

PHILIPPINE BIDDING DOCUMENTS

(As Harmonized with Development Partners)

PROCUREMENT OF KABANKALAN AIRPORT DEVELOPMENT PROJECT - PHASE II (CONCRETING OF RUNWAY)

Government of the Republic of the Philippines

Bid No. 21-013-07 CHARLIE

**Sixth Edition
July 2020**

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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

KABANKALAN AIRPORT DEVELOPMENT PROJECT - PHASE II (CONCRETING OF RUNWAY) Bid No. 21-013-07 CHARLIE

1. The Civil Aviation Authority of the Philippines through the GAA CY 2018 DOTr Downloaded Projects (Batch 1) intends to apply the sum of **FIFTY-NINE MILLION SIX HUNDRED NINETY-FOUR THOUSAND EIGHT HUNDRED EIGHTEEN PESOS 40/100 (PHP 59,694,818.40)** being the Approved Budget for the Contract (ABC) to payments under the contract for **KABANKALAN AIRPORT DEVELOPMENT PROJECT - PHASE II (CONCRETING OF RUNWAY) (Bid No. 21-013-07 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	Three (3) Units Dump Truck, 12 cu.yd. Two (2) Units Payloader, 1.50 cu.m. One (1) Unit Bulldozer, D6H Serises II PSDS/DD One (1) Unit Motorized Grader, (140 hp), G710A One (1) Unit Vibratory Roller (10 mt), SD100DC One (1) Unit Water Truck/Pump (16000 L) Two (2) Units Transit Mixer, 5.0cu.m. Two (2) Units Concrete Vibrator One (1) Unit Concrete Batch Plant, 30cu.m. One (1) Unit Concrete Screeder, 5.5hp One (1) Unit Concrete Saw, 7.5hp (14" Blade diameter) One (1) Unit One Bagger Concrete Mixer
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 Forty (240) Calendar Days (inclusive of twenty-five (25) 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 **July 16, 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 **July 16, 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 **July 23, 2021 @ 2:00PM** 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 **August 06, 2021 @ 2:00PM** 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 **August 06, 2021 @ 2:00PM** 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 Regulations (IRR) of RA No. 9184, without thereby incurring any liability to the affected bidder or bidders.

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.

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.

July 15, 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 **KABANKALAN AIRPORT DEVELOPMENT PROJECT - PHASE II (CONCRETING OF RUNWAY)**, with Project Identification Number: **Bid No. 21-013-07 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 DOTr Downloaded Projects (Batch 1) in the amount of **FIFTY-NINE MILLION SIX HUNDRED NINETY-FOUR THOUSAND EIGHT HUNDRED EIGHTEEN PESOS 40/100 (PHP 59,694,818.40)**.

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 shall be issued by the Local Government Unit of Kabankalan City and shall be dully signed by the City Mayor or his authorized representative for the project.</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 facility/City Hall visitor’s logbook; & c) Picture of the proposed site including the personnel who conducted the site inspection together with the Local Government Unit 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 of Roads and other Horizontal Structures”</p>
7.1	Subcontracting is not allowed.
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>

1. *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 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

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 Certificate of Site Inspection shall be issued by the **Local Government Unit of Kabankalan City** and shall be duly signed by the City Mayor or his authorized representative for the project; 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

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

	<p>institutions, for the preceding calendar year which should not be earlier than two (2) years from the date of bid submission; and</p> <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 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 border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; border-bottom: 1px solid black;"><u>Key Personnel</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>General Experience</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Relevant Experience</u></th> </tr> </thead> <tbody> <tr> <td style="vertical-align: middle;"> Project (Civil) Engineer Geodetic Engineer Materials Engineer Construction Foreman Safety and Health Officer </td> <td style="vertical-align: middle; text-align: center;"> Five (5) years in General Engineering </td> <td style="vertical-align: middle;"> Three (3) years in Concreting of Roads or other Horizontal Structures </td> </tr> </tbody> </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 of Roads or other Horizontal Structures																														
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	Bids not complying with the above instruction shall be disqualified.	
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 – Annexes "A" & "B".</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	<p>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.</p>
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 (KABANKALAN AIRPORT DEVELOPMENT PROJECT - PHASE II (CONCRETING OF RUNWAY))</p>

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	The date by which operating and maintenance manuals are required is upon completion of the project The date by which “as built” drawings are required is upon completion of the project. 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.
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	:	KABANKALAN AIRPORT DEVELOPMENT PROJECT - PHASE II (CONCRETING OF RUNWAY)
Location	:	Kabankalan City, Negros Occidental
Duration	:	Two Hundred Forty (240) Calendar Days (inclusive of twenty-five (25) rainy/unworkable Days)
Source of Funds	:	GAA CY 2018 DOTr Downloaded Projects (Batch 1)

SCOPE OF WORK

The project covers the supply of labor, materials and equipment necessary for the **CONCRETING OF RUNWAY-PHASE II** at Kabankalan Airport, Kabankalan City, Negros Occidental. 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.

C-105 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 and rubbish materials.

ITEM – P-151-4.2 CLEARING AND GRUBBING

This item covers the clearing and grubbing (stripping works of 0.15m depth) 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 from STA 0+848.84 (end of LGU Scope) to STA 1+080.00 with span of 100 meters.

ITEM – P-151-4.1a UNCLASSIFIED EXCAVATION

This item covers the excavation and disposal 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 from STA 0+848.84 (end of LGU Scope) to STA 1+280.00.

ITEM – P-151-4.2b EMBANKMENT FROM BORROW

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 to be delivered on site. This item covers from STA 0+848.84 (end of LGU Scope) to STA 1+280.00.

