Coarseness Factor (CF)	±3.5	±5
Workability Factor (WF)	±2	±3
Slump	+0.5 to -1 inch (+13 to -25 mm)	+1 to -1.5 inch (+25 to -38 mm)
Air Content	±1.5%	±2.0%

¹ Control charts shall developed and maintained for each control parameter indicated.

² Control charts shall be developed and maintained for each sieve size.

³ Action and suspension limits shall be determined by the Contractor.

501-5.5 Corrective action at Suspension Limit. [The CQCP shall indicate that appropriate action shall be taken when the process is believed to be out of control. The CQCP shall detail what action will be taken to bring the process into control and shall contain sets of rules to gauge when a process is out of control. As a minimum, a process shall be deemed out of control and corrective action taken if any one of the following conditions exists.

- a. Fine and coarse aggregate gradation. When two consecutive averages of five tests are outside of the suspension limits, immediate steps, including a halt to production, shall be taken to correct the grading.
- b. Coarseness and Workability factor. When the CF or WF reaches the applicable suspension limits, the Contractor, immediate steps, including a halt to production, shall be taken to correct the CF and WF.
- c. Fine and coarse aggregate moisture content. Whenever the moisture content of the fine or coarse aggregate changes by more than 0.5%, the scale settings for the aggregate batcher and water batcher shall be adjusted.
- d. Slump. The Contractor shall halt production and make appropriate adjustments whenever:
 - (1) one point falls outside the Suspension Limit line for individual measurements
 - OR
 - (2) two points in a row fall outside the Action Limit line for individual measurements.
- d. Air content. The Contractor shall halt production and adjust the amount of air-entraining admixture whenever:
 - (1) one point falls outside the Suspension Limit line for individual measurements
 - OR
 - (2) two points in a row fall outside the Action Limit line for individual measurements.]

MATERIAL ACCEPTANCE

501-6.1 Quality Assurance (QA) Acceptance sampling and testing. All acceptance sampling and testing necessary to determine conformance with the requirements specified in this section, with the exception of coring for thickness determination, will be performed by the RPR. The Contractor shall provide adequate facilities for the initial curing of beams. The Contractor shall bear the cost of providing initial curing facilities and coring and filling operations, per paragraph 501-6.5b(1).

The samples will be transported while in the molds. The curing, except for the initial cure period, will be accomplished using the immersion in saturated lime water method. 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 using other suitable methods, provided the temperature and moisture loss requirements are met.

501-6.2 Quality Assurance (QA) testing laboratory. Quality assurance testing organizations performing these acceptance tests will be accredited in accordance with ASTM C1077. The quality assurance 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 will be submitted to the RPR prior to start of construction.

501-6.3 Lot size. Concrete will be accepted for strength and thickness on a lot basis. A lot will consist of a day's production not to exceed 2,000 cubic yards (1530 cubic meters) [____] square yards ([____] square meters)]. Each lot will be divided into approximately equal sublots with individual sublots between 400 to 600 cubic yards. Where three sublots are produced, they will constitute a lot. Where one or two sublots are produced, they will be incorporated into the previous or next lot. Where more than one plant is simultaneously producing concrete for the job, the lot sizes will apply separately for each plant.

501-6.4 Partial lots. When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot or for overages or minor 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.

Where three sublots have been produced, they will constitute a lot. Where one or two sublots have been produced, they will be incorporated into the next lot or the previous lot and the total number of sublots will be used in the acceptance criteria calculation, that is, n=5 or n=6.

The Engineer will specify the lot size for a project based on the total quantity and the expected production rate. The lot size should not exceed 2,000 cubic yards (1,530 cubic meters). For projects where basis of payment

is square yards (square meters), the Engineer will convert the lot size to an equivalent area that contains 2,000 cubic yards (1,530 cubic meters) or less.

501-6.5 Acceptance Sampling and Testing.

a. Strength.

(1) Sampling. One sample will be taken for each subplot from the concrete delivered to the job site. Sampling locations will be determined by the RPR in accordance with random sampling procedures contained in ASTM D3665. The concrete will be sampled in accordance with ASTM C172.

(2) Test Specimens. The RPR will be responsible for the casting, initial curing, transportation, and curing of specimens in accordance with ASTM C31. Two (2) specimens will be made from each sample and slump, air content, unit weight, and temperature tests will be conducted for each set of strength specimens. Within 24 to 48 hours, the samples will be transported from the field to the laboratory while in the molds. Samples will be cured in saturated lime water.

The strength of each specimen will be determined in accordance with [ASTM C39] [ASTM C78]. The strength for each subplot will be computed by averaging the results of the two test specimens representing that subplot.

(3) Acceptance. Acceptance of pavement for strength will be determined by the RPR in accordance with paragraph 501-6.6b(1). All individual strength tests within a lot will be checked for outliers in accordance with ASTM E178, at a significance level of 5%. Outliers will be discarded and the remaining test values will be used to determine acceptance in accordance with paragraph 501-6.5b.

The Engineer must make the appropriate selections in paragraph 501-3.3 based on whether the strength is based on flexural or compressive strength.

b. Pavement thickness.

(1) Sampling. One core will be taken by the Contractor for each subplot in the presence of the RPR. Sampling locations will be determined by the RPR in accordance with random sampling procedures contained in ASTM D3665. Areas, such as thickened edges, with planned variable thickness, will be excluded from sample locations.

Cores shall be a minimum 4 inch (100 mm) in diameter neatly cut with a core drill. The Contractor will furnish all tools, labor, and materials for cutting samples and filling the cored hole. Core holes will be filled by the Contractor with a non-shrink grout approved by the RPR within one day after sampling.

(2) Testing. The thickness of the cores will be determined by the RPR by the average caliper measurement in accordance with ASTM C174. Each core shall be photographed and the photograph included with the test report.

(3) **Acceptance.** Acceptance of pavement for thickness will be determined by the RPR in accordance with paragraph 501-6.6.

501-6.6 Acceptance criteria.

a. General. Acceptance will be based on the following characteristics of the completed pavement discussed in paragraph 501-6.5b:

- (1) Strength
- (2) Thickness
- (3) Grade
- (4) Profilograph smoothness [Not used.]
- (5) Adjustments for repairs

Add bracketed text when profilograph smoothness not used.

Profilograph smoothness and acceptance adjustment paragraphs only apply when the overall project is a new and/or reconstructed runway(s) and/or taxiway(s) greater than 500 feet (152 m) in length. Any changes to the profilograph smoothness acceptance limits requires a modification to standards in accordance with FAA Order 5300.1, Modifications to Agency Airport Design, Construction, and Equipment Standards.

Acceptance for strength, thickness, and grade, will be based on the criteria contained in accordance with paragraph 501-6.6b(1), 501-6.6b(2), and 501-6.6b(3), respectively. [Acceptance for profilograph smoothness will be based on the criteria contained in paragraph 501-6.6b(4).]

[Production quality must achieve 90 PWL or higher to receive full payment.

When the design strength in paragraph 501-3.3 is based on compressive strength, substitute compressive strength for flexural strength.

Strength and thickness will be evaluated for acceptance on a lot basis using the method of estimating PWL. Production quality must achieve 90 PWL or higher to receive full pavement. The PWL will be determined in accordance with procedures specified in Item C-110.

The lower specification tolerance limit (L) for strength and thickness will be:

Lower Specification Tolerance Limit (L)

Strength	$0.93 \times \text{strength specified in paragraph 501-3.3}$
Thickness	Lot Plan Thickness in inches, - 0.50 in

]

The lower specification tolerance limits above are based on applying statistical analysis to FAA design assumptions, and there is no need to compensate for the above factor in the design process.

b. Acceptance criteria.

[**(1) Strength.** If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment for the lot will be determined in accordance with paragraph 501-8.1.

(2) Thickness. If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment for the lot will be determined in accordance with paragraph 501-8.1.]

For small maintenance and repair projects:

Where the project has multiple small placements or the total project size is less than 2000 cubic yards (1530 cubic meters), the use of percent within limits (PWL) is not appropriate and acceptable material will be paid for by the cubic yard (square yard).

Replace the above bracketed PWL requirements with the following:

(1) Strength. The strength for each subplot shall be computed by averaging the results of that subplot. When subplot strength equals or exceeds the strength as specified in paragraph 501-3.3, the lot will be acceptable. Acceptance and payment for the lot will be determined in accordance with paragraph 501-8.1.

(2) Thickness. If subplot thickness is not be less than ½ inch (12 mm) from plan thickness, the lot will be acceptable. Acceptance and payment for the lot will be determined in accordance with paragraph 501-8.1.

(3) Grade. The final finished surface of the pavement of the completed project will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch (12 mm) vertically [or 0.1 feet (30 mm) laterally]. The documentation, stamped and signed by a licensed surveyor shall be in accordance with paragraph 501-5.3h. Payment for sublots

that do not meet grade for over 25% of the subplot shall reduced by 5% and not be more than 95%.

(4) Profilograph roughness for QA Acceptance. [The final profilograph shall be the full length of the project to facilitate testing of roughness between lots. The [Contractor, in the presence of the RPR shall] [RPR will] perform a profilograph roughness test on the completed project with a profilograph meeting the requirements of ASTM E1274 or a Class I inertial profiler meeting ASTM E950. Data and results shall be provided within [48 hrs] of profilograph roughness tests.

The pavement shall have an average profile index less than 15 inches per mile per 1/10 mile. 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). Profilograph shall be performed one foot right and left of project centerline and 15 feet (4.5 m) right and left of project centerline. Any areas that indicate “must grind” shall be corrected with diamond grinding per paragraph 501-4.19f or by removing and replacing full depth of surface course. as directed by the RPR. Where corrections are necessary, a second profilograph run shall be performed to verify that the corrections produced an average profile index of 15 inches per mile per 1/10 mile or less.] [Not used.]

Edit as required for project.

Profilograph roughness and acceptance paragraphs only apply when the overall project is a new and/or reconstructed runway(s) and/or taxiway(s) greater than 500 feet (152 m) in length.

Profilograph roughness is not applicable to aprons and should be used with caution on projects to rehabilitate runways and/or taxiways unless the project includes provisions to correct existing deficiencies.

Any changes to the profilograph roughness acceptance limits requires a modification to standards in accordance with FAA Order 5300.1, Modifications to Agency Airport Design, Construction, and Equipment Standards.

The Engineer must select who will provide the specified equipment and the timeframe for receiving the test data. The Airport should retain a copy of the profilograph roughness test and reports for inclusion in the Airport’s Pavement Maintenance Management Program (PMP).

(5) Adjustments for repair. Sublots with spall repairs, crack repairs, or partial panel replacement, will be limited to no more than 95% payment.

(6) Adjustment for grinding. For sublots with grinding over 25% of a subplot, payment will be reduced 5%.

METHOD OF MEASUREMENT

501-7.1 Concrete pavement shall be measured by the number of [cubic yards (cubic meters)] [square yards (square meters)] of [plain] [reinforced] pavement as specified in-place, completed and accepted.

BASIS OF PAYMENT

501-8.1 Payment. Payment for concrete pavement meeting all acceptance criteria as specified in paragraph 501-6.6. Acceptance Criteria shall be based on results of strength [, smoothness,] and thickness tests. Payment for acceptable lots of concrete pavement shall be adjusted in accordance with paragraph 501-8.1a for strength and thickness; 501-8.1b for repairs; 501-8.1c for grinding; and 501-8.1d for smoothness, subject to the limitation that:

The total project payment for concrete pavement shall not exceed [_____] percent of the product of the contract unit price and the total number of [cubic yards (cubic meters)] [square yards (square meters)] of concrete pavement used in the accepted work (See Note 1 under the Price Adjustment Schedule table below).

Payment shall be full compensation for all labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and on the drawings.

The Engineer shall specify a value ranging from 100% to 106%. When the total project payment for Item P-501 pavement exceeds the contract unit price, any Airport Improvement Program (AIP) or Passenger Facility Charge (PFC) funds used to pay the excess may require an amendment to the AIP grant or PFC application for the project.

a. Basis of adjusted payment. The pay factor for each individual lot shall be calculated in accordance with the Price Adjustment Schedule table below. A pay factor shall be calculated for both strength and thickness. The lot pay factor shall be the higher of the two values when calculations for both strength and thickness are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either strength or thickness is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both strength and thickness are less than 100%.

Price Adjustment Schedule¹

Percentage of Materials Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)
96 – 100	106
90 – 95	PWL + 10
75 – 90	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject ²

¹ Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment in excess of 100% shall be subject to the total project payment limitation specified in paragraph 501-8.1.

² The lot shall be removed and replaced unless, after receipt of FAA concurrence, the Owner and Contractor agree in writing that the lot will remain; the lot paid at 50% of the contract unit price; and the total project payment limitation reduced by the amount withheld for that lot.

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 501-8.1. Payment in excess of 100% for accepted lots of concrete pavement shall be used to offset payment for accepted lots of concrete pavement that achieve a lot pay factor less than 100%; except for rejected lots which remain in place and/or sublots with adjustments for repairs.

b. Adjusted payment for repairs. The PWL lot pay factor shall be reduced by 5% and be no higher than 95% for sublots which contain repairs in accordance with paragraph 501-4.19 on more than 20% of the slabs within the subplot. Payment factors greater than 100 percent for the strength and thickness cannot be used to offset adjustments for repairs.

c. Adjusted payment for grinding. The PWL lot pay factor shall be reduced by 5% and be no higher than 95% for sublots with grinding over 25% of a subplot.

d. Profilograph Roughness. [The Contractor will receive full payment when the profilograph average profile index is in accordance with paragraph 501-6.6b(4). When the final average profile index for the entire length of pavement does not exceed 15 inches per mile per 1/10 mile, payment will be made at the contract unit price for the completed pavement.]

[Not used.]

Edit as required for project.

e. Payment. Payment shall be made under:

Item P-501-8.1 Concrete Pavement. [per cubic yard (cubic meter)] [per square
yard (square meter)]

Item P-603 Emulsified Asphalt Tack Coat

**

Item P-603 is used to promote bonding between the underlying surface and the new asphalt layer.

**

DESCRIPTION

603-1.1 This item shall consist of preparing and treating an asphalt or concrete surface with asphalt material in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

MATERIALS

603-2.1 Asphalt materials. The asphalt material shall be an emulsified asphalt as specified in ASTM D3628 as an asphalt application for tack coat appropriate to local conditions. The emulsified asphalt shall not be diluted. The Contractor shall provide a copy of the manufacturer's Certificate of Analysis (COA) for the asphalt material to the Resident Project Representative (RPR) before the asphalt material is applied for review and acceptance. The furnishing of COA for the asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer's COA may be subject to verification by testing the material delivered for use on the project.

CONSTRUCTION METHODS

603-3.1 Weather limitations. The tack coat shall be applied only when the existing surface is dry and the atmospheric temperature is 50°F (10°C) or above; the temperature has not been below 35°F (2°C) for the 12 hours prior to application; and when the weather is not foggy or rainy. The temperature requirements may be waived when directed by the RPR.

603-3.2 Equipment. The Contractor shall provide equipment for heating and applying the emulsified asphalt material. The emulsion shall be applied with a manufacturer-approved computer rate-controlled asphalt distributor. The equipment shall be in good working order and contain no contaminants or diluents in the tank. Spray bar tips must be clean, free of burrs, and of a size to maintain an even distribution of the emulsion. Any type of tip or pressure source is suitable that will maintain predetermined flow rates and constant pressure during the application process with application speeds under eight (8) miles per hour (13 km per hour) or seven (700) feet per minute (213 m per minute).

The equipment will be tested under pressure for leaks and to ensure proper set-up before use to verify truck set-up (via a test-shot area), including but not limited to, nozzle tip size appropriate for application, spray-bar height and pressure and pump speed, evidence of triple-overlap spray pattern, lack of leaks, and any other factors relevant to ensure the truck is in good working order before use.

