SECTION III-A

GENERAL PROVISION SPECIFICATIONS

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GENERAL PROVISIONS SPECIFICATIONS
SECTION 10

DEFINITION OF TERMS

Whenever the following terms are used in these specifications, in the contract, in any documents or other instruments pertaining to construction where these specifications govern, the intent and meaning shall be interpreted as follows:

10-1.1 AASHTO
The American Association of State Highway and Transportation Officials, the successor association to AASHO.

10-1.2 ACCESS ROAD
The right-of-way, the roadway and all improvements constructed thereon connecting the airport to a public highway.

10-1.3 ADVERTISEMENT
A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.

10-1.4 AIP
The Airport Improvement Program, a grant-in-aid program, administered by the Federal Aviation Administration.

10-1.5 AIR OPERATIONS AREA
For the purpose of these specifications, the term air operations area shall mean any area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An air operation area shall include such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiway, or apron.

10-1.6 AIRPORT
Airport means an area of land or water which is used or intended to be used for the landing and takeoff of aircraft, and includes its buildings and facilities, if any.

10-1.7 ASTM
The American Society for Testing and Materials.

10-1.8 AWARD
The acceptance by the owner of the successful bidder’s proposal.

10-1.9 BIDDER
Any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who submits a proposal for the work contemplated.

10-1.10 BUILDING AREA
An area on the airport to be used, considered, or intended to be used for airport buildings or other airport facilities or rights-of-way together with all airport buildings and facilities located thereon.

10-1.11 CALENDAR DAY
Every day shown on the calendar.

10-1.12 CHANGE ORDER
A written order to the Contractor covering changes in the plans, specifications, or proposal quantities and establishing the basis of payment and contract time adjustment, if any, for the work affected by such changes. The work, covered by a change order, shall be within the scope of the contract.

10-1.13 CONTRACT
The written agreement covering the work to be performed. The awarded contract shall include, but is not limited to: The Advertisement; The Contract Form; The Proposal; The Performance Bond; The Payment Bond; any required insurance certificates; The Specifications; The Plans, and any addenda issued to bidders.

10-1.14 CONTRACT ITEM (PAY ITEM)
A specific unit of work for which a price is provided in the contract.

10-1.15 CONTRACT TIME
The number of calendar days or working days, stated in the proposal, allowed for completion of the contract, including authorized time extensions. If a calendar date of completion is stated in the proposal, in lieu of a number of calendar or working days, the contract shall be completed by that date.

10-1.16 CONTRACTOR
The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the work contracted and for the payment of all legal debts pertaining to the work who acts directly or through lawful agents or employees to complete the contract work.

10-1.17 DRAINAGE SYSTEM
The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the airport area.

10-1.18 ENGINEER
The individual, partnership, firm, or corporation duly authorized by the owner (sponsor) to be responsible for engineering supervision of the contract work and acting directly or through an authorized representative.

10-1.19 EQUIPMENT
All machinery, together with the necessary supplies for upkeep and maintenance, and also all tools and apparatus necessary for the proper construction and acceptable completion of the work.

10-1.20 EXTRA WORK
An item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, but which is found by the Engineer to be necessary to complete the work within the intended scope of the contract as previously modified.

10-1.21 FAA
The Federal Aviation Administration of the U.S. Department of Transportation. When used to designate a person, FAA shall mean the Administrator or his/her duly authorized representative.

10-1.22 FEDERAL SPECIFICATIONS
The Federal Specifications and Standards, and supplements, amendments and indices thereto are prepared and issued by the General Services Administration of the Federal Government.

10-1.23 INSPECTOR
An authorized representative of the Engineer assigned to make all necessary inspections and/or tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.

10-1.24 INTENTION OF TERMS
Whenever, in these specifications or on the plans, the words “directed,” “required,” “permitted,” “ordered,” “designated,” “prescribed,” or words of the like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer is intended; and similarly, the words “approved,” “acceptable,” “satisfactory,” or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer, subject in each case to the final determination of the owner.