ITEM – 105 (1)a SUBGRADE PREPARATION

This item covers the preparation of the subgrade within the limits of the runway from station STA 0+848.84 (end of LGU Scope) to STA 1+280.00 with a minimum width of 32 meters and where the lean subbase course shall be placed as shown on the approved plans and in accordance with specifications and conformity with the lines, grades and dimensions.

ITEM – P-154-5.1 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 aggregate subbase coarse shall be composed of crushed/uncrushed coarse aggregate bonded with either soil or fine aggregates or both.

- STA 0+848.84 (end of LGU Scope) to STA 1+080.00

- Base Area: 32m x 231.16m
Thickness= 0.15m

ITEM – P-208-5.1 AGGREGATE BASE COURSE

This item covers the furnishing, placing and compacting of aggregate base coarse on a prepared subbase course in accordance with specifications and shall conform to the lines, grade and cross section shown on the approved plans. The aggregate base course shall be composed of crushed/uncrushed coarse aggregate bonded with either soil of fine aggregates or both.

- STA 0+848.84 (end of LGU Scope) to STA 1+080.00

- Base Area: 32m x 231.16m
Thickness= 0.30m
- Shoulder Area: 1m x 431.16m x 2(*both sides*)
Thickness= 0.30m

- STA 1+080.00 to STA 1+280.00

- Base Area: 32m x 200m
Thickness= 0.10m (correction for disturbed)
- Shoulder Area: 1m x 200m x 2(*both sides*)
Thickness= 0.30m

ITEM – P-501-8.1b PORTLAND CEMENT CONCRETE PAVEMENT, 300mm THK

This item covers the placement of rebars, steel forms and concrete paving constructed on a prepared base course in accordance with the specifications and shall conform to the lines, grade, thickness and typical cross section shown on the approves plans.

- STA 0+848.84 (end of LGU Scope) to STA 1+280.00

- Runway Area: 30m x 431.16m
Thickness= 0.30m

ITEM – L-110-5.2 CONCRETE ENCASED ELECTRICAL CONDUIT

This item shall consist of the construction of pipe culverts in accordance with the specification and in conformity with the lines and grades shown on the Plans or as established by the Engineer.

➤ Concrete Pipe Conduits

- Eight (8) Hole Conduits:

Area Opening = 0.16sq.m x 8 = 1.28 sq.m

Length= 60m x 1 set = 60m

ITEM – A.1.1(10) PROVISION OF LIVING QUARTERS FOR THE ENGINEERS

The following provisions must be delivered within ten (10) days upon receipt of the Notice to Proceed (NTP).

This item covers the Contractor's provision of PMO Staff House on rental basis. The Facility shall be provided with air-conditioning units 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(4) PROVISION OF SERVICE VEHICLE FOR THE ENGINEERS

The following provisions must be delivered within ten (10) days upon receipt of the Notice to Proceed (NTP).

This covers the provision of 4x2 pickup service vehicle at least 2013 model cab pick-up, air-conditioned, in good running condition and updated registration on a rental basis including driver, fuel, oil and lubricants per day for exclusive use of CAAP Engineers for the duration of the project. Maintenance for the said service shall be included under this item.

ITEM – B.5 PROJECT BILLBOARD/SIGNBOARD

This covers the provision of project billboard/signboard (8' x 8' tarpaulin size) constructed in a sturdy materials, visible to public, and if possible, near the construction site.

Samples, Tests, Cited Specifications, Pre-Testing Certificate

When requested, the Contractor shall furnish a complete written statement of the origin, composition and/or manufacture of any or all materials (manufactured, produced or grown) that are to be used in the work.

Unless otherwise provide, sampling and testing of materials shall be made by the Contractor, under the direct supervision of the Engineer.

The Approval of preliminary samples shall not be considered as a guarantee of acceptance of all materials from the same source, nor the quality or quantity of such material, and it is understood, that all materials delivered on the work which do not meet the requirement of these Specifications shall be rejected by the Engineer. No materials shall be used in work until sampled, tested and found satisfactory by the Engineer. The Contractor shall not be allowed any compensation for any delays or damages sustained pending the completion of testing and approval. Any material which has been sampled and passed as satisfactory may be resampled and re-tested at any time before use at the discretion of the Engineer.

When test of materials such as cement, concrete, asphalt, steel, timber, etc. cannot be done in the field laboratory due to lack of equipment, but are necessary, or required by the Engineer, such tests shall afford such facilities as the Engineer may require for collecting and forwarding samples to an approved Laboratory. The materials represented by the samples shall not be allowed to be incorporated into the work until tests have been made, and the materials found to meet the requirements of the Specifications. The Contractor in all cases shall furnish the required samples without charge.

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-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 105 – SUBGRADE PREPARATION

105.1 Description

This Item shall consist of the preparation of the subgrade for the support of overlying structural layers. It shall extend to full width of the roadway. Unless authorized by the Engineer, subgrade preparation shall not be done unless the Contractor is able to start immediately the construction of the pavement structure.

105.2 Material Requirements

Unless otherwise stated in the Contract and except when the subgrade is in rock cut, all materials below subgrade level to a depth 150 mm or to such greater depth as may be specified shall meet the requirements of Section 104.2, Selected Borrow for Topping.

105.3 Construction Requirements

105.3.1 Prior Works

Prior to commencing preparation of the subgrade, all culverts, cross drains, ducts and the like (including their fully compacted backfill), ditches, drains and drainage outlets shall be completed. Any work on the preparation of the subgrade shall not be started unless prior work herein described shall have been approved by the Engineer.