The distributor truck shall be equipped with a minimum 12-foot (3.7-m) spreader spray bar with individual nozzle control with computer-controlled application rates. The distributor truck shall have an easily accessible thermometer that constantly monitors the temperature of the emulsion, and have an operable mechanical tank gauge that can be used to cross-check the computer accuracy. If the distributor is not equipped with an operable quick shutoff valve, the prime operations shall be started and stopped on building paper.

The distributor truck shall be equipped to effectively heat and mix the material to the required temperature prior to application as required. Heating and mixing shall be done in accordance with the manufacturer's recommendations. Do not overheat or over mix the material.

The distributor shall be equipped with a hand sprayer.

Asphalt distributors must be calibrated annually in accordance with ASTM D2995. The Contractor must furnish a current calibration certification for the asphalt distributor truck from any State or other agency as approved by the RPR.

A power broom and/or power blower suitable for cleaning the surfaces to which the asphalt tack coat is to be applied shall be provided.

603-3.3 Application of emulsified asphalt material. The emulsified asphalt shall not be diluted. Immediately before applying the emulsified asphalt tack coat, the full width of surface to be treated shall be swept with a power broom and/or power blower to remove all loose dirt and other objectionable material.

The emulsified asphalt material shall be uniformly applied with an asphalt distributor at the rates appropriate for the conditions and surface specified in the table below. The type of asphalt material and application rate shall be approved by the RPR prior to application.

Emulsified Asphalt

Surface Type	Residual Rate, gal/SY (L/square meter)	Emulsion Application Bar Rate, gal/SY (L/square meter)
New asphalt	0.02-0.05 (0.09-0.23)	0.03-0.07 (0.13-0.32)
Existing asphalt	0.04-0.07 (0.18-0.32)	0.06-0.11 (0.27-0.50)
Milled Surface	0.04-0.08 (0.18-0.36)	.06-0.12 (0.27-0.54)
Concrete	0.03-0.05 (0.13-0.23)	0.05-0.08 (0.23-0.36)

After application of the tack coat, the surface shall be allowed to cure without being disturbed for the period of time necessary to permit drying and setting of the tack coat. This period shall be determined by the RPR. The Contractor shall protect the tack coat and maintain the surface until the next course has been placed. When the tack coat has been disturbed by the Contractor, tack coat shall be reapplied at the Contractor's expense.

603-3.4 Freight and waybills The Contractor shall submit waybills and delivery tickets, during progress of the work. Before the final statement is allowed, file with the RPR certified waybills and certified delivery tickets for all emulsified asphalt materials used in the construction of the pavement covered by the contract. Do not remove emulsified asphalt material from storage until the initial outage and temperature measurements have been taken. The delivery or storage units will not be released until the final outage has been taken.

METHOD OF MEASUREMENT

603-4.1 The emulsified asphalt material for tack coat shall be measured by the [gallon (liter)] [ton (kg)]. Volume shall be corrected to the volume at 60°F (16°C) in accordance with ASTM D1250. The emulsified asphalt material paid for will be the measured quantities used in the accepted work, provided that the measured quantities are not 10% over the specified application rate. Any amount of emulsified asphalt material more than 10% over the specified application rate for each application will be deducted from the measured quantities, except for irregular areas where hand spraying of the emulsified asphalt material is necessary. Water added to emulsified asphalt will not be measured for payment.

BASIS OF PAYMENT

603.5-1 Payment shall be made at the contract unit price per [gallon (liter)] [ton (kg)] of emulsified asphalt material. This price shall be full compensation for furnishing all materials, for all preparation, delivery, and application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-603-5.1	Emulsified Asphalt Tack Coat - per [gallon (liter)] [ton (kg)]
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REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D1250	Standard Guide for Use of the Petroleum Measurement Tables
ASTM D2995	Standard Practice for Estimating Application Rate and Residual Application Rate of Bituminous Distributors
ASTM D3628	Standard Practice for Selection and Use of Emulsified Asphalts

END ITEM P-603

Item P-620 Runway and Taxiway Marking

DESCRIPTION

620-1.1 This item shall consist of the preparation and painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Resident Project Representative (RPR). The terms “paint” and “marking material” as well as “painting” and “application of markings” are interchangeable throughout this specification.

MATERIALS

620-2.1 Materials acceptance. The Contractor shall furnish manufacturer’s certified test reports, for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. This certification along with a copy of the paint manufacturer’s surface preparation; marking materials, including adhesion, flow promoting and/or floatation additive; and application requirements must be submitted and approved by the Resident Project Representative (RPR) prior to the initial application of markings. The reports can be used for material acceptance or the RPR may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the RPR upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers that are easily quantifiable for inspection by the RPR.

620-2.2 Marking materials.

Table 1. Marking Materials

Paint¹				Glass Beads²	
Type	Color	Fed Std. 595 Number	Application Rate Maximum	Type	Application Rate Minimum
*	*	*	*	*	*
*	*	*	*	*	*

¹ See paragraph 620-2.2a

² See paragraph 620-2.2b

Make the appropriate selections for paint type, color, Fed Std 595 number, application rates, and glass bead type and application rates and inserted into Table 1. Asterisks denote insert points.

a. Paint. Paint shall be [waterborne][epoxy][methacrylate][solvent-base] [and][preformed thermoplastic] in accordance with the requirements of this paragraph. Paint colors shall comply with Federal Standard No. 595. []

The Engineer must specify paint type (s), colors and glass beads to be used for the project and populate that information above in Table 1. When more than one paint type is specified, the plans should clearly indicate paint type, paint color and bead type required for each marking.

Select type of paint.

Types: Waterborne, Epoxy, Methacrylate, solvent-base, or preformed Thermoplastic

For waterborne or solvent based paints, specify Type I, II, or III:

- **Type I intended for locations where slower tracking is not a problem.**
- **Type II intended for locations where faster curing is desirable.**
- **Type III intended for locations that require a thicker, more durable coating.**

1. Select paint color(s) from the following Table:

Paint Color	Fed Std. No 595 Color Number
White	37925
Red	31136
Yellow	33538 or 33655
Black	37038
Pink	1 part 31136 to 2 parts 37925
Green	34108

Waterborne or solvent base black paint should be used to outline a border at least 6 inches (150 mm) wide around markings on all light-colored pavements. Preformed thermoplastic markings shall have a non-reflectorized black border integral to the marking.

Select appropriate application rates for type of paint and bead selected:

Application Rates for Paint and Glass Beads for Table 1

Paint		Glass Beads		
Type	Application Rate Maximum	Type I, Gradation A¹ Minimum	Type III Minimum	Type IV¹ Minimum
Waterborne Type I or II	115 ft ² /gal (2.8 m ² /l)	7 lb/gal (0.85 kg/l)	10 lb/gal (1.2 kg/l)	--
Waterborne Type III	90 ft ² /gal (2.2 m ² /l)	7 lb/gal (0.85 kg/l)	8 lb/gal (1.0 kg/l)	
Waterborne Type III	55 ft ² /gal (1.4 m ² /l)		6 lb/gal (.8 kg/l)	5 lb/gal (.7 kg/l)
Solvent Base	115 ft ² /gal (2.8 m ² /l)	7 lb/gal (0.85 kg/l)	10 lb/gal (1.2 kg/l)	--
Solvent Base	55 ft ² /gal (2.2 m ² /l)	--	--	5 lb/gal (.7 kg/l)
Epoxy	90 ft ² /gal (2.2 m ² /l)	15 lb/gal (1.8 kg/l)	20 lb/gal (2.4 kg/l)	16 lb/gal (1.9 kg/l)
Methacrylate	45 ft ² /gal (1.1 m ² /l)	15 lb/gal (1.8 kg/l)	20 lb/gal (2.4 kg/l)	16 lb/gal (1.9 kg/l)
Methacrylate Splatter-Profile	24ft ² /gal. (0.6 m ² /l)	8 lb/gal. (0.1 kg/l)	10 lb/gal. (1.2 kg/l)	10 lb/gal (1.2 kg/l)
Temporary Marking Waterborne Type I or II	230 ft ² /gal (5.6 m ² /l)	No beads	No beads	No beads

¹Glass bead application rate for Red and Pink paint shall be reduced by 2 lb/gal (0.24 kg/l) for Type I and Type IV beads.

The Engineer shall specify the time period in paragraph 620-3.5 in order to allow adequate curing of the pavement surface. The Engineer should contact the paint manufacturer to determine the wait period. A 24- to 30-day waiting period is recommended for all types of paint used for pavement marking. The final application should occur after the waiting period has passed. The final marking application must be at a rate equal to 100% of the full application rate with glass beads.

Markings may be required before paving operations are complete. The Engineer may wish to specify waterborne or solvent-based materials for temporary markings at 30% to 50% of the specified application rates. Glass beads will not adhere well at the low application rates for temporary markings.

CAUTION: Prior to reopening pavements at Part 139 airports verify that all markings comply with Part 139 requirements. Temporary markings not in compliance with AC 150/5340-1 will require a NOTAM regarding any non-standard marking be issued. For example, temporary markings without beads.

When painting Porous Friction Course, the paint should be applied to the pavement in two coats from opposite directions. The first coat should be applied at a rate equal to 50% of the full application rate with no glass beads. The second coat should be applied from the opposite direction at a rate equal to 100% of the full application rate with glass beads.

Preformed thermoplastic pavement markings shall yield at least 225 mcd/m²/lux on white markings at installation and at least 100 mcd/m²/lux on yellow markings at installation.

Retroreflectivity shall be measured by a portable retroreflectometer according to ASTM E1710 and the practices in ASTM D7585 shall be followed for taking retroreflectivity readings with a portable retroreflectometer and computing measurement averages. A vehicle-mounted retroreflectometer may also be used.

[**Waterborne.** Paint shall meet the requirements of Federal Specification TT-P-1952F, [Type I] [Type II] [Type III]. The non-volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis. [The acrylic resin used for Type III shall be 100% cross linking acrylic as evidenced by infrared peaks at wavelengths 1568, 1624, and 1672 cm-l with intensities equal to those produced by an acrylic resin known to be 100% cross linking.]

[**Epoxy.** Paint shall be a two component, minimum 99% solids type system conforming to the following:

(1) **Pigments.** Component A. Percent by weight.

(a) **White:**

- Titanium Dioxide, ASTM D476, type II shall be 18% minimum (16.5% minimum at 100% purity).

(b) **Yellow and Colors:**

- Titanium Dioxide, ASTM D476, type II shall be 14 to 17%.
- Epoxy resin shall be 75 to 79%.
- Organic yellow, other colors, and tinting as required to meet color standard.

(2) **Epoxy content.** Component A. The weight per epoxy equivalent, when tested in accordance with ASTM D1652 shall be the manufacturer's target ± 50 .

(3) **Amine number.** Component B. When tested in accordance with ASTM D2074 shall be the manufacturer's target ± 50 .

(4) **Prohibited materials.** The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, halogenated solvents, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant federal regulations.

(5) **Daylight directional reflectance.**

(a) **White:** The daylight directional reflectance of the white paint shall not be less than 75% (relative to magnesium oxide), when tested in accordance with ASTM E2302.

(b) **Yellow:** The daylight directional reflectance of the yellow paint shall not be less than 55% (relative to magnesium oxide), when tested in accordance with ASTM E2302. The x and y values shall be consistent with the federal Hegman yellow color standard chart for traffic yellow standard 33538, or shall be consistent with the tolerance listed below:

x .462	x .470	x .479	x .501
y .438	y .455	y .428	y .452

(6) **Accelerated weathering.**

(a) **Sample preparation.** Apply the paint at a wet film thickness of 0.013-inch (0.33 mm) to four 3 × 6-inch (8 × 15 cm) aluminum panels prepared as described in ASTM E2302. Air dry the sample 48 hours under standard conditions.

(b) **Testing conditions.** Test in accordance with ASTM G154 using both Ultra Violet (UV-B) Light and condensate exposure, 72 hours total, alternating four (4) hour UV exposure at 140°F (60°C), and four (4) hours condensate exposure at 104°F (40°C).

(c) **Evaluation.** Remove the samples and condition for 24 hours under standard conditions. Determine the directional reflectance and color match using the procedures in paragraph 5 above. Evaluate for conformance with the color requirements.

(7) **Volatile organic content.** Determine the volatile organic content in accordance with 40 CFR Part 60 Appendix A, Method 24.

(8) **Dry opacity.** Use ASTM E2302. The wet film thickness shall be 0.015 inch (0.38 mm). The minimum opacity for white and colors shall be 0.92.

(9) **Abrasion resistance.** Subject the panels prepared in paragraph 620-2.2b(6) to the abrasion test in accordance with ASTM D968, Method A, except that the inside diameter of the metal guide tube shall be from 0.747 to 0.750 inch (18.97 to 19.05 mm). Five liters (17.5 lb (7.94 kg)) of unused sand shall be used for each test panel. The test shall be run on two test panels Both baked and weathered paint films shall require not less than 150 liters (525 lbs (239 kg)) of sand for the removal of the paint films.

(10) **Hardness, shore.** Hardness shall be at least 80 when tested in accordance with ASTM D2240.]

[**Methacrylate.** Paint shall be a two component, minimum 99% solids-type system conforming to the following:

(1) **Pigments.** Component A. Percent by weight.

(a) **White:**

- Titanium Dioxide, ASTM D476, type II shall be 10% minimum.

- Methacrylate resin shall be 18% minimum.

(b) Yellow and Colors:

- Titanium Dioxide, ASTM D476, type II shall be 1% minimum.
Organic yellow, other colors, and tinting as required to meet color standard.
- Methacrylate resin shall be 18% minimum.

(2) Prohibited materials. The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, halogenated solvents, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant federal regulations.

(3) Daylight directional reflectance:

(a) White: The daylight directional reflectance of the white paint shall not be less than 80% (relative to magnesium oxide), when tested in accordance with ASTM E2302.

(b) Yellow: The daylight directional reflectance of the yellow paint shall not be less than 55% (relative to magnesium oxide), when tested in accordance with ASTM E2302. The x and y values shall be consistent with the federal Hegman yellow color standard chart for traffic yellow standard 33538, or shall be consistent with the tolerance listed below:

x .462	x .470	x .479	x .501
y .438	y .455	y .428	y .452

(4) Accelerated weathering.

(a) Sample preparation. Apply the paint at a wet film thickness of 0.013-inch (0.33 mm) to four 3 × 6-inch (8 × 15 cm) aluminum panels prepared as described in ASTM E2302. Air dry the sample 48 hours under standard conditions.

(b) Testing conditions. Test in accordance with ASTM G154 using both Ultra Violet (UV-B) Light and condensate exposure, 72 hours total, alternating four (4) hour UV exposure at 140°F (60°C), and four (4) hours condensate exposure at 104°F (40°C).

(c) Evaluation. Remove the samples and condition for 24 hours under standard conditions. Determine the directional reflectance and color match using the procedures in paragraph 3 above. Evaluate for conformance with the color requirements.

(5) Volatile organic content. Determine the volatile organic content in accordance with 40 CFR Part 60 Appendix A, Method 24.

(6) Dry opacity. Use ASTM E2302. The wet film thickness shall be 0.015 inch (0.38 mm). The minimum opacity for white and colors shall be 0.92.

(7) Abrasion resistance. Subject the panels prepared in paragraph 620-2.2c(4) to the abrasion test in accordance with ASTM D968, Method A, except that the inside diameter of the metal guide tube shall be from 0.747 to 0.750 inch (18.97 to 19.05 mm). Five liters (17.5 lb (7.94 kg)) of unused sand shall be used for each test panel. The test shall be run on two test panels Both baked and weathered paint films shall require not less than 150 liters (525 lbs (239 kg)) of sand for the removal of the paint films.