Any reference to a specific requirement of a numbered paragraph of the contract specifications or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or cited standard that may be pertinent to such specific reference.

10-1.25 LABORATORY
The official testing laboratories of the owner or such other laboratories as may be designated by the Engineer.

10-1.26 LIGHTING
A system of fixtures providing or controlling the light sources used on or near the airport or within the airport buildings. The field lighting includes all luminous signals, markers, floodlights, and illuminating devices used on or near the airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the airport surface.

10-1.27 MAJOR AND MINOR CONTRACT ITEMS
A major contract item shall be any item that is listed in the proposal, the total cost of which is equal to or greater than 20 percent of the total amount of the award contract. All other items shall be considered minor contract items.

10-1.28 MATERIALS
Any substance specified for use in the construction of the contract work.

10-1.29 NOTICE TO PROCEED
A written notice to the Contractor to begin the actual contract work on a previously agreed to date. If applicable, the Notice to Proceed shall state the date on which the contract time begins.

10-1.30 OWNER (SPONSOR)
The term owner shall mean the party of the first part or the contracting agency signatory to the contract. For AIP contracts, the term sponsor shall have the same meaning as the term owner.

10-1.31 PAVEMENT
The combined surface course, base course, and sub base course, if any, considered as a single

unit.

10-1.32 PAYMENT BOND
The approved form of security furnished by the Contractor and his/her surety as a guaranty that he will pay in full all bills and accounts for materials and labor used in the construction of the work.

10-1.33 PERFORMANCE BOND
The approved form of security furnished by the Contractor and his/her surety as a guaranty that the Contractor will complete the work in accordance with the terms of the contract.

10-1.34 PLANS
The official drawings or exact reproductions which show the location, character, dimensions and details of the airport and the work to be done and which are to be considered as a part of the contract, supplementary to the specifications.

10-1.35 PROJECT
The agreed scope of work for accomplishing specific airport development with respect to a particular airport.

10-1.36 PROPOSAL
The written offer of the bidder (when submitted on the approved proposal form) to perform the contemplated work and furnish the necessary materials in accordance with the provisions of the plans and specifications.

10-1.37 PROPOSAL GUARANTEE
The security furnished with a proposal to guarantee that the bidder will enter into a contract if his/her proposal is accepted by the owner.

10-1.38 RUNWAY
The area on the airport prepared for the landing and takeoff of aircraft.

10-1.39 SPECIFICATIONS
A part of the contract containing the written directions and requirements for completing the contract work. Standards for specifying materials or testing which are cited in the contract specifications by reference shall have the same force and effect as if included in the contract physically.

10-1.40 STRUCTURES
Airport facilities such as bridges; culverts; catch basins, inlets, retaining walls, cribbing; storm and sanitary sewer lines; water lines; under drains; electrical ducts, manholes, hand holes, lighting fixtures and bases; transformers; flexible and rigid pavements; navigational aids; buildings; vaults; and, other manmade features of the airport that may be encountered in the work and not otherwise classified herein.

10-1.41 SUBGRADE
The soil which forms the pavement foundation.

10-1.42 SUPERINTENDENT
The Contractor’s executive representative who is present on the work during progress, authorized to receive and fulfill instructions from the Engineer, and who shall supervise and direct the

construction.

10-1.43 SUPPLEMENTAL AGREEMENT
A written agreement between the Contractor and the owner covering: (1) work that would increase or decrease the total amount of the awarded contract, or any major contract item, by more than 25 percent, such increased or decreased work being within the scope of the originally awarded contract; or (2) work that is not within the scope of the originally awarded contract.

10-1.44 SURETY
The corporation, partnership, or individual, other than the Contractor, executing payment or performance bonds which are furnished to the owner by the Contractor.

10-1.45 TAXIWAY
For the purpose of this document, the term taxiway means the portion of the air operations area of an airport that has been designated by competent airport authority for movement of aircraft to and from the airport's runways or aircraft parking areas.