105.3.2 Subgrade Level Tolerances

The finished compacted surface of the subgrade shall conform to the allowable tolerances as specified hereunder:

Permitted variation from	+	20 mm
design LEVEL OF SURFACE	-	30 mm
Permitted SURFACE IRREGULARITY		
MEASURED BY 3-m STRAIGHT EDGE		30 mm
Permitted variation from		
design CROSSFALL OR CAMBER	±	0.5 %
Permitted variation from	±	0.1 %
design LONGITUDINAL		
GRADE		
over 25 m length		

105.3.3 Subgrade in Common Excavation

Unless otherwise specified, all materials below subgrade level in earth cuts to a depth 150 mm or other depth shown on the Plans or as directed by the Engineer shall be excavated. The material, if suitable, shall be set aside for future use or, if unsuitable, shall be disposed off in accordance with the requirements of Subsection 102.2.9.

Where material has been removed from below subgrade level, the resulting surface shall be compacted to a depth of 150 mm and in accordance with other requirements of Subsection 104.3.3.

All materials immediately below subgrade level in earth cuts to a depth of 150 mm, or to such greater depth as may be specified, shall be compacted in accordance with the requirements of Subsection 104.3.3.

105.3.4 Subgrade in Rock Excavation

Surface irregularities under the subgrade level remaining after trimming of the rock excavation shall be leveled by placing specified material and compacted to the requirements of Subsection 104.3.3.

105.3.5 Subgrade on Embankment

After the embankment has been completed, the full width shall be conditioned by removing any soft or other unstable material that will not compacted properly. The resulting areas and all other low sections, holes, or depressions shall be brought to grade with suitable material. The entire roadbed shall be shaped and compacted to the requirements of Subsections 104.3.3. Scarifying, blading, dragging, rolling, or other methods of work shall be performed or used as necessary to provide a thoroughly compacted roadbed shaped to the cross-sections shown on the Plans.

105.3.6 Subgrade on Existing Pavement

Where the new pavement is to be constructed immediately over an existing Portland Cement concrete pavement and if so specified in the Contract the slab be broken into pieces with greatest dimension of not more than 500 mm and the existing pavement material compacted as specified in Subsection 104.3.3, as directed by the Engineer. The resulting subgrade level shall, as part pavement construction be shaped to conform to the allowable tolerances of Subsection 105.3.2 by placing and compacting where necessary

a leveling course comprising the material of the pavement course to be placed immediately above.

Where the new pavement is to be constructed immediately over an existing asphalt concrete pavement or gravel surface pavement and if so specified in the Contract the pavement shall be scarified, thoroughly loosened, reshaped and recompactd in accordance with Subsection 104.3.3. The resulting subgrade level shall conform to the allowable tolerances of Subsection 105.3.2.

105.3.7 Protection of Completed Work

The Contractor shall be required to protect and maintain at his own expense the entire work within the limits of his Contract in good condition satisfactory to the Engineer from the time he first started work until all work shall have been completed. Maintenance shall include repairing and recompactd ruts, ridges, soft spots and deteriorated sections of the subgrade caused by the traffic of the Contractor's vehicle/equipment or that of the public.

105.3.8 Templates and Straight-edges

The Contractor shall provide for use of the Engineer, approved templates and straight- edges in sufficient number to check the accuracy of the work, as provided in this Specification.

105.4 Method of Measurement

105.4.1 Measurement of Items for payment shall be provided only for:

1. The compaction of existing ground below subgrade level in cuts of common material as specified in Subsection 105.3.3.
2. The breaking up or scarifying, loosening, reshaping and recompactd of existing pavement as specified in Subsection 105.3.6. The quantity to be paid for shall be the area of the work specified to be carried out and accepted by the Engineer.

105.4.2 Payment for all work for the preparation of the subgrade, including shaping to the required levels and tolerances, other than as specified above shall be deemed to be included in the Pay Item for Embankment.

105.5 Basis of Payment

The accepted quantities, measured as prescribed in Section 105.4, shall be paid for

at the appropriate contract unit price for Pay Item listed below that is included in the Bill of Quantities which price and payment shall be full compensation for the placing or removal and disposal of all materials including all labor, equipment, tools and incidentals necessary to complete the work prescribed in this Item.

Payment will be made under:

Pay Item Number	Description	Unit of Measurement
105 (1)	Subgrade Preparation (Common Material)	Square Meter
105 (2)	Subgrade Preparation (Existing Pavement)	Square Meter
105 (3)	Subgrade Preparation (Unsuitable Material)	Square 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 ±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-15

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 recompact 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- μm (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-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% ±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:

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

(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 ¼ 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 × 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 1/2 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 L-110 Airport Underground Electrical Duct Banks and Conduits

DESCRIPTION

110-1.1 This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete or buried in sand) installed per this specification at the locations and per the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits. It shall also include all turfing trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandrelling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables per the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

EQUIPMENT AND MATERIALS

110-2.1 General.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide **materials** per these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, that comply with these specifications, at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in project that accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. [The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section.] The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least [twelve (12) months] from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

**

The Engineer should specify the form in which submittals are to be received and number of copies.

The length of time for guarantee of materials and workmanship should be as stated in the contract between the Owner and Contractor and the contract special provisions.

**

110-2.2 Steel conduit. Rigid galvanized steel (RGS) conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other similar environments shall be painted with a 10 mil thick coat of asphaltum sealer or shall have a factory bonded polyvinyl chloride (PVC) cover. Any exposed galvanizing or steel shall be coated with 10 mil of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions.

110-2.3 Plastic conduit. Plastic conduit and fittings shall conform to the following requirements:

- UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10.
- UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
- UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
- UL 651A covers W-C-1094-Rigid PVC Conduit and high density polyethylene (HDPE) Conduit type III and Class 4.

Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

- a. Type I—Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.
- b. Type II—Schedule 40 PVC suitable for either above ground or underground use.
- c. Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.
- d. Type III –HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

110-2.4 Split conduit. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

110-2.5 Conduit spacers. Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads, They shall be designed to accept No. 4 reinforcing bars installed vertically.