(8) Hardness, shore. Hardness shall be at least 60 when tested in accordance with ASTM D2240.

(9) Additional requirements for methacrylate splatter profiled pavement marking. Pavement markings of this type shall comply with all above requirements for methacrylate paint, except as noted below:

(a) The thickness of the marking will be irregular ranging from 0.000 to 0.250 inches (0.00 to 6.4 mm), applied in a splatter pattern which comprises a minimum of 80% of the visible line (when traveling at 5 mph the line appears to be solid.).

(b) The hardness shall be 48 Shore D minimum.]

[**Solvent-Base.** Paint shall meet the requirements of Commercial Item Description [A-A-2886B Type I, Type II, and Type III].]

[**Preformed Thermoplastic Airport Pavement Markings.** Markings must be composed of ester modified resins in conjunction with aggregates, pigments, and binders that have been factory produced as a finished product. The material must be impervious to degradation by aviation fuels, motor fuels, and lubricants.

(1) The markings must be able to be applied in temperatures as low as 35°F without any special storage, preheating, or treatment of the material before application.

(a) The markings must be supplied with an integral, non-reflectorized black border.

(2) Graded glass beads.

(a) The material must contain a minimum of 30% intermixed graded glass beads by weight. The intermixed beads shall conform to Federal Specification TT-B-1325D, Type I, gradation A and Federal Specification TT-B-1325D, Type IV.

(b) The material must have factory applied coated surface beads in addition to the intermixed beads at a rate of one (1) lb (0.45 kg) ($\pm 10\%$) per 10 square feet (1 sq m). These factory-applied coated surface beads shall have a minimum of 90% true spheres, minimum refractive index of 1.50, and meet the following gradation.

Preformed Thermoplastic Bead Gradation

Size Gradation		Retained, %	Passing, %
U.S. Mesh	μm		
12	1700	0 - 2	98 - 100
14	1400	0 - 3.5	96.5 - 100
16	1180	2 - 25	75 - 98
18	1000	28 - 63	37 - 72
20	850	63 - 72	28 - 37
30	600	67 - 77	23 - 33
50	300	89 - 95	5 - 11
80	200	97 - 100	0 - 3

(3) **Heating indicators.** The material manufacturer shall provide a method to indicate that the material has achieved satisfactory adhesion and proper bead embedment during application and that the installation procedures have been followed.

(4) **Pigments.** Percent by weight.

(a) White:

- Titanium Dioxide, ASTM D476, type II shall be 10% minimum.

(b) Yellow and Colors:

- Titanium Dioxide, ASTM D476, type II shall be 1% minimum.
- Organic yellow, other colors, and tinting as required to meet color standard.

(5) Prohibited materials. The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, halogenated solvents, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant federal regulations.

(6) Daylight directional reflectance.

(a) White: The daylight directional reflectance of the white paint shall not be less than 75% (relative to magnesium oxide), when tested in accordance with ASTM E2302.

(b) Yellow: The daylight directional reflectance of the yellow paint shall not be less than 45% (relative to magnesium oxide), when tested in accordance with ASTM E2302. The x and y values shall be consistent with the federal Hegman yellow color standard chart for traffic yellow standard 33538, or shall be consistent with the tolerance listed below:

x .462	x .470	x .479	x .501
y .438	y .455	y .428	y .452

(7) Skid resistance. The surface, with properly applied and embedded surface beads, must provide a minimum resistance value of 45 BPN when tested according to ASTM E303.

(8) Thickness. The material must be supplied at a nominal thickness of 65 mil (1.7 mm).

(9) Environmental resistance. The material must be resistant to deterioration due to exposure to sunlight, water, salt, or adverse weather conditions and impervious to aviation fuels, gasoline, and oil.

(10) Retroreflectivity. The material, when applied in accordance with manufacturer's guidelines, must demonstrate a uniform level of nighttime retroreflection when tested in accordance to ASTM E1710.

(11) Packaging. Packaging shall protect the material from environmental conditions until installation.

(12) Preformed thermoplastic airport pavement marking requirements.

(a) The markings must be a resilient thermoplastic product with uniformly distributed glass beads throughout the entire cross-sectional area. The markings must be resistant to the detrimental effects of aviation fuels, motor fuels and lubricants, hydraulic fluids, deicers, anti-icers, protective coatings, etc. Lines, legends, and symbols must be capable of being affixed to asphalt and/or Portland cement concrete pavements by the use of a large radiant heater. Colors shall be available as required.

(b) The markings must be capable of conforming to pavement contours, breaks, and faults through the action of airport traffic at normal pavement temperatures. The markings must be capable of fully conforming to grooved pavements, including pavement grooving per advisory circular (AC) 150/5320-12, current version. The markings shall have resealing characteristics, such that it is capable of fusing with itself and previously applied thermoplastics when heated with a heat source per manufacturer's recommendation.

(c) Multicolored markings must consist of interconnected individual pieces of preformed thermoplastic pavement marking material, which through a variety of colors and

patterns, make up the desired design. The individual pieces in each large marking segment (typically more than 20 feet (6 m) long) must be factory assembled with a compatible material and interconnected so that in the field it is not necessary to assemble the individual pieces within a marking segment. Obtaining multicolored effect by overlaying materials of different colors is not acceptable due to resulting inconsistent marking thickness and inconsistent application temperature in the marking/substrate interface.

(d) The marking material must set up rapidly, permitting the access route to be reopened to traffic after application.

(e) The marking material shall have an integral color throughout the thickness of the marking material.]

]

Thermoplastic airport markings will be subject to an Engineering life-cycle cost analysis prior to inclusion in specifications.

b. Reflective media. Glass beads for white and yellow paint shall meet the requirements for Federal Specification TT-B-1325D [Type I, Gradation A] [Type III] [Type IV, Gradation A].

Glass beads for red and pink paint shall meet the requirements for [Type I, Gradation A] [Type IV, Gradation A].

Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

Glass beads shall not be used in black and green paint.

Type III glass beads shall not be used in red and pink paint.

The Engineer should insert all that will be used in the project. When more than one bead type is specified, the plans should indicate the bead type for each marking.

Federal Specification TT-B-1325D, Type I, gradation A shall be used when remarking on a frequent basis (at least every six months), and typically yield 300 mcd/m²/lux on white markings at installation and 175 mcd/m²/lux on yellow markings at installation.

Federal Specification TT-B-1325D, Type III. Initial readings typically yield 600 mcd/m²/lux on white markings and 300 mcd/m²/lux on yellow markings at installation and once in service, the reflectance values are approximately the same as Type I beads.

Federal Specification TT-B-1325D, Type IV, gradation A shall be used with TT-P-1952F, Type III paint. The glass beads are larger than either Type I or Type III, thus requiring more of the coating material to properly anchor.

The Engineer should consult with the paint and bead manufacturer on the use of adhesion, flow promoting, and/or flotation additives.

Preformed thermoplastic pavement markings should yield at least 225 mcd/m²/lux on white markings at installation and at least 100 mcd/m²/lux on yellow markings at installation.

CONSTRUCTION METHODS

620-3.1 Weather limitations. Painting shall only be performed when the surface is dry, and the ambient temperature and the pavement surface temperature meet the manufacturer's recommendations in accordance with paragraph 620-2.1. Painting operations shall be discontinued when the ambient or surface temperatures does not meet the manufacturer's recommendations. Markings shall not be applied when the wind speed exceeds 10 mph unless windscreens are used to shroud the material guns. Markings shall not be applied when weather conditions are forecasts to not be within the manufacturers' recommendations for application and dry time.

620-3.2 Equipment. Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless type marking machine with automatic glass bead dispensers suitable for application of traffic paint. It shall produce an even and uniform film thickness and appearance of both paint and glass beads at the required coverage and shall apply markings of uniform cross-sections and clear-cut edges without running or spattering and without over spray. The marking equipment for both paint and beads shall be calibrated daily.

620-3.3 Preparation of surfaces. Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other contaminants that would reduce the bond between the paint and the pavement. Use of any chemicals or impact abrasives during surface preparation shall be approved in advance by the RPR. After the cleaning operations, sweeping, blowing, or rinsing with pressurized water shall be performed to ensure the surface is clean and free of grit or other debris left from the cleaning process.

a. Preparation of new pavement surfaces. The area to be painted shall be cleaned by broom, blower, water blasting, or by other methods approved by the RPR to remove all contaminants, including PCC curing compounds, minimizing damage to the pavement surface.

b. Preparation of pavement to remove existing markings. Existing pavement markings shall be removed by rotary grinding, water blasting, or by other methods approved by the RPR minimizing damage to the pavement surface. The removal area may need to be larger than the area of the markings to eliminate ghost markings. After removal of markings on asphalt pavements, apply a fog seal or seal coat to 'block out' the removal area to eliminate 'ghost' markings.

c. Preparation of pavement markings prior to remarking. Prior to remarking existing markings, loose existing markings must be removed minimizing damage to the pavement

surface, with a method approved by the RPR. After removal, the surface shall be cleaned of all residue or debris.

Prior to the application of markings, the Contractor shall certify in writing that the surface is dry and free from dirt, grease, oil, laitance, or other foreign material that would prevent the bond of the paint to the pavement or existing markings. This certification along with a copy of the paint manufactures application and surface preparation requirements must be submitted to the RPR prior to the initial application of markings.

Loose markings should always be removed prior to remarking, whether or not existing markings need to be removed is up to the Engineer and the Airport Operator. The type of removal method used depends upon whether you need to remove loose markings or all existing markings.

620-3.4 Layout of markings. The proposed markings shall be laid out in advance of the paint application. The locations of markings to receive glass beads shall be shown on the plans. [The locations of markings to receive silica sand shall be shown on the plans.]

Glass beads improve conspicuity and the friction characteristics of markings. At a minimum, the Engineer shall indicate the locations to receive glass beads per AC 150/5340-1, Standards for Airport Markings.

620-3.5 Application. A period of [] days shall elapse between placement of surface course or seal coat and application of the permanent paint markings. Paint shall be applied at the locations and to the dimensions and spacing shown on the plans. Paint shall not be applied until the layout and condition of the surface has been approved by the RPR.

Select timeframe between placement of surface course or seal coat and application of the paint based on type of surface course or seal coat in the project and environment at the project location. The typical timeframe is 30-days for volatiles and moisture vapor to dissipate.

The edges of the markings shall not vary from a straight line more than 1/2 inch (12 mm) in 50 feet (15 m), and marking dimensions and spacing shall be within the following tolerances:

Marking Dimensions and Spacing Tolerance

Dimension and Spacing	Tolerance
36 inch (910 mm) or less	±1/2 inch (12 mm)
greater than 36 inch to 6 feet (910 mm to 1.85 m)	±1 inch (25 mm)
greater than 6 feet to 60 feet (1.85 m to 18.3 m)	±2 inch (50 mm)
greater than 60 feet (18.3 m)	±3 inch (76 mm)

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate shown in Table 1. The addition of thinner will not be permitted.

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate shown in Table 1. Glass beads shall not be applied to black paint or green paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment and distribution should be performed.

620-3.6 Application--preformed thermoplastic airport pavement markings.

[Preformed thermoplastic pavement markings not used.]

[To ensure minimum single-pass application time and optimum bond in the marking/substrate interface, the materials must be applied using a variable speed self-propelled mobile heater with an effective heating width of no less than 16 feet (5 m) and a free span between supporting wheels of no less than 18 feet (5.5 m). The heater must emit thermal radiation to the marking material in such a manner that the difference in temperature of 2 inches (50 mm) wide linear segments in the direction of heater travel must be within 5% of the overall average temperature of the heated thermoplastic material as it exits the heater. The material must be able to be applied at ambient and pavement temperatures down to 35°F (2°C) without any preheating of the pavement to a specific temperature. The material must be able to be applied without the use of a thermometer. The pavement shall be clean, dry, and free of debris. A non-volatile organic content (non-VOC) sealer with a maximum applied viscosity of 250 centiPoise must be applied to the pavement shortly before the markings are applied. The supplier must enclose application instructions with each box/package.]

The Engineer will make the appropriate selection for thermoplastic markings.

620-3.7 Control strip. Prior to the full application of airfield markings, the Contractor shall prepare a control strip in the presence of the RPR. The Contractor shall demonstrate the surface preparation method and all striping equipment to be used on the project. The marking

equipment must achieve the prescribed application rate of paint and population of glass beads (per Table 1) that are properly embedded and evenly distributed across the full width of the marking. Prior to acceptance of the control strip, markings must be evaluated during darkness to ensure a uniform appearance.

620-3.8 Retro-reflectance. [Reflectance shall be measured with a portable retro-reflectometer meeting ASTM E1710 (or equivalent). A total of 6 reading shall be taken over a 6 square foot area with 3 readings taken from each direction. The average shall be equal to or above the minimum levels of all readings which are within 30% of each other.

Minimum Retro-Reflectance Values

Material	Retro-reflectance mcd/m ² /lux		
	White	Yellow	Red
Initial Type I	300	175	35
Initial Type III	600	300	35
Initial Thermoplastic	225	100	35
All materials, remark when less than ¹	100	75	10

¹ ‘Prior to remarking determine if removal of contaminants on markings will restore retro-reflectance’[not used]

Include tests of retro-reflectance at Part 139 airports, recommend testing at least 2 times per day. Enter Not Used at all other locations.

620-3.9 Protection and cleanup. After application of the markings, all markings shall be protected from damage until dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings. The Contractor shall remove from the work area all debris, waste, loose reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the RPR. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and federal environmental statutes and regulations.

METHOD OF MEASUREMENT

620-4.1a The quantity of surface preparation shall be measured by [the number of square feet (square meters) for each type of surface preparation specified in paragraph 620-3.3] [lump sum].

620-4.1b The quantity of markings shall be paid for shall be measured [by the number of square feet (square meters) of painting] [by lump sum].

620-4.1c The quantity of reflective media shall be paid for by [the number of pounds (km)] [lump sum] of reflective media.

620-4.1d [The quantity of temporary markings to be paid for shall be [the number of square feet (square meters) of painting] [lump sum price] performed in accordance with the specifications and accepted by the RPR. Temporary marking includes surface preparation, application and complete removal of the temporary marking.] [Temporary markings not required.]

[**620-4.1e** The quantity of preformed markings to be paid for shall be [the number of square feet (square meters) of preformed markings] [lump sum]].

Separate pay items for surface preparation, marking, and reflective media is recommended, however on small jobs, lump sum pay items is acceptable.

BASIS OF PAYMENT

620-5.1 This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item complete in place and accepted by the RPR in accordance with these specifications.

620-5.1a Payment for surface preparation shall be made at the contract price for [the number of square feet (square meters) for each type of surface preparation specified in paragraph 620-3.3] [lump sum].

620-5.2b Payment for markings shall be made at the contract price for [the number of square feet (square meters) of painting and the number of pounds (km) of reflective media] [by the number of square feet (square meters) of painting] [by lump sum].

620-5.3c Payment for reflective media shall be made at the contract unit price for [the number of pounds (km) of reflective media] [lump sum].

620-5.4d Payment for temporary markings shall be made at the contract price for [the number of square feet (square meters) of painting] [lump sum price]. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item. [Temporary markings are not required.]

[**620-5.5e** Payment for preformed markings shall be made at the contract price for [the number of square feet (square meters) of preformed markings] [lump sum price].]

Payment will be made under:

Item P-620-5.1a Surface Preparation [per square foot (square meter)] [lump sum]

Item P-620-5.2b Marking [per square foot (square meter)] [lump sum]

Item P-620-5.3c Reflective Media [per pound (km)] [lump sum]

Item P-620-5.4d Temporary runway and taxiway marking [per square foot]
[per square meter][lump sum].