10-1.46 WORK
The furnishing of all labor, materials, tools, equipment, and incidentals necessary or convenient to the Contractor's performance of all duties and obligations imposed by the contract, plans, and specifications.

10-1.47 WORKING DAY
A working day shall be any day other than a legal holiday, Saturday, or Sunday on which the normal working forces of the Contractor may proceed with regular work for at least 6 hours toward completion of the contract. Unless work is suspended for causes beyond the Contractor's control, Saturdays, Sundays and holidays on which the Contractor's forces engage in regular work, requiring the presence of an inspector, will be considered as working days.

END OF SECTION 10

SECTION 20

This section is not used.

END OF SECTION 20

SECTION 30

This section is not used.

END OF SECTION 30

SECTION 40

SCOPE OF WORK

40-1.1 INTENT OF CONTRACT

The intent of the contract is to provide for construction and completion, in every detail, of the work described. It is further intended that the Contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work in accordance with the plans, specifications, and terms of the contract.

40-1.2 ALTERATION OF WORK AND QUANTITIES

The owner reserves and shall have the right to make such alterations in the work as may be necessary or desirable to complete the work originally intended in an acceptable manner. Unless otherwise specified herein, the Engineer shall be and is hereby authorized to make such alterations in the work as may increase or decrease the originally awarded contract quantities, provided that the aggregate of such alterations does not change the total contract cost or the total cost of any major contract item by more than 25 percent (total cost being based on the unit prices and estimated quantities in the awarded contract). Alterations which do not exceed the 25 percent limitation shall not invalidate the contract nor release the surety, and the Contractor agrees to accept payment for such alterations as if the altered work had been a part of the original contract. These alterations which are for work within the general scope of the contract shall be covered by "Change Orders" issued by the Engineer. Change orders for altered work shall include extensions of contract time where, in the Engineer's opinion, such extensions are commensurate with the amount and difficulty of added work.

Should the aggregate amount of altered work exceed the 25 percent limitation hereinbefore specified, such excess altered work shall be covered by supplemental agreement. If the owner and the Contractor are unable to agree on a unit adjustment for any contract item that requires a supplemental agreement, the owner reserves the right to terminate the contract with respect to the item and make other arrangements for its completion.

All supplemental agreements shall be approved by the FAA and shall include valid wage determinations of the U.S. Secretary of Labor when the amount of the supplemental agreement exceeds $2,000. However, if the CONTRACTOR elects to waive the limitations on work that increases or decreases the originally awarded CONTRACT or any major CONTRACT item by more than 25 percent, the supplemental agreement shall be subject to the same U.S. Secretary of Labor Wage determination as was included in the originally awarded CONTRACT.

40-1.3 OMITTED ITEMS

The Engineer may, in the owner's best interest, omit from the work any contract item, except major contract items. Major contract items may be omitted by a supplemental agreement. Such omission of contract items shall not invalidate any other contract provision or requirement.

Should a contract item be omitted or otherwise ordered to be non-performed, the Contractor shall be paid for all work performed toward completion of such item prior to the date of the order to omit such item. Payment for work performed shall be in accordance with the subsection titled PAYMENT FOR OMITTED ITEMS of Section 90.

40-1.4 EXTRA WORK

Should acceptable completion of the contract require the Contractor to perform an item of work for which no basis of payment has been provided in the original contract or previously issued change orders or supplemental agreements, the same shall be called Extra Work. Extra work that is within the general scope of the contract shall be covered by written change order. Change orders for such extra work shall contain agreed unit prices for performing the change order work in accordance with the requirements specified in the order, and shall contain any adjustment to the contract time that, in the Engineer's opinion, is necessary for completion of such extra work.

When determined by the Engineer to be in the owner's best interest, he may order the Contractor to proceed with extra work by force account as provided in the subsection titled PAYMENT FOR EXTRA AND FORCE ACCOUNT WORK of Section 90.