110-2.6 Concrete. Concrete shall conform to Item P-610, Structural Portland Cement Concrete, using [] inch maximum size coarse aggregate with a minimum 28-day compressive strength of [] psi. Where reinforced duct banks are specified, reinforcing steel shall conform to ASTM A615 Grade 60. Concrete and reinforcing steel are incidental to the respective pay item of which they are a component part.

**

Typically, the maximum size aggregate should be specified as one inch (25 mm); however, Engineer may specify smaller to accommodate special situations where one inch (25 mm) aggregate may be too large.

Item P-610 requires concrete to develop a 28-day compressive strength of 4,000 psi. Engineer to determine the strength of concrete appropriate for the project and insert in paragraph 110-2.6.

**

110-2.7 Flowable backfill. Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material. Fill shall be designed to achieve a 28-day compressive strength of 200 psi (1.4 MPa) under pavement.

110-2.8 Detectable warning tape. Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend magnetic tape shall be polyethylene film with a metallized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

**

Specify color and legend.

**

CONSTRUCTION METHODS

110-3.1 General. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The Engineer shall indicate specific locations as the work progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 inches (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. No duct bank or underground conduit shall be less than 18 inches (0.5 m) below finished grade. Where under pavement, the top of the duct bank shall not be less than 18 inches (0.5 m) below the subgrade.

**

For a closed conduit/duct bank system, the system should be designed to be connected to, and thus drain into, the airfield storm drainage system.

Engineer needs to be careful to define the term “subgrade” as it relates to pavement construction. In areas of pavement construction requiring the placement of embankment, or in areas requiring over-excavation to remove unsuitable material, the desired location of the top of the duct bank needs to be clearly identified in areas susceptible to frost, the top of the duct bank should be placed at or below the level of the frost line.

**

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 inch (6 mm) smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc., interiors IMMEDIATELY prior to pulling cable. Once cleaned and swabbed the light bases, manholes, pull boxes, etc., and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be recleaned at the Contractor’s expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200 pound (90 kg) test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminants from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet (1.5 m).

Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads, such as runways, taxiways, taxilanes, ramps and aprons. When under paved shoulders and other paved areas, conduit and duct banks shall be encased using flowable fill for protection.

All conduits within concrete encasement of the duct banks shall terminate with female ends for ease in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4 inch (6 mm) sieve. Flowable backfill may alternatively be used. The Contractor shall ascertain the type of soil or rock to be excavated before bidding. All such rock removal shall be performed and paid for under Item P-152.

Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the Engineer. If not shown on the plans, the warning tape shall be located 6 inches above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared per the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet (60 cm).

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the Engineer, the unsuitable material shall be removed per Item P-152 and replaced with suitable material. Alternatively, additional duct bank supports that are adequate and stable shall be installed, as approved by the Engineer.

All excavation shall be unclassified and shall be considered incidental to the respective L-110 pay item of which it is a component part. Dewatering necessary for duct installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay item as a part of Item L-110. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-110 Item.

Unless otherwise specified, excavated materials that are deemed by the Engineer to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

Any excess excavation shall be filled with suitable material approved by the Engineer and compacted per Item P-152.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

a. Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred

b. Trenching, etc., in cable areas shall then proceed with approval of the Engineer, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

110-3.2 Duct banks. Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches (0.5 m) below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches (0.5 m) below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (1 m) beyond the edges of the pavement or 3 feet (1 m) beyond any under drains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 inches (75 mm) thick prior to its initial set. The Contractor shall space the conduits not less than 3 inch (75 mm) apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches (75 mm) thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5-foot (1.5-m) intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 3 to 6 inches (75 to 150 mm) wide tape, 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch (75-mm) wide tape only for single conduit runs. Utilize the 6-inch (150-mm) wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches (600 mm) in width, utilize more than one tape for sufficient coverage and identification of the duct bank as required.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the Engineer shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the Engineer.

110-3.3 Conduits without concrete encasement. Trenches for single-conduit lines shall be not less than 6 inches (150 mm) nor more than 12 inches (300 mm) wide. The trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4 inch (6 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits within the Airport's secured area where trespassing is prohibited are at least 18 inches (0.5 m) below the finished grade. Conduits outside the Airport's secured area shall be installed so that the tops of the conduits are at least 24 inches (60 cm) below the finished grade per National Electric Code (NEC), Table 300.5.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

110-3.4 Markers. The location of each end and of each change of direction of conduits and duct banks shall be marked by a concrete slab marker 2 feet (60 cm) square and 4 - 6 inches (100 - 150 mm) thick extending approximately one inch (25 mm) above the surface. The markers shall also be located directly above the ends of all conduits or duct banks, except where they terminate in a junction/access structure or building. Each cable or duct run from a line of lights and signs to the equipment vault must be marked at approximately every 200 feet (61 m)

along the cable or duct run, with an additional marker at each change of direction of cable or duct run.

The Contractor shall impress the word "DUCT" or "CONDUIT" on each marker slab. Impression of letters shall be done in a manner, approved by the Engineer, for a neat, professional appearance. All letters and words must be neatly stenciled. After placement, all markers shall be given one coat of high-visibility orange paint, as approved by the Engineer. The Contractor shall also impress on the slab the number and size of conduits beneath the marker along with all other necessary information as determined by the Engineer. The letters shall be 4 inches (100 mm) high and 3 inches (75 mm) wide with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep or as large as the available space permits. Furnishing and installation of duct markers is incidental to the respective duct pay item.