[Item 620-5.5e Preformed markings per [the number of square feet (square meters) of
preformed markings] [lump sum price].]

Section VII. Drawings

[Insert here a list of Drawings. The actual Drawings, including site plans, should be attached to this section, or annexed in a separate folder.]

Section VIII. Bill of Quantities

Bill of Quantities, Detailed Breakdown of Component of Each Item and Detailed Unit Price Analysis should be submitted together with the Annex “C” Form 4 to 7 in pages 223 to 226.

Non-attachment of Annex “C” Form 1 to 7 shall be automatically disqualified.

{ATTACH COMPANY LETTERHEAD/LOGO}

BILL OF QUANTITIES

PROJECT: BASCO AIRPORT DEVELOPMENT PROJECT CY 2019 (Widening of Stopway, Expansion of Apron, Runway and Taxiway Asphalt Overlay
Including Strip Width Correction)
LOCATION: Basco Airport, Basco, Batanes

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT PRICE (Pesos)	AMOUNT (Pesos)
PART I	FACILITIES FOR THE ENGINEER				
A.1.1(10)	Provision of Living Quarters for the Engineer (Rental Basis)	7.00	months		
	Pesos _____ Amount in Words _____ and _____ _____ centavos				
A.1.2(3)	Provision of 4x2 Pick Up Type Service for the Engineer	7.00	months		
	Pesos _____ Amount in Words _____ and _____ _____ centavos				
PART II	OTHER GENERAL REQUIREMENTS				
B.5	Project Sign Board	1.00	each		
	Pesos _____ Amount in Words _____ and _____ _____ centavos				
B.9	Mobilization/Demobilization	1.00	lot		
	Pesos _____ Amount in Words _____ and _____ _____ centavos				
PART III	WIDENING OF STOPWAY				
P-152-4.1a	Unclassified Excavation	1,391.12	cu.m.		
	Pesos _____ Amount in Words _____ and _____ _____ centavos				
P-152-4.2a.1	Embankment in place (horizontal structures)	1,286.79	cu.m.		
	Pesos _____ Amount in Words _____ and _____ _____ centavos				

P-152-4.2b	Embankment from Borrow Excavation	673.45	cu.m.		
	Pesos_____ Amount in Words _____ and _____ centavos				
105(1)a	Subgrade Preparation	1,260.00	sq.m.		
	Pesos_____ Amount in Words _____ and _____ centavos				
P-154-5.1	Aggregate Subbase Course	216.00	cu.m.		
	Pesos_____ Amount in Words _____ and _____ centavos				
P-208-5.1	Aggregate Base Course	486.00	cu.m.		
	Pesos_____ Amount in Words _____ and _____ centavos				
P-501-8.1b.2	Cement Concrete Pavement, 300mm thick (Widening of stopway)	1,260.00	sq.m.		
	Pesos_____ Amount in Words _____ and _____ centavos				
PART IV	EXPANSION OF APRON				
P-152-4.1a	Unclassified Excavation	4,676.98	cu.m.		
	Pesos_____ Amount in Words _____ and _____ centavos				
105(1)a	Subgrade Preparation	2,427.60	sq.m.		
	Pesos_____ Amount in Words _____ and _____ centavos				

P-154-5.1	Aggregate Subbase Course	371.36	cu.m.		
	Pesos_____ Amount in Words _____ and _____ centavos				
P-208-5.1	Aggregate Base Course	757.00	cu.m.		
	Pesos_____ Amount in Words _____ and _____ centavos				
P-501-8.1b.2	Cement Concrete Pavement, 300mm thick (Expansion of Apron)	2,427.60	sq.m.		
	Pesos_____ Amount in Words _____ and _____ centavos				
P-606(1).a2	Pavement Marking (Flat Latex Paint-Yellow)	95.04	sq.m.		
	Pesos_____ Amount in Words _____ and _____ centavos				
PART V	RUNWAY STRIP WIDTH CORRECTION				
P-151-4.2	Clearing and Grubbing, 150mm thick	32,352.58	sq.m.		
	Pesos_____ Amount in Words _____ and _____ centavos				
P-152-4.2b	Embankment from Borrow Excavation	1,033.18	cu.m.		
	Pesos_____ Amount in Words _____ and _____ centavos				
PART VI	RUNWAY AND TAXIWAY ASPHALT OVERLAY				
P-603-5.1	Emulsified Asphalt Tack Coat	115.00	M.T.		
	Pesos_____ Amount in Words _____ and _____ centavos				

P-403-8.1a	Asphalt Mix Pavement Surface (Bituminous Hot Laid)	10,089.00	M.T.		
	Pesos_____ Amount in Words _____ and _____ _____ centavos				
P-101-5.1b	Pavement Removal (Asphalt Temporary Transitions)	4,217.40	sq.m.		
	Pesos_____ Amount in Words _____ and _____ _____ centavos				
P-606(1).a3	Pavement Marking (Flat Latex Paint-White)	7,411.71	sq.m.		
	Pesos_____ Amount in Words _____ and _____ _____ centavos				

TOTAL BID AMOUNT (Php)

TOTAL BID AMOUNT IN WORDS

Signature: _____
Printed Name: _____
Position: _____
Name Company: _____
Date: _____

BASCO AIRPORT DEVELOPMENT PROJECT CY 2019
Widening of Stopway, Expansion of Apron, Runway and Taxiway Asphalt Overlay including strip width correction
Basco Airport, Basco, Batanes

DETAILED BREAKDOWN

ITEM NO.	DESCRIPTION OF WORK	QUANTITY	UNIT	Wt. %	DIRECT COST			ESTIMATED DIRECT COST	MARK-UPS IN PERCENT				TOTAL MARK-UP		VAT	TOTAL INDIRECT COST	TOTAL COST	UNIT COST
					MATERIALS	LABOR	EQUIPMENT		OCM	Amount	Profit	Amount	%	VALUE				
(1)	(2)	(3)	(4)					(5)	(6)	(7) (5 x 6)	(8)	(9) (5 x 8)	(10)	(11) (5 x 10)	(12) 5% (9 + 11)	(13) (11) + (12)	(14) (9) + (13)	(15) (14) / (3)
PART I	FACILITIES FOR THE ENGINEER																	
A-1.1(1)	Provision of Living Quarters for the Engineer (Rental Basis)	7.00	months															
A-1.2(3)	Provision of 4x2 Pick Up Type Service for the Engineer	7.00	months															
TOTAL OF PART I																		
PART II	OTHER GENERAL REQUIREMENTS																	
B-5	Project Sign Board	1.00	each															
B-9	Notification/Demolition	1.00	lot															
TOTAL OF PART II																		
PART III	WIDENING OF STOPWAY																	
P-152-4.1a	Unclassified Excavation	1,391.12	cum.															
P-152-4.2a.1	Embankment in place (horizontal structures)	1,286.79	cum.															
P-152-4.2b	Embankment from Borrow Excavation	673.45	cum.															
105(1)a	Subgrade Preparation	1,260.00	sq.m.															
P-154-5.1	Aggregate Subbase Course	216.00	cum.															
P-208-5.1	Aggregate Base Course	465.00	cum.															
P-501-8.1b.2	Cement Concrete Pavement, 300mm thick (Widening of stopway)	1,260.00	sq.m.															
TOTAL OF PART III																		
PART IV	EXPANSION OF APRON																	
P-152-4.1a	Unclassified Excavation	4676.98	cum.															
105(1)a	Subgrade Preparation	2,427.60	sq.m.															
P-154-5.1	Aggregate Subbase Course	371.26	cum.															
P-208-5.1	Aggregate Base Course	757.00	cum.															
P-501-8.1b.2	Cement Concrete Pavement, 300mm thick (Expansion of Apron)	2,427.60	sq.m.															
P-606(1)a2	Pavement Marking (Flat Latex Paint-Yellow)	95.04	sq.m.															
TOTAL OF PART IV																		

{ATTACH COMPANY LETTERHEAD/LOGO}

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019
Project Description : Widening of Stopway, Expansion of Apron, Runway and Taxiway Asphalt Overlay including strip width
Location : Basco Airport, Basco, Batanes
Item No./Description : **A.1.1(10)** Provision of Living Quarters for the Engineer (Rental Basis)
Quantity : **7.00**
Unit of Measurement : months
Output per hour :

	DESIGNATION	No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A	Labor				
	Sub-Total for A				
	NAME AND CAPACITY	No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B	Equipment				
	Sub-Total for B				
C	Total (A+B)				
D	Output per Hour				
E	Direct Unit Cost (C/Quantity per hour)				
	NAME AND CAPACITY	Quantity	Unit	Unit Cost	Amount
F	Materials				
	a. Provision of Living Quarters for the Engineer, including water and electrical supply in rental basis for 210 days	1.00	month		
	Sub-Total for F				
G	DIRECT UNIT COST (E + F)				
H	OCM (0% of G)				
I	CONTRACTOR'S PROFIT (0% - 8% of G)				
J	VALUE ADDED TAX, (VAT)	5.0%	of (G+H+I)		
K	TOTAL UNIT COST (G + H + I + J)				

Submitted by:

Signature: _____
Printed Name: _____
Position: _____
Name Company: _____
Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019

Project Description : Widening of Stopway, Expansion of Apron, Runway and Taxiway Asphalt Overlay including strip width correction

Location : Basco Airport, Basco, Batanes

Item No./Description : A.1.2(3) Provision of 4x2 Pick Up Type Service for the Engineer

Quantity : 7.00

Unit of Measurement : months

Output per hour :

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A	Labor				
	Sub-Total for A				
NAME AND CAPACITY		No. of Unit/s	Unit	Unit Cost	Amount
B	Equipment				
	a. 4x2 Pick-up, 2.5 liter diesel engine at least 2018	1.00	month		
Sub-Total for B					
C Total (A+B)					
D Output per Hour					
E Direct Unit Cost (C/Quantity per hour)					
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F	Materials				
	a. 450 liters per month @ 75pesos per liter	1.00	month		
	b. 10% for repair & maintenace	1.00	lot		
Sub-Total for F					
G DIRECT UNIT COST (E + F)					
H OCM (0% of G)					
I CONTRACTOR's PROFIT (0% of G)					
J VALUE ADDED TAX, (VAT)		5.0%	of (G+H+I)		
K TOTAL UNIT COST (G + H + I + J)					

Submitted by:

Signature: _____
 Printed Name: _____
 Position: _____
 Name Company: _____
 Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019

Project Description : Widening of Stopway, Expansion of Apron, Runway and Taxiway Asphalt Overlay including strip width correction

Location : Basco Airport, Basco, Batanes

Item No./Description : **B.5 Project Sign Board**

Quantity : **1.00**

Unit of Measurement : each

Output per hour : 1.00

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A	Labor				
	a. Construction Foreman	1.00	1.00		
	b. Unskilled Laborer	2.00	1.00		
	Sub-Total for A				
NAME AND CAPACITY		No. of Unit/s	Unit	Unit Cost	Amount
B	Equipment				
	Sub-Total for B				
C Total (A+B)					
D Output per Hour		1.00	each		
E Direct Unit Cost (C/Quantity per hour)					
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F	Materials				
	a. Tarpaulin (8ft x 8ft)	1.00	pc		
	Sub-Total for F				
G DIRECT UNIT COST (E + F)					
H OCM (0% - 10% of G)			of G		
I CONTRACTOR'S PROFIT (0% - 8% of G)			of G		
J VALUE ADDED TAX, (VAT)		5.0%	of (G+H+I)		
K TOTAL UNIT COST (G + H + I + J)					

Submitted by:

Signature: _____
 Printed Name: _____
 Position: _____
 Name Company: _____
 Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019

Project Description : Widening of Stopway, Expansion of Apron, Runway and Taxiway Asphalt Overlay including strip width correction

Location : Basco Airport, Basco, Batanes

Item No./Description : **B.9 Mobilization/Demobilization**

Quantity : **1.00**

Unit of Measurement : lot

Output per hour : 1.00

	NAME AND CAPACITY	No. of Unit/s	Unit	Unit Cost	Amount
B	Equipment				
	a. 4x2 Pick-up, 2.5 liter diesel engine at least 2018 model (including diesel and maintenance)				
	b. Bulldozer, 165HP				
	c. Payloader, 1.50 cu.m.				
	d. Dump Truck, 12yd ³				
	e. Motorized Road Grader, 140HP				
	f. Vibratory Single Smooth Drum Roller, 12MT				
	g. Water Truck, 4,000 gals				
	h. Plate Compactor, 5HP				
	i. Concrete Batch Plant, 30 cu.m.				
	j. Concrete Screeder, 5.5HP				
	k. Transit Mixer, 5 cu.m.				
	l. Concrete Vibrator	1.00	lot		
	m. Bar Cutter, Single Phase				
	n. Bar Bender				
	o. Concrete Saw, self-propelled 10 3/4 in				
	p. Asphalt Distributor/Sprayer Pen, 5T				
	q. Power Broom & Blower, 30 km/hr				
	r. Stake Truck				
	s. Generator Set, 51-100kW (with lighting assembly)				
	t. Asphalt Paver Finisher, 10ft. wid				
	u. Vibratory Tandem Steel Roller, 10.10MT				
	v. Pneumatic Tire Roller, 20MT				
	w. Generator Set, 51-100kW (with lighting assembly)				
	x. Dump Truck, 12yd ³				
	y. Improvised Asphalt Batch Plant, 60-80tph				
	z. Concrete Diamond Saw, Blade 14" diameter				
	Sub-Total for B				-
C	Total (A+B)				
D	Output per Hour	1.00	lot		
E	Direct Unit Cost (C/Quantity per hour)				
	NAME AND CAPACITY	Quantity	Unit	Unit Cost	Amount
F	Materials				
	Sub-Total for F				
G	DIRECT UNIT COST (E + F)				
H	OCM (0% of G)				
I	CONTRACTOR'S PROFIT (0% of G)				
J	VALUE ADDED TAX, (VAT)	5.0%	of (G+H+I)		
K	TOTAL UNIT COST (G + H + I + J)				

Submitted by:

Signature: _____
Printed Name: _____
Position: _____
Name Company: _____
Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019
Project Description : Widening of Stopway including strip width correction
Location : Basco Airport, Basco, Batanes
Item No./Description : P-152-4.1a Unclassified Excavation
Quantity : 1,391.12
Unit of Measurement : cu.m.
Output per hour : 30.00 cu.m./hr

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A	Labor				
	a. Construction Foreman	1.00	1.00		
	b. Skilled Laborer	2.00	1.00		
	Sub-Total for A				
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B	Equipment				
	Excavation works at site				
	a. Bulldozer, 165HP	1.00	0.60		
	Disposal / Stockpile				
	b. Payloader, 1.50 cu.m.	1.00	1.00		
	c. Dump Truck, 12yd ³	3.00	1.00		
	at Stockpile Area				
	d. Payloader, 1.50 cu.m. - at disposal area	1.00	0.20		
Sub-Total for B					
C Total (A+B)					
D Output per Hour		30.00	cu.m./hr		
E Direct Unit Cost (C/Quantity per hour)					
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F	Materials				
	(from Station -0+090.00 to Station 0+000.00)				
Sub-Total for F					
G DIRECT UNIT COST (E + F)					
H OCM (0% - 10% of G)			of G		
I CONTRACTOR'S PROFIT (0% - 8% of G)			of G		
J VALUE ADDED TAX, (VAT)		5.0%	of (G+H+I)		
K TOTAL UNIT COST (G + H + I + J)					

Submitted by:

Signature: _____
 Printed Name: _____
 Position: _____
 Name Company: _____
 Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019
Project Description : Widening of Stopway including strip width correction
Location : Basco Airport, Basco, Batanes
Item No./Description : P-152-4.2a.1 Embankment in place (horizontal structures)
Quantity : 1,286.79
Unit of Measurement : cu.m.
Output per hour : 41.667 cu.m./hr

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A Labor	<i>From stockpile to jobsite:</i>				
	a. Construction Foreman	1.00	1.00		
	b. Unskilled Laborer	2.00	1.00		
	<i>Spreading and Compaction:</i>				
	a. Construction Foreman	1.00	1.00		
	b. Unskilled Laborer	2.00	1.00		
Sub-Total for A					
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B Equipment	<i>From stockpile to jobsite:</i>				
	a. Payloader, 1.50 cu.m.	2.00	0.70		
	b. Dump Truck, 12yd ³	6.00	0.70		
	<i>Spreading and Compaction:</i>				
	a. Motorized Road Grader, 140HP	1.00	1.00		
	b. Vibratory Single Smooth Drum Roller, 10MT	1.00	1.00		
	c. Water Truck, 4,000 gals	1.00	0.25		
	Sub-Total for B				
C	Total (A+B)				
D	Output per Hour	41.667	cu.m./hr		
E	Direct Unit Cost (C/Quantity per hour)				
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F Materials	<i>(use suitable excavated materials)</i>				
	<i>(from Station -0+090.00 to Station 0+000.00)</i>				
Sub-Total for F					
G	DIRECT UNIT COST (E + F)				
H	OCM (0% - 10% of G)		of G		
I	CONTRACTOR'S PROFIT (0% - 8% of G)		of G		
J	VALUE ADDED TAX, (VAT)	5.0%	of (G+H+I)		
K	TOTAL UNIT COST (G + H + I + J)				

Submitted by:

Signature: _____
 Printed Name: _____
 Position: _____
 Name Company: _____
 Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019
Project Description : Widening of Stopway including strip width correction
Location : Basco Airport, Basco, Batanes
Item No./Description : P-152-4.2b Embankment from Borrow Excavation
Quantity : 673.45
Unit of Measurement : cu.m.
Output per hour : 41.667 cu.m./hr

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A	Labor				
	a. Construction Foreman	1.00	1.00		
	b. Unskilled Laborer	2.00	1.00		
	Sub-Total for A				
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B	Equipment				
	a. Motorized Road Grader, 140HP G710A	1.00	1.00		
	b. Vibratory Single Smooth Drum Roller, 10MT	1.00	1.00		
	c. Water Truck, 4,000 gals	1.00	0.25		
Sub-Total for B					
C Total (A+B)					
D Output per Hour		41.667	cu.m./hr		
E Direct Unit Cost (C/Quantity per hour)					
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F	Materials				
	a. Embankment Materials (suitable) with 20% Shrinkage Factor (from Station -0+090.00 to Station 0+000.00)	1.20	cu.m.		
	Sub-Total for F				
G DIRECT UNIT COST (E + F)					
H OCM (0% - 10% of G)			of G		
I CONTRACTOR'S PROFIT (0% - 8% of G)			of G		
J VALUE ADDED TAX, (VAT)		5.0%	of (G+H+I)		
K TOTAL UNIT COST (G + H + I + J)					

Submitted by:

Signature: _____
 Printed Name: _____
 Position: _____
 Name Company: _____
 Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019
Project Description : Widening of Stopway including strip width correction
Location : Basco Airport, Basco, Batanes
Item No./Description : 105(1)a Subgrade Preparation
Quantity : 1,260.00
Unit of Measurement : sq.m.
Output per hour : 300.00 sq.m./hr.

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A	Labor				
	a. Construction Foreman	1.00	1.00		
	b. Unskilled Laborer	2.00	1.00		
	Sub-Total for A				
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B	Equipment				
	a. Motorized Road Grader, 140HP	1.00	1.00		
	b. Vibratory Single Smooth Drum Roller, 10MT	1.00	1.00		
	c. Water Truck, 4,000 gals	1.00	0.25		
Sub-Total for B					
C Total (A+B)					
D Output per Hour		300.00	sq.m./hr.		
E Direct Unit Cost (C/Quantity per hour)					
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F	Materials				
	(from Station -0+090.00 to Station 0+000.00)				
Sub-Total for F					
G DIRECT UNIT COST (E + F)					
H OCM (0% - 10% of G)			of G		
I CONTRACTOR'S PROFIT (0% - 8% of G)			of G		
J VALUE ADDED TAX, (VAT)		5.0%	of (G+H+I)		
K TOTAL UNIT COST (G + H + I + J)					

Submitted by:

Signature: _____
 Printed Name: _____
 Position: _____
 Name Company: _____
 Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019

Project Description : Widening of Stopway including strip width correction

Location : Basco Airport, Basco, Batanes

Item No./Description : P-154-5.1 Aggregate Subbase Course

Quantity : 216.00

Unit of Measurement : cu.m.

Output per hour : 43.478 cu.m./hr.

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A	Labor				
	a. Construction Foreman	1.00	1.00		
	b. Unskilled Laborer	2.00	1.00		
	Sub-Total for A				
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B	Equipment				
	a. Motorized Road Grader, 140HP	1.00	1.00		
	b. Vibratory Single Smooth Drum Roller, 10MT	1.00	1.00		
	d. Water Truck, 4,000 gals	1.00	0.25		
	Sub-Total for B				
C	Total (A+B)				
D	Output per Hour	43.478	cu.m./hr.		
E	Direct Unit Cost (C/Quantity per hour)				
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F	Materials				
	a. Aggregate Subbase Coarse with 15% Shrinkage Factor (from Station -0+090.00 to Station 0+000.00)	1.15	cu.m.		
	Sub-Total for F				
G	DIRECT UNIT COST (E + F)				
H	OCM (0% - 10% of G)		of G		
I	CONTRACTOR'S PROFIT (0% - 8% of G)		of G		
J	VALUE ADDED TAX, (VAT)	5.0%	of (G+H+I)		
K	TOTAL UNIT COST (G + H + I + J)				

Submitted by:

Signature: _____

Printed Name: _____

Position: _____

Name Company: _____

Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019
Project Description : Widening of Stopway including strip width correction
Location : Basco Airport, Basco, Batanes
Item No./Description : P-208-5.1 Aggregate Base Course
Quantity : 486.00
Unit of Measurement : cu.m.
Output per hour : 43.478 cu.m./hr.

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A	Labor				
	a. Construction Foreman	1.00	1.00		
	b. Unskilled Laborer	2.00	1.00		
	Sub-Total for A				
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B	Equipment				
	a. Motorized Road Grader, 140HP G710A	1.00	1.00		
	b. Vibratory Single Smooth Drum Roller, 10MT	1.00	1.00		
	c. Water Truck, 4,000 gals	1.00	0.25		
Sub-Total for B					
C Total (A+B)					
D Output per Hour		43.478	cu.m./hr.		
E Direct Unit Cost (C/Quantity per hour)					
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F	Materials				
	a. Aggregate Base Coarse with 15% Shrinkage Factor (from Station -0+090.00 to Station 0+000.00)	1.15	cu.m.		
	Sub-Total for F				
G DIRECT UNIT COST (E + F)					
H OCM (0% - 10% of G)			of G		
I CONTRACTOR'S PROFIT (0% - 8% of G)			of G		
J VALUE ADDED TAX, (VAT)		5.0%	of (G+H+I)		
K TOTAL UNIT COST (G + H + I + J)					

Submitted by:

Signature: _____
 Printed Name: _____
 Position: _____
 Name Company: _____
 Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019

Project Description : Widening of Stopway including strip width correction

Location : Basco Airport, Basco, Batanes

Item No./Description : P-501-8.1b.2 Cement Concrete Pavement, 300mm thick (Widening of stopway)

Quantity : 1,260.00

Unit of Measurement : sq.m.

Output per hour : 33.34 sq.m./hr.

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A Labor	a. Construction Foreman	1.00	1.00		
	b. Skilled Laborer	4.00	1.00		
	c. Unskilled Laborer	12.00	1.00		
	Sub-Total for A				
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B Equipment	a. Concrete Batch Plant, 30 cu.m.	1.00	1.00		
	b. Concrete Screeder, 5.5HP	1.00	1.00		
	c. Transit Mixer, 5 cu.m.	2.00	1.00		
	d. Payloader, 1.5 cu.m.	1.00	1.00		
	e. Water Truck, 4,000 gals	1.00	1.00		
	f. Concrete Vibrator	2.00	1.00		
	g. Bar Cutter, Single Phase	1.00	1.00		
	h. Concrete Saw, self-propelled 14 in	1.00	0.10		
	Minor Tools (5% of Labor Cost)				
	Sub-Total for B				
C	Total (A+B)				
D	Output per Hour	33.34	sq.m./hr.		
E	Direct Unit Cost (C/Quantity per hour)				
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F Materials	(from Station -0+090.00 to Station 0+000.00)				
	a. Portland Cement, 40 kgs	3.60	bags		
	b. Sand	0.15	cu.m.		
	c. Gravel, 3/4"	0.30	cu.m.		
	d. 25mm dia. Round Steel Bar, Gr.60 (Dowel)	0.61	kgs.		
	e. 10mm dia. Round Steel Bar, Gr.40 (Dowel Holder)	0.59	kgs.		
	f. #16 G.I. Tie Wires	0.02	kgs.		
	g. Steel Form (rental)	0.15	ln.m.		
	h. Curing Compound	0.01	liters		
	i. Joint Sealer	0.02	tins		
	j. 25mm Polyethylene Backer Rod, 3.50 meters	0.23	pcs.		
	k. Form Oil	0.22	L		
	l. Grease/Tar	0.01	L		
	m. Red Oxide	0.01	L		
	n. 152mm Paint Roller	0.01	pcs.		
	o. Concrete Saw Diamond Blade, 14"Ø	0.00015	pc.		
	Sub-Total for F				
G	DIRECT UNIT COST (E + F)				
H	OCM (0% - 10% of G)				
I	CONTRACTOR'S PROFIT (0% - 8% of G)				
J	VALUE ADDED TAX, (VAT)				
K	TOTAL UNIT COST (G + H + I + J)				

Submitted by:

Signature: _____

Printed Name: _____

Position: _____

Name Company: _____

Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019

Project Description : Expansion of Apron

Location : Basco Airport, Basco, Batanes

Item No./Description : P-152-4.1a Unclassified Excavation

Quantity : 4,676.98

Unit of Measurement : cu.m.

Output per hour : 30.00 cu.m./hr

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A Labor	a. Construction Foreman	1.00	1.00		
	b. Skilled Laborer	2.00	1.00		
	Sub-Total for A				
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B Equipment	Excavation works at site				
	a. Bulldozer, 165HP	1.00	0.60		
	Disposal / Stockpile				
	b. Payloader, 1.50 cu.m.	1.00	1.00		
	c. Dump Truck, 12yd ³	3.00	1.00		
	Sub-Total for B				
C Total (A+B)					
D Output per Hour		30.00	cu.m./hr		
E Direct Unit Cost (C/Quantity per hour)					
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F Materials	(from Station 0+023.03 to Station 0+070.64)				
	Sub-Total for F				
G DIRECT UNIT COST (E + F)					
H OCM (0% - 10% of G)			of G		
I CONTRACTOR'S PROFIT (0% - 8% of G)			of G		
J VALUE ADDED TAX, (VAT)		5.0%	of (G+H+I)		
K TOTAL UNIT COST (G + H + I + J)					

Submitted by:

Signature: _____

Printed Name: _____

Position: _____

Name Company: _____

Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019

Project Description : Expansion of Apron

Location : Basco Airport, Basco, Batanes

Item No./Description : 105(1)a Subgrade Preparation

Quantity : 2,427.60

Unit of Measurement : sq.m.

Output per hour : 300.00 sq.m./hr.

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A Labor	a. Construction Foreman	1.00	1.00		
	b. Unskilled Laborer	2.00	1.00		
	Sub-Total for A				
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B Equipment	a. Motorized Road Grader, 140HP	1.00	1.00		
	b. Vibratory Single Smooth Drum Roller, 10MT	1.00	1.00		
	c. Water Truck, 4,000 gals	1.00	0.25		
	Sub-Total for B				
C Total (A+B)					
D Output per Hour		300.00	sq.m./hr.		
E Direct Unit Cost (C/Quantity per hour)					
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F Materials	(from Station 0+023.03 to Station 0+070.64)				
	Sub-Total for F				
G DIRECT UNIT COST (E + F)					
H OCM (0% - 10% of G)			of G		
I CONTRACTOR'S PROFIT (0% - 8% of G)			of G		
J VALUE ADDED TAX, (VAT)		5.0%	of (G+H+I)		
K TOTAL UNIT COST (G + H + I + J)					

Submitted by:

Signature: _____
Printed Name: _____
Position: _____
Name Company: _____
Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019

Project Description : Expansion of Apron

Location : Basco Airport, Basco, Batanes

Item No./Description : P-154-5.1 Aggregate Subbase Course

Quantity : 371.36

Unit of Measurement : cu.m.

Output per hour : 43.478 cu.m./hr.

	DESIGNATION	No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A	Labor				
	a. Construction Foreman	1.00	1.00		
	b. Unskilled Laborer	2.00	1.00		
	Sub-Total for A				
	NAME AND CAPACITY	No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B	Equipment				
	a. Motorized Road Grader, 140HP	1.00	1.00		
	b. Vibratory Single Smooth Drum Roller, 10MT	1.00	1.00		
	d. Water Truck, 4,000 gals	1.00	0.25		
	Sub-Total for B				
C	Total (A+B)				
D	Output per Hour	43.478	cu.m./hr.		
E	Direct Unit Cost (C/Quantity per hour)				
	NAME AND CAPACITY	Quantity	Unit	Unit Cost	Amount
F	Materials				
	a. Aggregate Subbase Coarse	1.15	cu.m.		
	15% Shrinkage Factor included in the total volume (from Station 0+023.03 to Station 0+070.64)				
	Sub-Total for F				
G	DIRECT UNIT COST (E + F)				
H	OCM (0% - 10% of G)		of G		
I	CONTRACTOR'S PROFIT (0% - 8% of G)		of G		
J	VALUE ADDED TAX, (VAT)	5.0%	of (G+H+I)		
K	TOTAL UNIT COST (G + H + I + J)				

Submitted by:

Signature: _____

Printed Name: _____

Position: _____

Name Company: _____

Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019

Project Description : Expansion of Apron

Location : Basco Airport, Basco, Batanes

Item No./Description : P-208-5.1 Aggregate Base Course

Quantity : 757.00

Unit of Measurement : cu.m.

Output per hour : 43.478 cu.m./hr.

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A	Labor				
	a. Construction Foreman	1.00	1.00		
	b. Unskilled Laborer	2.00	1.00		
	Sub-Total for A				
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B	Equipment				
	a. Motorized Road Grader, 140HP G710A	1.00	1.00		
	b. Vibratory Single Smooth Drum Roller, 10MT	1.00	1.00		
	c. Water Truck, 4,000 gals	1.00	0.25		
Sub-Total for B					
C Total (A+B)					
D Output per Hour		43.478	cu.m./hr.		
E Direct Unit Cost (C/Quantity per hour)					
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F	Materials				
	a. Aggregate Base Coarse	1.15	cu.m.		
	15% Shrinkage Factor included in the total volume (from Station 0+023.03 to Station 0+070.64)				
	Sub-Total for F				
G DIRECT UNIT COST (E + F)					
H OCM (0% - 10% of G)			of G		
I CONTRACTOR'S PROFIT (0% - 8% of G)			of G		
J VALUE ADDED TAX, (VAT)		5.0%	of (G+H+I)		
K TOTAL UNIT COST (G + H + I + J)					

Submitted by:

Signature: _____
Printed Name: _____
Position: _____
Name Company: _____
Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019

Project Description : Expansion of Apron

Location : Basco Airport, Basco, Batanes

Item No./Description : P-501-8.1b.2 Cement Concrete Pavement, 300mm thick (Expansion of Apron)

Quantity : 2,427.60

Unit of Measurement : sq.m.