Extra work that is necessary for acceptable completion of the project, but is not within the general scope of the work covered by the original contract shall be covered by a Supplemental Agreement as hereinbefore defined in the subsection titled SUPPLEMENTAL AGREEMENT of Section 10.

Any claim for payment of extra work that is not covered by written agreement (change order or supplemental agreement) shall be rejected by the owner.

40-1.5 MAINTENANCE OF TRAFFIC

It is the explicit intention of the contract that the safety of aircraft, as well as the Contractor's equipment and personnel, is the most important consideration. It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of aircraft in the air operations areas of the airport with respect to his/her own operations and the operations of all his/her subcontractors as specified in the subsection titled LIMITATION OF OPERATIONS of Section 80. It is further understood and agreed that the Contractor shall provide for the uninterrupted operation of visual and electronic signals (including power supplies thereto) used in the guidance of aircraft while operating to, from, and upon the airport as specified in the subsection titled CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS in Section 70.

With respect to his/her own operations and the operations of all his/her subcontractors, the Contractor shall provide marking, lighting, and other acceptable means of identifying: personnel; equipment; vehicles; storage areas; and any work area or condition that may be hazardous to the operation of aircraft, fire-rescue equipment, or maintenance vehicles at the airport.

When the contract requires the maintenance of vehicular traffic on an existing road, street, or highway during the Contractor's performance of work that is otherwise provided for in the contract, plans, and specifications, the Contractor shall keep such road, street, or highway open to all traffic and shall provide such maintenance as may be required to accommodate traffic. The Contractor shall furnish erect, and maintain barricades, warning signs, flagmen, and other traffic control devices in reasonable conformity with the manual of Uniform Traffic Control Devices for Streets and Highways (published by the United States Government Printing Office), unless otherwise specified herein. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress to and egress from abutting property or intersecting roads, streets or highways. Unless otherwise specified herein, the Contractor will not be required to furnish snow removal for

such existing road, street, or highway.

The Contractor shall make his/her own estimate of all labor, materials, equipment, and incidentals necessary for providing the maintenance of aircraft and vehicular traffic as specified in this subsection.

The cost of maintaining the aircraft and vehicular traffic specified in this subsection shall not be measured or paid for directly, but shall be included in the various contract items.

40-1.6 REMOVAL OF EXISTING STRUCTURES

All existing structures encountered within the established lines, grades, or grading sections shall be removed by the Contractor, unless such existing structures are otherwise specified to be relocated, adjusted up or down, salvaged, abandoned in place, reused in the work or to remain in place. The cost of removing such existing structures shall not be measured or paid for directly, but shall be included in the various contract items.

Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the plans, the Engineer shall be notified prior to disturbing such structure. The disposition of existing structures so encountered shall be immediately determined by the Engineer in accordance with the provisions of the contract.

Except as provided in the subsection titled RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK of this section, it is intended that all existing materials or structures that may be encountered (within the lines, grades, or grading sections established for completion of the work) shall be utilized in the work as otherwise provided for in the contract and shall remain the property of the owner when so utilized in the work.

40-1.7 RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK

Should the Contractor encounter any material such as (but not restricted to) sand, stone, gravel, slag, or concrete slabs within the established lines, grades, or grading sections, the use of which is intended by the terms of the contract to be either embankment or waste, he may at his/her option either:

a. Use such material in another contract item, providing such use is approved by the Engineer and is in conformance with the contract specifications applicable to such use; or,

b. Remove such material from the site, upon written approval of the Engineer; or

c. Use such material for his/her own temporary construction on site; or,

d. Use such material as intended by the terms of the contract.

Should the Contractor wish to exercise option a., b., or c., he shall request the Engineer's approval in advance of such use.