110-3.5 Backfilling for conduits. For conduits, 8 inches (200 mm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 "Excavation and Embankment" except that material used for back fill shall be select material not larger than 4 inches (100 mm) in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during back filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the Engineer.

110-3.6 Backfilling for duct banks. After the concrete has cured, the remaining trench shall be backfilled and compacted per Item P-152 "Excavation and Embankment" except that the material used for backfill shall be select material not larger than 4 inches (100 mm) in diameter. In addition to the requirements of P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet (76 m) of duct bank or one work period's construction, whichever is less.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the Engineer.

110-3.7 Restoration. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include [sodding] [topsoiling]

[fertilizing][liming][seeding][sprigging][mulching] shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item. Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

**

Engineer to specify the correct method of turfing and include in the construction documents the appropriate FAA turfing specification for restoration related to the installation of such duct banks and conduits.

**

METHOD OF MEASUREMENT

110-4.1 Underground conduits and duct banks shall be measured by the linear feet (meter) of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated material, and for drain lines, the termination at the drainage structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

BASIS OF PAYMENT

110-5.1 Payment will be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material, and, for drain lines, the termination at the drainage structure. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item per the provisions and intent of the plans and specifications.

Payment will be made under:

- | | |
|----------------|--|
| Item L-110-5.1 | [Concrete Encased][Non-Encased] Electrical Duct Bank, [# and Size] - per linear foot (meter) |
| Item L-110-5.2 | [Concrete Encased][Non-Encased] Electrical Conduit, [# and Size] - per linear foot (meter) |

MATERIAL REQUIREMENTS

- | | |
|------------------------------------|--|
| Advisory Circular (AC) 150/5340-30 | Design and Installation Details for Airport Visual Aids |
| AC 150/5345-53 | Airport Lighting Equipment Certification Program |
| ASTM A615 | Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement |

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 D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2922	Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
NFPA-70	National Electrical Code (NEC)
Underwriters Laboratories Standard 6	Electrical Rigid Metal Conduit - Steel
Underwriters Laboratories Standard 514B	Conduit, Tubing, and Cable Fittings
Underwriters Laboratories Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
Underwriters Laboratories Standard 1242	Electrical Intermediate Metal Conduit Steel
Underwriters Laboratories Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
Underwriters Laboratories Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit

END OF ITEM L-110

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 176 to 179.

Non-attachment of Annex “C” Form 1 to 7 shall be automatically disqualified.

{ATTACH COMPANY LETTERHEAD/LOGO}

BILL OF QUANTITIES

PROJECT: KABANKALAN AIRPORT DEVELOPMENT PROJECT-PHASE II (Concreting of Runway

LOCATION: Kabankalan City, Negros Occidental

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)	8.00	month		
	Pesos _____ Amount in Words _____ and _____ centavos				
A.1.2(4)	Provision of 4x2 Pick Up Type Service Vehicle for the Engineer on Bare Rental Basis	8.00	month		
	Pesos _____ Amount in Words _____ and _____ centavos				
PART II	GENERAL REQUIREMENTS				
B.5	Project Billboard/ Signboard	1.00	each		
	Pesos _____ Amount in Words _____ and _____ centavos				
C-105	Mobilization and Demobilization	1.00	lot		
	Pesos _____ Amount in Words _____ and _____ centavos				
PART III	SITWORK				
P-151-4.2	Clearing and Grubbing, 150mm thick	23,116.00	sq.m.		
	Pesos _____ Amount in Words _____ and _____ centavos				
P-152-4.1a	Unclassified Excavation	12,096.72	cu.m.		
	Pesos _____ Amount in Words _____ and _____ centavos				

P-152-4.2b	Embankment from Borrow	17,558.72	cu.m.		
	Pesos _____ Amount in Words _____ and _____ _____ centavos				
105(1)a	Subgrade Preparation	13,797.12	sq.m.		
	Pesos _____ Amount in Words _____ and _____ _____ centavos				
P-154-5.1	Subbase Course	1,109.59	cu.m.		
	Pesos _____ Amount in Words _____ and _____ _____ centavos				
PART IV	BASE COURSE				
P-208-5.1	Aggregate Base Course	3,117.88	cu.m.		
	Pesos _____ Amount in Words _____ and _____ _____ centavos				
PART V	RIGID PAVEMENT				
P-501-8.1b	Cement Concrete Pavement,300mm thick	12,934.80	sq.m.		
	Pesos _____ Amount in Words _____ and _____ _____ centavos				
PART VI	LIGHTING INSTALLATION				
L-110-5.2	Concrete Encased Electrical Conduit	60.00	ln.m		
	Pesos _____ Amount in Words _____ and _____ _____ centavos				

TOTAL BID AMOUNT (Php) _____

TOTAL BID AMOUNT IN WORDS _____

Signature: _____
Printed Name: _____
Position: _____
Name Company: _____
Date: _____

KABANKALAN AIRPORT DEVELOPMENT PROJECT-PHASE II
KABANKALAN AIRPORT
 Kabankalan City, Negros Occidental