Output per hour : 33.34 sq.m./hr.

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A Labor	a. Construction Foreman	1.00	1.00		
	b. Skilled Laborer	4.00	1.00		
	c. Unskilled Laborer	12.00	1.00		
	Sub-Total for A				
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B Equipment	a. Concrete Batch Plant, 30 cu.m.	1.00	1.00		
	b. Concrete Screeder, 5.5HP	1.00	1.00		
	c. Transit Mixer, 5 cu.m.	2.00	1.00		
	d. Payloader, 1.5 cu.m.	1.00	1.00		
	e. Water Truck, 4,000 gals	1.00	1.00		
	f. Concrete Vibrator	2.00	1.00		
	g. Bar Cutter, Single Phase	1.00	1.00		
	i. Concrete Saw, self-propelled 14 in	1.00	0.10		
	Minor Tools (5% of Labor Cost)				
	Sub-Total for B				
C Total (A+B)					
D Output per Hour		33.34	sq.m./hr.		
E Direct Unit Cost (C/Quantity per hour)					
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F Materials (from Station 0+023.03 to Station 0+070.64)	a. Portland Cement, 40 kgs	3.61	bags		
	b. Sand	0.16	cu.m.		
	c. Gravel, 3/4"	0.31	cu.m.		
	d. 25mm dia. Round Steel Bar, Gr.60	1.51	kgs.		
	e. 10mm dia. Round Steel Bar, Gr.40	0.90	kgs.		
	f. #16 G.I. Tie Wires	0.03	kgs.		
	g. Steel Form (rental)	0.12	ln.m.		
	h. Curing Compound	0.01	liters		
	i. Joint Sealer	0.02	tins		
	j. 25mm Polyethylene Backer Rod, 3.50 meters	0.21	pcs.		
	k. Form Oil	0.50	L		
	l. Grease/Tar	0.01	L		
	m. Red Oxide	0.01	L		
	n. 152mm Paint Roller	0.01	pcs.		
	o. Concrete Saw Diamond Blade, 14"Ø	0.00015	pc.		
	Sub-Total for F				
G DIRECT UNIT COST (E + F)					
H OCM (0% - 10% of G)			of G		
I CONTRACTOR'S PROFIT (0% - 8% of G)			of G		
J VALUE ADDED TAX, (VAT)		5.0%	of (G+H+I)		
K TOTAL UNIT COST (G + H + I + J)					

Submitted by:

Signature: _____
Printed Name: _____
Position: _____
Name Company: _____
Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019
Project Description : Expansion of Apron
Location : Basco Airport, Basco, Batanes
Item No./Description : P-606(1).a2 Pavement Marking (Flat Latex Paint-Yellow)
Quantity : 95.04
Unit of Measurement : sq.m.
Output per hour : 15.00 sq.m./hour

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A	Labor				
	a. Construction Foreman	1.00	1.00		
	b. Skilled Laborer	3.00	1.00		
	c. Unskilled Laborer	3.00	1.00		
Sub-Total for A					
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B	Equipment				
	Sub-Total for B				
C Total (A+B)					
D Output per Hour		15.00	sq.m./hour		
E Direct Unit Cost (C/Quantity per hour)					
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F	Materials				
	a. Pavement Marking (Yellow)	0.50	gal		
	Miscellaneous (5% of Material Cost)	1.00	lot		
	Sub-Total for F				
G DIRECT UNIT COST (E + F)					
H OCM (0% - 10% of G)			of G		
I CONTRACTOR'S PROFIT (0% - 8% of G)			of G		
J VALUE ADDED TAX, (VAT)		5.0%	of (G+H+I)		
K TOTAL UNIT COST (G + H + I + J)					

Submitted by:

Signature: _____
 Printed Name: _____
 Position: _____
 Name Company: _____
 Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019

Project Description : Runway Strip Width Correction

Location : Basco Airport, Basco, Batanes

Item No./Description : P-151-4.2 Clearing and Grubbing, 150mm thick

Quantity : 32,352.58

Unit of Measurement : sq.m.

Output per hour : 200.00 sq.m./hr

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A	Labor				
	a. Construction Foreman	1.00	1.00		
	c. Unskilled Laborer	2.00	1.00		
	Sub-Total for A				
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B	Equipment				
	<i>Clearing and grubbing works</i>				
	a. Bulldozer, 165HP	1.00	0.60		
	<i>Disposal works</i>				
	b. Payloader, 1.50 cu.m.	1.00	1.00		
	c. Dump Truck, 12yd ³	3.00	1.00		
	Sub-Total for B				
C	Total (A+B)				
D	Output per Hour	200.00	sq.m./hr		
E	Direct Unit Cost (C/Quantity per hour)				
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F	Materials				
	<i>from Station 0+000.00 to Station 1+244.33</i>				
	Sub-Total for F				
G	DIRECT UNIT COST (E + F)				
H	OCM (0% - 10% of G)		of G		
I	CONTRACTOR'S PROFIT (0% - 8% of G)		of G		
J	VALUE ADDED TAX, (VAT)	5.0%	of (G+H+I)		
K	TOTAL UNIT COST (G + H + I + J)				

Submitted by:

Signature: _____

Printed Name: _____

Position: _____

Name Company: _____

Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019

Project Description : Runway Strip Width Correction

Location : Basco Airport, Basco, Batanes

Item No./Description : **P-152-4.2b Embankment from Borrow Excavation**

Quantity : **1,033.18**

Unit of Measurement : cu.m.

Output per hour : 41.667 cu.m./hr

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A	Labor				
	a. Construction Foreman	1.00	1.00		
	b. Unskilled Laborer	2.00	1.00		
	Sub-Total for A				
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B	Equipment				
	a. Motorized Road Grader, 140HP G710A	1.00	1.00		
	b. Vibratory Single Smooth Drum Roller, 10MT	1.00	1.00		
	c. Water Truck, 4,000 gals	1.00	0.25		
	Sub-Total for B				
C	Total (A+B)				
D	Output per Hour	41.667	cu.m./hr		
E	Direct Unit Cost (C/Quantity per hour)				
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F	Materials				
	a. Embankment Materials (suitable) with 20% Shrinkage Factor from Station 0+000.00 to Station 1+244.33	1.20	cu.m.		
	Sub-Total for F				
G	DIRECT UNIT COST (E + F)				
H	OCM (0% - 10% of G)		of G		
I	CONTRACTOR'S PROFIT (0% - 8% of G)		of G		
J	VALUE ADDED TAX, (VAT)	5.0%	of (G+H+I)		
K	TOTAL UNIT COST (G + H + I + J)				

Submitted by:

Signature: _____

Printed Name: _____

Position: _____

Name Company: _____

Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019

Project Description : Runway Asphalt Overlay

Location : Basco Airport, Basco, Batanes

Item No./Description : P-603-5.1 Emulsified Asphalt Tack Coat

Quantity : 115.00

Unit of Measurement : M.T.

Output per hour : 0.214 MT/hour

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A Labor					
a. Construction Foreman		1.00	1.00		
b. Skilled Laborer		6.00	1.00		
c. Unskilled Laborer		8.00	1.00		
Sub-Total for A					
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B Equipment					
a. Asphalt Distributor/Sprayer Pen, 5T		1.00	1.00		
b. Power Broom & Blower, 30 km/hr		1.00	1.00		
c. Stake Truck		1.00	1.00		
d. Generator Set, 51-100kW (with lighting assembly)		1.00	1.00		
Minor Tools (5% of Labor Cost)		1.00	lot		
Sub-Total for B					
C Total (A+B)					
D Output per Hour		0.214	MT/hour		
E Direct Unit Cost (C/Quantity per hour)					
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F Materials					
a. Emulsified Asphalt Tack Coat, SS1 (specific gravity = 1,010 kgs/cu.m.) From Sta. -0+090.00 to Sta. 1+244.33		1.00	MT		
Sub-Total for F					
G DIRECT UNIT COST (E + F)					
H OCM (0% - 10% of G)			of G		
I CONTRACTOR'S PROFIT (0% - 8% of G)			of G		
J VALUE ADDED TAX, (VAT)		5.0%	of (G+H+I)		
K TOTAL UNIT COST (G + H + I + J)					

Submitted by:

Signature: _____

Printed Name: _____

Position: _____

Name Company: _____

Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019
Project Description : Runway Asphalt Overlay
Location : Basco Airport, Basco, Batanes
Item No./Description : P-403-8.1a Asphalt Mix Pavement Surface (Bituminous Hot Laid)
Quantity : 10,089.00
Unit of Measurement : M.T.
Output per hour : 18.75 MT/hour

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A	Labor				
	a. Construction Foreman	1.00	1.00		
	b. Skilled Laborer	6.00	1.00		
	c. Unskilled Laborer	8.00	1.00		
	Sub-Total for A				
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B	Equipment				
	a. Asphalt Paver Finisher, 10ft. width	1.00	1.00		
	b. Vibratory Tandem Steel Roller, 10.10MT	1.00	1.00		
	c. Pneumatic Tire Roller, 20MT	1.00	1.00		
	d. Generator Set, 51-100kW (with lighting assembly)	1.00	1.00		
	e. Dump Truck, 12yd ³	1.00	1.00		
	f. Improvised Asphalt Batch Plant, 60-80tph	1.00	1.00		
	g. Water Truck, 4,000 gals	1.00	1.00		
	h. Payloader, 1.5 cu.m.	1.00	1.00		
	Minor Tools (10% of Labor Cost)	1.00	lot		
Sub-Total for B					
C	Total (A+B)				
D	Output per Hour	18.75	MT/hour		
E	Direct Unit Cost (C/Quantity per hour)				
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F	Materials				
	a. Asphalt Concrete Mix specific weight of BCSC = 2.33 MT/cu.m.	1.00	M.T.		
Sub-Total for F					
G	DIRECT UNIT COST (E + F)				
H	OCM (0% - 10% of G)		of G		
I	CONTRACTOR'S PROFIT (0% - 8% of G)		of G		
J	VALUE ADDED TAX, (VAT)	5.0%	of (G+H+I)		
K	TOTAL UNIT COST (G + H + I + J)				

Submitted by:

Signature: _____
 Printed Name: _____
 Position: _____
 Name Company: _____
 Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019
Project Description : Runway Asphalt Overlay
Location : Basco Airport, Basco, Batanes
Item No./Description : P-101-5.1b Pavement Removal (Asphalt Temporary Transitions)
Quantity : 4,217.40
Unit of Measurement : sq.m.
Output per hour : 8.110 sq.m./hour

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A	Labor				
	a. Construction Foreman	1.00	1.00		
	b. Skilled Laborer	3.00	1.00		
	c. Unskilled Laborer	6.00	1.00		
	Sub-Total for A				
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B	Equipment				
	a. Concrete Saw, self-propelled 14 in	1.00	1.00		
	b. Dump Truck, 12yd ³	1.00	1.00		
	d. Generator Set, 51-100kW (with lighting assembly)	1.00	0.10		
	Minor Tools (5% of Labor Cost)	1.00	lot		
	Sub-Total for B				
C	Total (A+B)				
D	Output per Hour	8.110	sq.m./hour		
E	Direct Unit Cost (C/Quantity per hour)				
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F	Materials				
	a. Diamond Blade Cutter 14" diameter	0.0024	pc.		
	Sub-Total for F				
G	DIRECT UNIT COST (E + F)				
H	OCM (0% - 10% of G)		of G		
I	CONTRACTOR'S PROFIT (0% - 8% of G)		of G		
J	VALUE ADDED TAX, (VAT)	5.0%	of (G+H+I)		
K	TOTAL UNIT COST (G + H + I + J)				

Submitted by:

Signature: _____
 Printed Name: _____
 Position: _____
 Name Company: _____
 Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : BASCO AIRPORT DEVELOPMENT PROJECT CY 2019
Project Description : Runway Asphalt Overlay
Location : Basco Airport, Basco, Batanes
Item No./Description : P-606(1).a3 Pavement Marking (Flat Latex Paint-White)
Quantity : 7,411.71
Unit of Measurement : sq.m.
Output per hour : 15.00 sq.m./hour

DESIGNATION		No. of Person/s	No. of Hour/s	Hourly Rate	Amount
A	Labor				
	a. Construction Foreman	1.00	1.00		
	b. Skilled Laborer	3.00	1.00		
	c. Unskilled Laborer	3.00	1.00		
Sub-Total for A					
NAME AND CAPACITY		No. of Unit/s	No. of Hour/s	Hourly Rate	Amount
B	Equipment				
	Sub-Total for B				
C Total (A+B)					
D Output per Hour		15.00	sq.m./hour		
E Direct Unit Cost (C/Quantity per hour)					
NAME AND CAPACITY		Quantity	Unit	Unit Cost	Amount
F	Materials				
	a. Pavement Marking (White)	0.50	gal		
	Miscellaneous (5% of Material Cost)	1.00	lot		
	Sub-Total for F				
G DIRECT UNIT COST (E + F)					
H OCM (0% - 10% of G)			of G		
I CONTRACTOR'S PROFIT (0% - 8% of G)			of G		
J VALUE ADDED TAX, (VAT)		5.0%	of (G+H+I)		
K TOTAL UNIT COST (G + H + I + J)					

Submitted by:

Signature: _____
 Printed Name: _____
 Position: _____
 Name Company: _____
 Date: _____

Section IX. Bidding Forms

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Other Bidding Forms

(ANNEX “A”)

ANNEX “A” FORM 1	STATEMENT OF ALL ON-GOING CONTRACTS
ANNEX “A” FORM 2	STATEMENT OF SINGLE LARGEST COMPLETED CONTRACT
ANNEX “A” FORM 3	JOINT RESOLUTION FORM FOR JVA

{ATTACH COMPANY LETTERHEAD/LOGO}

Statement of all its ON-GOING government and private contracts, including contracts awarded but not yet started, if any, whether similar or not similar in nature and complexity to the contract to be bid

Name of Project: _____

Location of Project: _____

Name of Company : _____

Address of Company: _____

[illegible]

Submitted by: _____

(Print Name & Signature)

Designation: _____

Date: _____

{ATTACH COMPANY LETTERHEAD/LOGO }

Statement of single largest COMPLETED contract similar to the contract to be bid

Name of Project: _____
Location of Project: _____

Name of Company : _____
Address of Company: _____

Name of Contract	a. Owner's Name b. Address c. Telephone No.	Nature of Work	Contractor's Role		Contract Amount at Award	a. Date Awarded b. Date of Contract c. Contract Duration d. Date Started e. Date Completed
			Description	%		

Submitted by: _____
(Print Name & Signature)

Designation: _____

Date: _____

JOINT RESOLUTION

Whereas, _____ (Bidder / Name of Particular JV Partner), duly organized and existing under the Laws of the _____, with office address at _____, represented herein by its _____, _____, and _____ (Name of Particular JV Partner), duly organized and existing under the Laws of the _____, with main office address at _____, represented by herein by its _____, have entered into a Joint Venture (JV) Agreement to undertake the following project / contract:

(Name of Project / Contract)

Whereas, in order to facilitate the orderly execution and conduct of the contract that was entered into by the joint venture in the name of the joint venture, it is hereby resolved by the parties in the Joint Venture as follows:

- a. To appoint _____ as the Authorized Managing Officer and Official Representative, to represent, to manage the Joint Venture and is empowered to enter in contract in the name of the Joint Venture, or to sign for any document in the name of the Joint Venture required by the (Procurement Agency) or any entities pursuant to the terms of the Joint Venture Agreement:
- b. That, the parties agreed to make _____ (Name of Particular Lead Partner) _____ as the Lead Partner of the Joint Venture and (Name of Authorized Officer) _____ as the Official Representative & Managing Partner of the Joint Venture, and are granted full power and authority to do, execute and perform any and all acts necessary and/or to represent the Joint Venture in the Eligibility Check, Bidding and Undertaking of the said contract in the name of the Joint Venture, as fully and effectively and the Joint Venture may do and if personally present with full power of substitution and revocation. _____ is fully authorized and empowered to sign any or all documents pertaining to the above stated project / contract in the name of the Joint Venture.
- c. That the parties agree to be jointly and severally liable for their participation in the Eligibility Check, Bidding and Undertaking of the said contract.
- d. That the terms of the JV Agreement entered into the parties shall be valid and is co-terminus with the final completion and turnover of the Name of Contract / Project to

the agency of the government, which in this case, the (Name of Procurement Entity);

IN WITNESS THEREFORE, We hereby sign jointly this Joint Resolution this _____ day of _____, 20 ____ in _____.