DETAILED BREAKDOWN OF COMPONENT FOR EACH ITEM

ITEM NO.	DESCRIPTION OF WORK	QUANTITY	UNIT	Wt. %	DIRECT COST			ESTIMATED DIRECT COST	MARK-UPS IN PERCENT			TOTAL MARK-UP VALUE	VAT (5%)	TOTAL INDIRECT COST	TOTAL COST	UNIT COST		
					MATERIALS	LABOR	EQUIPMENT		OCM	Amount	Profit						Amount	%
(1)	(2)	(3)	(4)					(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	PART I FACILITIES FOR THE ENGINEER																	
A.1.1(10)	Provision of Living Quarters for the Engineer (Rental Basis)	8.00	month															
A.1.2(4)	Provision of 4x2 Pick Up Type Service Vehicle for the Engineer on Bare Rental Basis	8.00	month															
	TOTAL OF PART I																	
	PART II GENERAL REQUIREMENTS																	
B.5	Project Billboard Signboard	1.00	each															
C-105	Mobilization and Demobilization	1.00	lot															
	TOTAL OF PART II																	
	PART III SITEWORK																	
P-151-4.2	Cleaning and Grubbing, 150mm thick	23,116.00	sq.m.															
P-152-4.1a	Unclassified Excavation	12,086.72	cum.															
P-152-4.2b	Embankment from Borrow	17,588.72	cum.															
T05(1)a	Subgrade Preparation	13,797.12	sq.m.															
P-154-5.1	Subbase Course	1,109.89	cum.															
	TOTAL OF PART III																	
	PART IV BASE COURSE																	
P-208-5.1	Aggregate Base Course	3,117.88	cum.															
	TOTAL OF PART IV																	
	PART V RIGID PAVEMENT																	
P-501-8.1b	Cement Concrete Pavement 300mm thick	12,934.80	sq.m.															
	TOTAL OF PART V																	
	PART VI LIGHTING INSTALLATION																	
L-110-5.2	Concrete Encased Electrical Conduit	60.00	h.m															
	TOTAL OF PART VI																	
	GRAND TOTAL																	

Submitted by:

Signature: _____
 Printed Name: _____
 Position: _____
 Name Company: _____
 Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : KABANKALAN AIRPORT DEVELOPMENT PROJECT-PHASE II
 Project Description : FACILITIES FOR THE ENGINEER
 Location : Kabankalan City, Negros Occidental
 Item No./Description : A.1.1(10) Provision of Living Quarters for the Engineer (Rental Basis)
 Quantity : 8.00
 Unit of Measurement : month
 Output per hour : 1.00

	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	1.00	lot		
E.	Direct Unit Cost (C/Quantity per hour)				
	NAME AND CAPACITY	Quantity	Unit	Unit Cost	Amount
F.	Materials Living Quarters for the Engineer (Rental)	1.00	month		
	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) 5% 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 : KABANKALAN AIRPORT DEVELOPMENT PROJECT-PHASE II
 Project Description : FACILITIES FOR THE ENGINEER
 Location : Kabankalan City, Negros Occidental
 Item No./Description : A.1.2(4) Provision of 4x2 Pick Up Type Service Vehicle for the Engineer on Bare Rental Basis
 Quantity : 8.00
 Unit of Measurement : month
 Output per hour : 1.00

	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 4x2 Pick Up Type Service Vehicle for the Engineer (See Scope of Works for Specification)	1.00	240.00		
	Sub-Total for B				
C.	Total (A+B)				
D.	Output per Hour	1.00	month		
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% - 10% of G)				
I.	CONTRACTOR'S PROFIT (0% - 8% of G)				
J.	VALUE ADDED TAX, (VAT) 5% 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 : KABANKALAN AIRPORT DEVELOPMENT PROJECT-PHASE II
 Project Description : GENERAL REQUIREMENTS
 Location : Kabankalan City, Negros Occidental
 Item No./Description : B.5 Project Billboard/ Signboard
 Quantity : 1.00
 Unit of Measurement : each
 Output per hour : 1.000

		DESIGNATION	No. of Person(s)	No. of Hours	Hourly Rate	Amount
A	Labor					
	Construction Foreman		1.00	1.00		
	Unskilled Laborer		2.00	1.00		
		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		1.00	each		
E.	Direct Unit Cost (C/Quantity per hour)					
		NAME AND CAPACITY	Quantity	Unit	Unit Cost	Amount
F.	Materials					
	8ft x 8ft Tarpaulin		1.00	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) 5% 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 : KABANKALAN AIRPORT DEVELOPMENT PROJECT-PHASE II
 Project Description : GENERAL REQUIREMENTS
 Location : Kabankalan City, Negros Occidental
 Item No./Description : C-105 Mobilization and Demobilization
 Quantity : 1.00
 Unit of Measurement : lot
 Output per hour : 1.00

	DESIGNATION	No. of Person(s)	No. of Hours	Hourly Rate	Amount
A	Labor				
	Sub-Total for A				
	NAME AND CAPACITY	Quantity	Unit	Unit Cost	Amount
B	Equipment Dump Truck, 12 cu.yd. Payloader, 1.50 cu.m. Bulldozer, D6H Serises II PSDS/DD Motorized Grader, (140 hp), G710A Vibratory Roller (10 mt), SD100DC Water Truck/Pump (16000 L) Transit Mixer, 5.0cu.m. Concrete Vibrator Concrete Batch Plant, 30cu.m. Concrete Screeder, 5.5hp Concrete Saw, 7.5hp (14" Blade diameter) Bar Cutter, Single Phase One Bagger Mixer	1.00	lot		
	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% - 10% of G)			of G	
I.	CONTRACTOR's PROFIT (0% - 8% of G)			of G	
J.	VALUE ADDED TAX, (VAT)		5%	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 : KABANKALAN AIRPORT DEVELOPMENT PROJECT-PHASE II
 Project Description : SITEWORK
 Location : Kabankalan City, Negros Occidental
 Item No./Description : P-151-4.2 Clearing and Grubbing, 150mm thick
 Quantity : 23,116.00
 Unit of Measurement : sq.m.
 Output per hour : 200.00