Name of Bidder (Lead Partner)

Name of Bidder (Member Partner)

By: _____

Signature & Name of
Managing Officer

By: _____

Signature & Name of Authorized
Authorized Representative

Designation / Position

Designation / Position

Name of Bidder (Member Partner)

Name of Bidder (Member Partner)

By: _____

Signature & Name of
Managing Officer

By: _____

Signature & Name of Authorized
Authorized Representative

Designation / Position

Designation / Position

SIGNED IN THE PRESENCE OF:

ACKNOWLEDGEMENT

REPUBLIC OF THE PHILIPPINES)

CITY OF _____)S.S.

BEFORE ME, a Notary Public, for and in the City of _____, Philippines,
this _____ day of _____, 20____ personally appeared the following persons:

NAME	Community Cert. No.	Date / Place of Issue
------	---------------------	-----------------------

Representing _____ to be the _____ of
_____ and _____ of
_____ respectively, known to me and
to me known to be the same persons who executed the foregoing instrument for and in behalf
of said corporations and who acknowledge to me that same is their free and voluntary act
and deed as well as of the corporations which they represent, for the uses, purposes, and
considerations therein set forth and that they are duly authorized to sign the same.

This Instrument consists of THREE (3) pages including this page wherein this
Acknowledgement is written and signed by the parties and their instrumental witnesses on
each and every page thereon.

WITNESS MY HAND AND NOTARIAL SEAL at the place and date hereinafter first
above written.

NOTARY PUBLIC

Doc. No. _____

Book No. _____

Page No. _____

Series of _____

Other Bidding Forms

(ANNEX “B”)

Annex “B” Form 1	Certificate of Site Inspection
Annex “B” Form 2	Bid Securing Declaration
Annex “B” Form 3	Organizational Chart of Contract to be Bid
Annex “B” Form 4	Qualification of Key Personnel Proposed to be Assigned in the Project
Annex “B” Form 5a	Contractor's Letter-Certificate to Procuring Entity
Annex “B” Form 5b	Key Personnel's Certificate of Employment
Annex “B” Form 5c	Key Personnel (Format of Bio-Data)
Annex “B” Form 6	List of Equipment Owned or Leased and/or under Purchased
Annex “B” Form 7	Omnibus Sworn Statement



Republic of the Philippines
CIVIL AVIATION AUTHORITY OF THE PHILIPPINES

CERTIFICATE OF SITE INSPECTION

This is to CERTIFY that _____, employee of
_____, has conducted the required Site Inspection
for the bidding of the project “_____” at
_____.

Issued this _____, 2021

Airport Manager/Officer-in-Charge:

Signature over Printed Name

Bid-Securing Declaration

(REPUBLIC OF THE PHILIPPINES)

CITY OF _____) S.S.

X-----X

Invitation to Bid *[Insert reference number]*

To: *[Insert name and address of the Procuring Entity]*

I/We, the undersigned, declare that:

1. I/We understand that, according to your conditions, bids must be supported by a Bid Security, which may be in the form of a Bid-Securing Declaration.
2. I/We accept that: (a) I/we will be automatically disqualified from bidding for any contract with any procuring entity for a period of two (2) years upon receipt of your Blacklisting Order; and, (b) I/we will pay the applicable fine provided under Section 6 of the Guidelines on the Use of Bid Securing Declaration, within fifteen (15) days from receipt of written demand by the procuring entity for the commission of acts resulting to the enforcement of the bid securing declaration under Sections 23.1(b), 34.2, 40.1 and 69.1, except 69.1 (f), of the IRR of RA 9184; without prejudice to other legal action the government may undertake.
3. I/We understand that this Bid-Securing Declaration shall cease to be valid on the following circumstances:
 - a. Upon expiration of the bid validity period, or any extension thereof pursuant to your request;
 - b. I am/we are declared ineligible or post-disqualified upon receipt of your notice to such effect, and (i) I/we failed to timely file a request for reconsideration or (ii) I/we filed a waiver to avail of said right;
 - c. I am/we are declared as the bidder with the Lowest Calculated Responsive Bid, and I/we have furnished the performance security and signed the Contract.

IN WITNESS WHEREOF, I/We have hereunto set my/our hand/s this ____ day of *[month]* *[year]* at *[place of execution]*.

[Insert NAME OF BIDDER'S AUTHORIZED REPRESENTATIVE]
[Insert signatory's legal capacity]

Affiant

SUBSCRIBED AND SWORN to before me this ____ day of *[month]* *[year]* at *[place of execution]*, Philippines. Affiant/s is/are personally known to me and was/were identified by me through competent evidence of identity as defined in the 2004 Rules on Notarial Practice (A.M. No. 02-8-13-SC). Affiant/s exhibited to me his/her *[insert type of government identification card used]*, with his/her photograph and signature appearing thereon, with no. _____.

Witness my hand and seal this ____ day of *[month]* *[year]*.

NAME OF NOTARY PUBLIC

Serial No. of Commission _____
Notary Public for _____ **until** _____
Roll of Attorneys No. _____
PTR No. __, *[date issued]*, *[place issued]*
IBP No. __, *[date issued]*, *[place issued]*
Doc. No. ____
Page No. ____
Book No. ____
Series of ____.

Contractor’s Organizational Chart for the Project

Submit Copy of the Organizational Chart that the Contractor intends to use to execute the contract if awarded to him. Indicate in the chart the names of the Key Engineering Personnel who will be assigned in the Project.

{ATTACH COMPANY LETTERHEAD/LOGO}

Attach the required Proposed Organizational Chart for the Contract as stated above.

Submitted by: _____

Designation : _____

Date : _____

{ ATTACH COMPANY LETTERHEAD/LOGO }

Qualification of Key Personnel Proposed to be Assigned to the Project

Name of Project: _____

Location of Project: _____

Name of Company: _____

Address of Company: _____

	Project Manager/Engineer	Material Engineer	Foreman	Construction Safety and Health Personnel	Other Position deemed required by the Applicant for this project
1. Name					
2. Address					
3. Date of Birth					
4. Employed Since					
5. Experience					
6. Previous Employment					
7. Education					
8. PRC License					

Note: Attached individual PRC License of the (professional) personnel.

Submitted by : _____

(Signature over Printed Name)

Designation : _____

Date : _____

{ ATTACH COMPANY LETTERHEAD/LOGO }

Date: _____

CAPTAIN DONALDO A. MENDOZA

Chairman, Bids and Awards Committee - **Charlie**

Civil Aviation Authority of the Philippines

Mia Road, Pasay City, M.M. 1300

Tel: 944-2358

Subject: Contractor's Letter-Certificate to Procuring Entity

Dear Sir:

Supplementing our Organizational Chart for the Contract, we have the honor to submit herewith, and to certify as true and correct, the following pertinent information:

That I/we have engaged the service of (Name of Employee) , to be the (Designation) of the (Name of Project) , who is a (Profession) with Professional License Certificate No. issued on and who has performed the duties in the construction of the project enumerated in the filled Annex "B" Form 5b.

That (Name of Employee) shall personally perform the duties of the said position in the above-mentioned project, if and when the same is awarded in our favor.

That (Name of Employee) shall employ the best care, skill and ability in performing his duties in accordance with the Contract Agreement, Conditions of Contract, Plans, Specifications, Special Provisions, and other provisions embodied in the proposed contract.

That (Name of Employee) shall be personally present at the jobsite all the time to supervise the phase of the construction work pertaining to his assignment as (Designation) .

That (Name of Employee) is aware that he shall be authorized to handle only one contract at a time.

That in order to guarantee that (Name of Employee) shall perform his duties properly and be personally present in the Job Site, he is hereby required to secure a certificate of appearance for the Procuring Entity's Engineer at the end of every month.

That in the event that I/we elect or choose to replace (Name of Employee) with another Engineer, the Procuring Entity will be accordingly notified by us in writing at least twenty one (21) days before making replacement. We will submit to the Procuring Entity, for prior approval, the name of the proposed new (Designation), his qualification, experience, list of projects undertaken and other relevant information.

That any willful violation on my/our part of the herein conditions may prejudice my/our standing as a reliable contractor in future bidding of the Procuring Entity.

Very truly yours,

(Authorized Representative of Bidder)

CONCURRED BY:

(Name of Engineer)

{ ATTACH COMPANY LETTERHEAD/LOGO }

Date: _____

CAPTAIN DONALDO A. MENDOZA

Chairman, Bids and Awards Committee - **Charlie**

Civil Aviation Authority of the Philippines

Mia Road, Pasay City, M.M. 1300

Tel: 944-2358

Subject: Key Personnel's Certificate of Employment

Dear Sir:

I am (Name of Employee) a License _____ Engineer with Professional License No. _____ issued on (Date of Issuance) at (Place of Issuance).

I hereby certify that (Name of Bidder) has engaged my services as (Designation) for (Name of the Project), if awarded in their favor.

As (Designation), I know I will have to stay in the job site all the time to supervise and managed the Contract works to the best of my ability, and aware that I am authorized to handle only one (1) contract at a time.

I do not allow the use of my name for the purpose of enabling the above-mentioned Contractor to qualify for the Contract without any firm commitment on my part to assume the post of (Designation).

As (Designation), I supervised the following completed projects similar to the contract under bidding:

NAME OF PROJECT	OWNER	COST	DATE COMPLETED
-----------------	-------	------	----------------

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

At present, I am supervising the following project:

NAME OF PROJECT	OWNER	COST	DATE COMPLETION
-----------------	-------	------	-----------------

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

In case of my separation for any reason whatsoever from the above-mentioned Contractor, I shall notify the _____ (*Name of the Procuring Entity*) at least twenty one (21) days before the effective date of my separation.

(Signature of Engineer)

SUBSCRIBED AND SWORN to before me this ____ day of _____, 20____
affiant exhibiting to me his/her Residence Certificate No. _____ issued
on _____ at _____, Philippines.

Notary Public

Until 31 December 20____
PRT No.: _____
Issued at: _____
Issued on: _____
TIN No.: _____

Doc. No. _____
Page No. _____

Book No. _____
Series of _____

CAAP-BAC-SF Annex "B" Form 5c

KEY PERSONNEL
(FORMAT OF BIO-DATA)

Give the detailed information of the following personnel who are scheduled to be assigned as full-time field staff for the project. Fill up a form for each person.

1. Authorized Managing Officer / Representative: _____

2. Sustained Technical Employee:

Name: _____

Date of Birth: _____

Nationality: _____

Education and Degrees: _____

Specialty: _____

Registration: _____

Length of Service with the Firm:

_____ Year From _____ (months) _____ (year)

To _____ (months) _____ (year)

Years of Experience:

If Item 7 is less than ten (10) years, give name and length of service with previous employers for a ten (10) year period (attached additional sheet/s, if necessary:

Name and Address of Employer Length of Service

_____ _____ year(s) from _____ to _____

_____ _____ year(s) from _____ to _____

_____ _____ year(s) from _____ to _____

Experience:

This should cover the past ten (10) years of experience. (Attached as many pages as necessary to show involvement of personnel in projects using the format below).

- a. Name: _____
- b. Name and Address of Owner: _____
- c. Name and Address of the Owner's Engineer (Consultant): _____
- d. Indicate the Features of Project (particulars of the project components and any other particular interest connected with the project): _____
- e. Contract Amount Expressed in Philippine Currency: _____
- f. Position: _____
- g. Structures for which the employee was responsible: _____
- h. Assignment Period: from _____(months) _____(years)
to _____(months) _____(years)

Name and Signature of Employee

It is hereby certified that the above personnel can be assigned to the _____ Project, if the contract is awarded to our company.

(Place and Date)

(The Authorized Representative)

List of Equipment, Owned or Leased and/or under Purchased Agreements, Pledge to the Proposed Project

Name of Project: _____
 Location of Project: _____

Name of Company: _____
 Address of Company: _____

Description	Model/Year	Capacity/ Performance/ Size	Plate No.	Motor No./ Body No.	Location	Condition	Proof of Ownership/ Lessor or Vendor
A. Owned							
I.							
II.							
III.							
IV.							
V.							
B. Leased							
I.							
II.							
III.							
IV.							
V.							
C. Under Purchased Agreement							
I.							
II.							
III.							
IV.							
V.							

Submitted by : _____
 Designation : _____
 Date : _____
 (Signature over Printed Name)

Omnibus Sworn Statement

REPUBLIC OF THE PHILIPPINES)
CITY/MUNICIPALITY OF _____) S.S.

AFFIDAVIT

I, *[Name of Affiant]*, of legal age, *[Civil Status]*, *[Nationality]*, and residing at *[Address of Affiant]*, after having been duly sworn in accordance with law, do hereby depose and state that:

1. *Select one, delete the other:*

If a sole proprietorship: I am the sole proprietor or authorized representative of *[Name of Bidder]* with office address at *[address of Bidder]*;

If a partnership, corporation, cooperative, or joint venture: I am the duly authorized and designated representative of *[Name of Bidder]* with office address at *[address of Bidder]*;

2. *Select one, delete the other:*

If a sole proprietorship: As the owner and sole proprietor or authorized representative of *[Name of Bidder]*, I have full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for *[Name of the Project]* of the *[Name of the Procuring Entity]* *[insert “as shown in the attached duly notarized Special Power of Attorney” for the authorized representative]*;

If a partnership, corporation, cooperative, or joint venture: I am granted full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for *[Name of the Project]* of the *[Name of the Procuring Entity]*, accompanied by the duly notarized Special Power of Attorney, Board/Partnership Resolution, or Secretary’s Certificate, whichever is applicable;

3. *[Name of Bidder]* is not “blacklisted” or barred from bidding by the Government of the Philippines or any of its agencies, offices, corporations, or Local Government Units, foreign government/foreign or international financing institution whose blacklisting rules have been recognized by the Government Procurement Policy Board;

4. Each of the documents submitted in satisfaction of the bidding requirements is an authentic copy of the original, complete, and all statements and information provided therein are true and correct;
5. *[Name of Bidder]* is authorizing the Head of the Procuring Entity or its duly authorized representative(s) to verify all the documents submitted;

6. ***Select one, delete the rest:***

If a sole proprietorship: The owner or sole proprietor is not related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

If a partnership or cooperative: None of the officers and members of *[Name of Bidder]* is related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

If a corporation or joint venture: None of the officers, directors, and controlling stockholders of *[Name of Bidder]* is related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

7. *[Name of Bidder]* complies with existing labor laws and standards; and
8. *[Name of Bidder]* is aware of and has undertaken the following responsibilities as a Bidder:
 - a) Carefully examine all of the Bidding Documents;
 - b) Acknowledge all conditions, local or otherwise, affecting the implementation of the Contract;
 - c) Made an estimate of the facilities available and needed for the contract to be bid, if any; and
 - d) Inquire or secure Supplemental/Bid Bulletin(s) issued for the *[Name of the Project]*.
9. *[Name of Bidder]* did not give or pay directly or indirectly, any commission, amount, fee, or any form of consideration, pecuniary or otherwise, to any person or official, personnel or representative of the government in relation to any procurement project or activity.