	DESIGNATION	No. of Person(s)	No. of Hours	Hourly Rate	Amount
A	Labor				
	Construction Foreman	1.00	1.00		
	Unskilled Laborer	2.00	1.00		
	Sub-Total for A				
	NAME AND CAPACITY	No. of Unit/s	No. of Hours	Hourly Rate	Amount
B	Equipment				
	Dump Truck, 12 cu.yd.	3.00	1.00		
	Payloader, 1.50 cu.m.	1.00	1.00		
	Bulldozer, D6H Serises II PSDS/DD	1.00	0.60		
	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				
	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%		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 : KABANKALAN AIRPORT DEVELOPMENT PROJECT-PHASE II
 Project Description : SITEWORK
 Location : Kabankalan City, Negros Occidental
 Item No./Description : P-152-4.1a Unclassified Excavation
 Quantity : 12,096.72
 Unit of Measurement : cu.m.
 Output per hour : 30.00

	DESIGNATION	No. of Person(s)	No. of Hours	Hourly Rate	Amount
A	Labor				
	Construction Foreman	1.00	1.00		
	Unskilled Laborer	2.00	1.00		
	Sub-Total for A				
	NAME AND CAPACITY	No. of Unit/s	No. of Hours	Hourly Rate	Amount
B	Equipment				
	Bulldozer, D6H SERIES II PSDS/DD	1.00	0.60		
	Payloader, 1.50 cu.m.	1.00	1.00		
	Payloader, 1.50 cu.m. - at disposal area	1.00	0.20		
	Dump Truck, 12 cu.yd.	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				
	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% 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 : KABANKALAN AIRPORT DEVELOPMENT PROJECT-PHASE II
 Project Description : SITEWORK
 Location : Kabankalan City, Negros Occidental
 Item No./Description : P-152-4.2b Embankment from Borrow
 Quantity : 17,558.72
 Unit of Measurement : cu.m.
 Output per hour : 41.67

	DESIGNATION	No. of Person(s)	No. of Hours	Hourly Rate	Amount
A	Labor				
	Construction Foreman	1.00	1.00		
	Unskilled Laborer	2.00	1.00		
	Sub-Total for A				
	NAME AND CAPACITY	No. of Unit/s	No. of Hours	Hourly Rate	Amount
B	Equipment				
	Motorized Grader, (140 hp), G710A	1.00	1.00		
	Vibratory Roller (10 mt), SD100DC	1.00	1.00		
	Water Truck/Pump (16000 L)	1.00	0.25		
	Sub-Total for B				
C.	Total (A+B)				
D.	Output per Hour	41.670	cu.m./hr		
E.	Direct Unit Cost (C/Quantity per hour)				
	NAME AND CAPACITY	Quantity	Unit	Unit Cost	Amount
F.	Materials				
	Common Borrow (w/ 20% Shrinkage Factor)	1.20	cu.m.		
	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)	5%			
K.	TOTAL UNIT COST (G + H + I + J)				

Submitted by:

Signature: _____
 Printed Name: _____
 Position: _____
 Name Company: _____
 Date: _____

DETAILED UNIT PRICE ANALYSIS

PROJECT NAME : KABANKALAN AIRPORT DEVELOPMENT PROJECT-PHASE II
 Project Description : SITEWORK
 Location : Kabankalan City, Negros Occidental
 Item No./Description : 105(1)a Subgrade Preparation
 Quantity : 13,797.12
 Unit of Measurement : sq.m.
 Output per hour : 300.00

	DESIGNATION	No. of Person(s)	No. of Hours	Hourly Rate	Amount
A	Labor				
	Construction Foreman	1.00	1.00		
	Unskilled Laborer	2.00	1.00		
	Sub-Total for A				
	NAME AND CAPACITY	No. of Unit/s	No. of Hours	Hourly Rate	Amount
B	Equipment				
	Motorized Grader, (140 hp), G710A	1.00	1.00		
	Vibratory Roller (10 mt), SD100DC	1.00	1.00		
	Water Truck/Pump (16000 L)	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				
	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%	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 : KABANKALAN AIRPORT DEVELOPMENT PROJECT-PHASE II
 Project Description : SITEWORK
 Location : Kabankalan City, Negros Occidental
 Item No./Description : P-154-5.1 Subbase Course
 Quantity : 1,109.59
 Unit of Measurement : cu.m.
 Output per hour : 43.48

	DESIGNATION	No. of Person(s)	No. of Hours	Hourly Rate	Amount
A	Labor				
	Construction Foreman	1.00	1.00		
	Unskilled Laborer	2.00	1.00		
	Sub-Total for A				
	NAME AND CAPACITY	No. of Unit/s	No. of Hours	Hourly Rate	Amount
B	Equipment				
	Motorized Grader, (140 hp), G710A	1.00	1.00		
	Vibratory Roller (10 mt), SD100DC	1.00	1.00		
	Water Truck/Pump (16000 L)	1.00	0.25		
	Sub-Total for B				
C.	Total (A+B)				
D.	Output per Hour	43.48	cu.m./hr		
E.	Direct Unit Cost (C/Quantity per hour)				
	NAME AND CAPACITY	Quantity	Unit	Unit Cost	Amount
F.	Materials				
	Aggregate Subbase Course (w/ 15% Shrinkage Factor)	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%	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 : KABANKALAN AIRPORT DEVELOPMENT PROJECT-PHASE II
 Project Description : BASE COURSE
 Location : Kabankalan City, Negros Occidental
 Item No./Description : P-208-5.1 Aggregate Base Course
 Quantity : 3,117.88
 Unit of Measurement : cu.m.
 Output per hour : 43.48