IN WITNESS WHEREOF, I have hereunto set my hand this ____ day of ____, 20__ at _____, Philippines.

Bidder's Representative/Authorized Signatory

SUBSCRIBED AND SWORN to before me this ____ day of *[month]* *[year]* at *[place of execution]*, Philippines. Affiant/s is/are personally known to me and was/were identified by me through competent evidence of identity as defined in the 2004 Rules on Notarial Practice (A.M. No. 02-8-13-SC). Affiant/s exhibited to me his/her *[insert type of government identification card used]*, with his/her photograph and signature appearing thereon, with no. _____ and his/her Community Tax Certificate No. _____ issued on ____ at _____.

Witness my hand and seal this ____ day of *[month]* *[year]*.

NAME OF NOTARY PUBLIC

Serial No. of Commission _____

Notary Public for _____ until _____

Roll of Attorneys No. _____

PTR No. _____ *[date issued]*, *[place issued]*

IBP No. _____ *[date issued]*, *[place issued]*

Doc. No. _____

Page No. _____

Book No. _____

Series of _____

* This form will not apply for WB funded projects.

Bid Form

Date: _____

IB² N^o: _____

To: *[name and address of PROCURING ENTITY]*

Address: *[insert address]*

We, the undersigned, declare that:

- (a) We have examined and have no reservation to the Bidding Documents, including Addenda, for the Contract *[insert name of contract]*;
- (b) We offer to execute the Works for this Contract in accordance with the Bid and Bid Data Sheet, General and Special Conditions of Contract accompanying this Bid;

The total price of our Bid, excluding any discounts offered below is: *[insert information]*;

The discounts offered and the methodology for their application are: *[insert information]*;

- (c) Our Bid shall be valid for a period of *[insert number]* days from the date fixed for the Bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
- (d) If our Bid is accepted, we commit to obtain a Performance Security in the amount of *[insert percentage amount]* percent of the Contract Price for the due performance of the Contract;
- (e) Our firm, including any subcontractors or suppliers for any part of the Contract, have nationalities from the following eligible countries: *[insert information]*;
- (f) We are not participating, as Bidders, in more than one Bid in this bidding process, other than alternative offers in accordance with the Bidding Documents;
- (g) Our firm, its affiliates or subsidiaries, including any subcontractors or suppliers for any part of the Contract, has not been declared ineligible by the Funding Source;

² If ADB, JICA and WB funded projects, use IFB.

- (h) We understand that this Bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal Contract is prepared and executed; and
- (i) We understand that you are not bound to accept the Lowest Calculated Bid or any other Bid that you may receive.
- (j) **We likewise certify/confirm that the undersigned, is the duly authorized representative of the bidder, and granted full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for the [Name of Project] of the [Name of the Procuring Entity].**
- (k) **We acknowledge that failure to sign each and every page of this Bid Form, including the Bill of Quantities, shall be a ground for the rejection of our bid.**

Name: _____

In the capacity of: _____

Signed: _____

Duly authorized to sign the Bid for and on behalf of: _____

Date: _____

Other Bidding Forms

(ANNEX “C”)

Annex “C” Form 1	Bill of Quantities
Annex “C” Form 2	Detailed Breakdown of Component of Each Item
Annex “C” Form 3	Detailed Unit Price Analysis
Annex “C” Form 4	Summary of Unit Prices of Materials
Annex “C” Form 5	Summary of Unit Prices of Labor
Annex “C” Form 6	Summary of Unit Prices of Equipment
Annex “C” Form 7	Cash Flow by Quarter and Payment Schedule

CAAP-BAC-SF Annex "C" Form 1

{ATTACH COMPANY LETTERHEAD/LOGO}

BILL OF QUANTITIES

PROJECT: _____

LOCATION: _____

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT PRICE (Pesos)	AMOUNT (Pesos)
	Pesos_____ Amount in Words _____ _____ and_____ _____ centavos				
	Pesos_____ Amount in Words _____ _____ and_____ _____ centavos				
	Pesos_____ Amount in Words _____ _____ and_____ _____ centavos				
	Pesos_____ Amount in Words _____ _____ and_____ _____ centavos				

TOTAL BID AMOUNT (Php) _____

TOTAL BID AMOUNT IN WORDS _____

Signature: _____
 Printed Name: _____
 Position: _____
 Name Company: _____
 Date: _____

(PROJECT TITLE)
(PROJECT DESCRIPTION)
(LOCATION)

DETAILED BREAKDOWN OF COMPONENT FOR EACH ITEM

ITEM NO.	DESCRIPTION OF WORK	QUANTITY	UNIT	WK %	DIRECT COST			ESTIMATED DIRECT COST	MARK-UPS IN PERCENT				TOTAL MARK-UP		VAT	TOTAL INDIRECT COST	TOTAL COST	UNIT COST
					MATERIALS	LABOR	EQUIPMENT		OCM	Amount	Profit	Amount	%	VALUE				
(1)	(2)	(3)	(4)					(5)	(6)	(7) (5) x (6)	(8)	(9) (5) x (8)	(10)	(11) (5) x (10)	(12) 5% [(5)+(11)]	(13) (11)+(12)	(14) (5)+(13)	(15) (14)/(9)

Submitted by:

Signature: _____
Printed Name: _____
Position: _____
Name Company: _____
Date: _____

CAAP-BAC-SF Annex “C” Form 3

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME :
Project Description :
Location :
Item No./Description :
Quantity :
Unit of Measuremen :
Output per hour :

	DESIGNATION	No. of Person(s)	No. of Hours	Hourly Rate	Amount
A	Labor				
	Sub-Total for A				
	NAME AND CAPACITY	No. of Unit/s	No. of Hours	Hourly Rate	Amount
B	Equipment				
	Sub-Total for B				
C.	Total (A+B)				
D.	Output per Hour	-	cu.m./hr		
E.	Direct Unit Cost (C/Quantity per day)				
	NAME AND CAPACITY	Quantity	Unit	Unit Cost	Amount
F.	Materials				
	Sub-Total for F				
G.	DIRECT UNIT COST (E + F)				
H.	OCM				
I.	CONTRACTOR'S PROFIT				
J.	VALUE ADDED TAX, (VAT)	5.0%	of (G+H+I)		
K.	TOTAL UNIT COST (G + H + I + J)				

Submitted by:

Signature: _____
 Printed Name: _____
 Position: _____
 Name Company: _____
 Date: _____

{ATTACH COMPANY LETTERHEAD/LOGO}

SUMMARY FOR UNIT PRICES OF MATERIALS

PROJECT: _____

LOCATION: _____

DESCRIPTION	UNIT PRICE	UNIT

SUBMITTED BY:

Signature: _____

Printed Name: _____

Position: _____

Name Company: _____

Date: _____

{ATTACH COMPANY LETTERHEAD/LOGO}

SUMMARY FOR UNIT PRICES OF LABOR

PROJECT: _____

LOCATION: _____

DESCRIPTION	UNIT PRICE	UNIT

SUBMITTED BY:

Signature: _____

Printed Name: _____

Position: _____

Name Company: _____

Date: _____

{ATTACH COMPANY LETTERHEAD/LOGO}

SUMMARY FOR UNIT PRICES OF EQUIPMENT

PROJECT: _____

LOCATION: _____

DESCRIPTION	UNIT PRICE	UNIT

SUBMITTED BY:

Signature: _____

Printed Name: _____

Position: _____

Name Company: _____

Date: _____

{ATTACH COMPANY LETTERHEAD/LOGO }

Name of Project : _____

Location of Project : _____

CASH FLOW BY QUARTER AND PAYMENY SCHEDULE

PARTICULAR	% W	1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER
ACCOMPLISHMENT					
CASH FLOW					
CUMULATIVE ACCOMPLISHMENT					
CUMULATIVE CASH FLOW					

Submitted by:

Name of the Representative of the Bidder

Position

Name of the Company

Date

Other Bidding Forms

(ANNEX “D”)

Annex “D” Form 1 Authority of Signatory (Secretary's Certificate)

**AUTHORITY OF SIGNATORY
(SECRETARY'S CERTIFICATE)**

I, a duly elected and qualified Corporate Secretary of (Name of the Bidder), a corporation duly organized and existing under and by virtue of the law of the, DO HEREBY CERTIFY, that:

I am familiar with the facts herein certified and duly authorized to certify the same;

At the regular meeting of the Board of Directors of the said Corporation duly convened and held on at which meeting a quorum was present and acting throughout, the following resolutions were approve, and the same have been annulled, revoked and amended in any way whatever and are in full force and effect on the date hereof:

RESOLVED, that (Name of Bidder) be, as it hereby is, authorized to participate in the bidding of (Name of the Project) by the (Name of the Procuring Entity); and in that if awarded the project shall enter into a contract with the (Name of the Procuring Entity) and in connection therewith hereby appoints (Name of Representative), acting as duly authorized and designated representatives of (Name of the Bidder), and granted full power and authority to do, execute and perform any and all acts necessary and/or to represent (Name of the Bidder) in the bidding as fully and effectively as the (Name of the Bidder) might do if personally present with full power of substitution and revocation and hereby satisfying and confirming all that my said representative shall lawfully do or cause to be done by virtue hereof;

RESOLVED FERTHER THAT, the Board hereby authorized its President to:

- a. execute a waiver of jurisdiction whereby the (Name of the Bidder) hereby submits itself to the jurisdiction of the Philippine government and hereby waives its right to question the jurisdiction of the Philippine court;
- b. execute a waiver that the (Name of the Bidder) shall not seek and obtain writ of injunctions or prohibition or restraining order against the CAAP or any other agency in connection with this Project to prevent and restrain the bidding procedures related thereto, the negotiating and award of a contract to a successful bidder, and the carrying out of the awarded project.

WITNESS the signature of the undersigned as such officer of the said this.

—

(Corporate Secretary)

SUBSCRIBED AND SWORN to before me thisday of, 20affiant exhibited to me
his/her Community Tax Certificate No. _____ issued on _____
_____ at, Philippines.

Notary Public

Until 31 December 20_____

PRT No.: _____

Issued at: _____

Issued on: _____

TIN No.: _____

Doc. No. _____

Page No.: _____

Book No.: _____

Series of _____

Section X. Checklist of Technical and Financial Documents

Checklist of Technical and Financial Documents

I. TECHNICAL COMPONENT ENVELOPE

Class “A” Documents

Legal Documents

- ☐ (a) Valid PhilGEPS Registration Certificate (Platinum Membership) (all pages);
or
- ☐ (b) Registration certificate from Securities and Exchange Commission (SEC), Department of Trade and Industry (DTI) for sole proprietorship, or Cooperative Development Authority (CDA) for cooperatives or its equivalent document;
and
- ☐ (c) Mayor’s or Business permit issued by the city or municipality where the principal place of business of the prospective bidder is located, or the equivalent document for Exclusive Economic Zones or Areas;
and
- ☐ (d) Tax clearance per E.O. No. 398, s. 2005, as finally reviewed and approved by the Bureau of Internal Revenue (BIR); **and**

Technical Documents

- ☐ (e) Statement of the prospective bidder of all its ongoing government and private contracts, including contracts awarded but not yet started, if any, whether similar or not similar in nature and complexity to the contract to be bid. (*Annex “A” Form 1*); **and**
- ☐ (f) Statement of the bidder’s Single Largest Completed Contract (SLCC) similar to the contract to be bid, except under conditions provided under the rules. (*Annex “A” Form 2*); **and**
- ☐ (g) Philippine Contractors Accreditation Board (PCAB) License;
or
Special PCAB License in case of Joint Ventures;
and registration for the type and cost of the contract to be bid;
and Joint Resolution (*Annex “A” Form 3*); **and**
- ☐ (h) Original copy of Bid Security. If in the form of a Surety Bond, submit also a certification issued by the Insurance Commission;
or
Original copy of Notarized Bid Securing Declaration (*Annex “B” Form 2*);
and
- ☐ (i) Project Requirements, which shall include the following:
 - 1. Organizational chart for the contract to be bid (*Annex “B” Form 3*); **and**

- ☐ 2. List of contractor's key personnel (e.g., Project Manager, Project Engineers, Materials Engineers, and Foremen), to be assigned to the contract to be bid, with their complete qualification and experience data (*Annex "B" Form 4, 5a, 5b & 5c*); **and**
- ☐ 3. List of contractor's major equipment units, which are owned, leased, and/or under purchase agreements, supported by proof of ownership or certification of availability of equipment from the equipment lessor/vendor for the duration of the project, as the case may be (*Annex "B" Form 6*); **and**
- ☐ (j) Original duly signed Omnibus Sworn Statement (OSS) (*Annex "B" Form 7*); **and** if applicable, Original Notarized Secretary's Certificate in case of a corporation, partnership, or cooperative; or Original Special Power of Attorney of all members of the joint venture giving full power and authority to its officer to sign the OSS and do acts to represent the Bidder; **and**

This shall include all of the following documents as attachment to the Omnibus Sworn Statement:

- ☐ 1. Certification, under oath, attesting that they have no pending case(s) against the Government, in addition to the eligibility requirements as prescribe under the 2016 Revised Implementing Rules and Regulation (R-IRR) of RA No. 9184; **and**
- ☐ 2. Legal Clearance to be issued by the CAAP Enforcement and Legal Service with respect to the non-pending cases of the prospective bidders against this Authority; **and**
- ☐ 3. Bid Bulletins (if applicable); **and**
- ☐ (k) **Certificate of Site Inspection** (*Annex "B" Form 1*) duly signed by **Ms. Louie Asantor, Officer in-Charge of Basco Airport** or her duly authorized representative; **and**

This shall include all of the following documents as attachment to the Certificate of Site Inspection:

- ☐ 1. Copy of company ID of the person who conducted the site inspection; **and**
- ☐ 2. Copy of the airport/facility visitor's logbook; **and**
- ☐ 3. Picture of the proposed site including the personnel who conducted the site inspection together with the Airport Manager/Officer in Charge or his duly authorized representative: **and**

Financial Documents

- ☐ (l) The prospective bidder's audited financial statements, showing, among others, the prospective bidder's total and current assets and liabilities, stamped "received" by the BIR or its duly accredited and authorized institutions, for the preceding calendar year which should not be earlier than two (2) years from the date of bid submission; **and**
- ☐ (m) The prospective bidder's computation of Net Financial Contracting Capacity (NFCC).

Class "B" Documents

- ☐ (n) If applicable, duly signed joint venture agreement (JVA) in accordance with RA No. 4566 and its IRR in case the joint venture is already in existence;
or
duly notarized statements from all the potential joint venture partners stating that they will enter into and abide by the provisions of the JVA in the instance that the bid is successful.

II. FINANCIAL COMPONENT ENVELOPE

- ☐ (o) Original of duly signed and accomplished Financial Bid Form; **and**

Other documentary requirements under RA No. 9184

- ☐ (p) Original of duly signed Bid Prices in the Bill of Quantities (*Annex "C" Form 1*); **and**
- ☐ (q) Detailed Breakdown of Component of Each Item (*Annex "C" Form 2*); **and**
- ☐ (r) Detailed Unit Price Analysis (*Annex "C" Form 3*); **and**
- ☐ (s) Summary Sheet indicating the Unit Prices of Construction Materials, Labor Rates, and Equipment Rentals used in coming up with the Bid (*Annex "C" Form 4, 5 & 6*); **and**
- ☐ (t) Cash Flow by Quarter and Payment Schedule (*Annex "C" Form 7*).