	DESIGNATION	No. of Person(s)	No. of Hours	Hourly Rate	Amount
A	Labor				
	Construction Foreman	1.00	1.00		
	Unskilled Laborer	2.00	1.00		
	Sub-Total for A				
	NAME AND CAPACITY	No. of Unit/s	No. of Hours	Hourly Rate	Amount
B	Equipment				
	Motorized Grader, (140 hp), G710A	1.00	1.00		
	Vibratory Roller (10 mt), SD100DC	1.00	1.00		
	Water Truck/Pump (16000 L)	1.00	0.25		
Sub-Total for B					
C.	Total (A+B)				
D.	Output per Hour	43.48	cu.m./hr		
E.	Direct Unit Cost (C/Quantity per hour)				
	NAME AND CAPACITY	Quantity	Unit	Unit Cost	Amount
F.	Materials				
	Aggregate Base Course, Grading A (w/ 15% Shrinkage Factor)	1.15	cu.m.		
	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 : KABANKALAN AIRPORT DEVELOPMENT PROJECT-PHASE II
 Project Description : RIGID PAVEMENT
 Location : Kabankalan City, Negros Occidental
 Item No./Description : P-501-8.1b Cement Concrete Pavement,300mm thick
 Quantity : 12,934.80
 Unit of Measurement : sq.m.
 Output per hour : 33.33

	DESIGNATION	No. of Person(s)	No. of Hours	Hourly Rate	Amount
A	Labor				
	Construction Foreman	1.00	1.00		
	Skilled Laborer	4.00	1.00		
	Unskilled Laborer	12.00	1.00		
	Sub-Total for A				
	NAME AND CAPACITY	No. of Unit/s	No. of Hours	Hourly Rate	Amount
B	Equipment				
	Transit Mixer, 5.0cu.m.	2.00	1.00		
	Concrete Vibrator	2.00	1.00		
	Concrete Batch Plant, 30cu.m.	1.00	1.00		
	Payloader, 1.50 cu.m.	1.00	1.00		
	Concrete Screeder, 5.5hp	1.00	1.00		
	Water Truck/Pump (16000 L)	1.00	1.00		
	Concrete Saw, 7.5hp (14" Blade diameter)	1.00	0.10		
	Bar Cutter, Single Phase	1.00	1.00		
	Minor Tools (5% of Labor Cost)				
	Sub-Total for B				
C.	Total (A+B)				
D.	Output per Hour	33.33	sq.m./hr		
E.	Direct Unit Cost (C/Quantity per hour)				
	NAME AND CAPACITY	Quantity	Unit	Unit Cost	Amount
F.	Materials				
	Portland Cement (40kg/bag)	3.636	bags		
	Sand S1	0.153	cu.m.		
	Gravel 3/4	0.306	cu.m.		
	Ø25mm x 6m RSB Bar Grade 60	1.724	kgs		
	Ø10mm x 6m RSB Bar Grade 40	0.043	kgs		
	#16 Tiewire	0.0008	kgs		
	Joint Sealer (Asphalt Sealant)	0.166	ltrs		
	25mm dia x 3.5m Backer Rod	0.19	pcs		
	Form Oil	0.032	ltrs		
	Red Oxide Paint	0.0063	gal		
	Grease / Tar (for dowel)	0.0022	ltrs		
	2" Paint Brush	0.0037	pcs.		
	Concrete Saw Diamond Blade, 14"Ø	0.00015	pcs		
	Curing Compound	0.29	ltrs		
Steel Forms, 30cm width (Rental)	0.37	ln.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%	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 : KABANKALAN AIRPORT DEVELOPMENT PROJECT-PHASE II
 Project Description : LIGHTING INSTALLATION
 Location : Kabankalan City, Negros Occidental
 Item No./Description : L-110-5.2 Concrete Encased Electrical Conduit
 Quantity : 60.00
 Unit of Measurement : In.m
 Output per hour : 1.00

	DESIGNATION	No. of Person(s)	No. of Hours	Hourly Rate	Amount
A	Labor				
	Construction Foreman	1.00	1.00		
	Skilled Laborer	1.00	1.00		
	Unskilled Laborer	2.00	1.00		
	Sub-Total for A				
	NAME AND CAPACITY	No. of Unit/s	No. of Hours	Hourly Rate	Amount
B	Equipment				
	One Bagger Mixer	1.00	1.00		
	Concrete Vibrator	1.00	1.00		
	Minor Tools (5% of Labor Cost)				
	Sub-Total for B				
C.	Total (A+B)				
D.	Output per Hour	1.00	In.m./hr		
E.	Direct Unit Cost (C/Quantity per hour)				
	NAME AND CAPACITY	Quantity	Unit	Unit Cost	Amount
F.	Materials				
	Portland Cement (40kg/bag)	2.505	bags		
	Sand S1	0.139	cu.m.		
	Gravel 3/4	0.278	cu.m.		
	1/2" x 4' x 8' Ordinary Plywood	0.35	pcs.		
	2" x 3" Form Lumber	12.72	bd.ft.		
	Assorted Common Wire Nail	0.29	kgs		
	8"Ø PVC Pipe x 3m	2.67	pcs.		
	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% 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 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:

A C K N O W L E D G E M E N T

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
<u>A. Owned</u>							
I.							
II.							
III.							
IV.							
V.							
<u>B. Leased</u>							
I.							
II.							
III.							
IV.							
V.							
<u>C. Under Purchased Agreement</u>							
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: _____

CAAP-BAC-SF Annex "C" Form 2

DETAILED BREAKDOWN OF COMPONENT OF EACH ITEM
(PROJECT/TITLE/DESCRIPTION/LOCATION)

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	OCIM	Amount	Profit	Amount	%	VALUE				
(1)	(2)	(3)	(4)					(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	
													5% [(5) + (9)]	(9) + (10)	(5) + (11)	(12) / (13)	

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}

Name of Project : _____

Location of Project : _____

CASH FLOW BY QUARTER AND PAYMENT 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** shall be issued by the **Local Government Unit of Kabankalan City** and shall be duly signed by the City Mayor or his authorized representative for the project; **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*).