Should the Engineer approve the Contractor's request to exercise option a., b., or c., the Contractor shall be paid for the excavation or removal of such material at the applicable contract price. The Contractor shall replace, at his/her own expense, such removed or excavated material with an agreed equal volume of material that is acceptable for use in constructing embankment,

backfills, or otherwise to the extent that such replacement material is needed to complete the contract work. The Contractor shall not be charged for his/her use of such material so used in the work or removed from the site.

Should the Engineer approve the Contractor's exercise of option a., the Contractor shall be paid, at the applicable contract price, for furnishing and installing such material in accordance with requirements of the contract item in which the material is used.

It is understood and agreed that the Contractor shall make no claim for delays by reason of his/her exercise of option a., b., or c.

The Contractor shall not excavate, remove, or otherwise disturb any material, structure, or part of a structure which is located outside the lines, grades, or grading sections established for the work, except where such excavation or removal is provided for in the contract, plans, or specifications.

40-1.8 FINAL CLEANING UP

Upon completion of the work and before acceptance and final payment will be made, the Contractor shall remove from the site all machinery, equipment, surplus and discarded materials, rubbish, temporary structures, and stumps or portions of trees. He shall cut all brush and woods within the limits indicated and shall leave the site in a neat and presentable condition. Material cleared from the site and deposited on adjacent property will not be considered as having been disposed of satisfactorily, unless the Contractor has obtained the written permission of such property owner.

END OF SECTION 40

SECTION 50

CONTROL OF WORK

50-1.1 AUTHORITY OF THE ENGINEER

The Engineer shall decide any and all questions which may arise as to the quality and acceptability of materials furnished, work performed, and as to the manner of performance and rate of progress of the work. He shall decide all questions which may arise as to the interpretation of the specifications or plans relating to the work, the fulfillment of the contract on the part of the Contractor, and the rights of different Contractors on the project. The Engineer shall determine the amount and quality of the several kinds of work performed and materials furnished which are to be paid for the under contract.

50-1.2 CONFORMITY WITH PLANS AND SPECIFICATIONS

All work and all materials furnished shall be in reasonably close conformity with the lines, grades, grading sections, cross sections, dimensions, material requirements, and testing requirements that are specified (including specified tolerances) in the contract, plans or specifications.

If the Engineer finds the materials furnished, work performed, or the finished product not within reasonably close conformity with the plans and specifications but that the portion of the work affected will, in his/her opinion, result in a finished product having a level of safety, economy, durability, and workmanship acceptable to the owner, he will advise the owner of his/her determination that the affected work be accepted and remain in place. In this event, the Engineer will document his/her determination and recommend to the owner a basis of acceptance which will provide for an adjustment in the contract price for the affected portion of the work. The Engineer's determination and recommended contract price adjustments will be based on good engineering judgment and such tests or retests of the affected work as are, in his/her opinion, needed. Changes in the contract price shall be covered by contract modifications (change order or supplemental agreement) as applicable.

If the Engineer finds the materials furnished, work performed, or the finished product are not in reasonably close conformity with the plans and specifications and have resulted in an unacceptable finished product, the affected work or materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor in accordance with the Engineer's written orders.

For the purpose of this subsection, the term "reasonably close conformity" shall not be construed as waiving the Contractor's responsibility to complete the work in accordance with the contract, plans, and specifications. The term shall not be construed as waiving the Engineer's right to insist on strict compliance with the requirements of the contract, plans, and specifications during the Contractor's prosecution of the work, when, in the Engineer's opinion, such compliance is essential to provide an acceptable finished portion of the work.

For the purpose of this subsection, the term "reasonably close conformity" is also intended to provide the Engineer with the authority to use good engineering judgment in his/her determinations as to acceptance of work that is not in strict conformity but will provide a finished product equal to or better than that intended by the requirements of the contract, plans and specifications.

50-1.3 COORDINATION OF CONTRACT, PLANS, AND SPECIFICATIONS

The contract, plans, specifications, and all referenced standards cited are essential parts of the contract requirements. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled dimensions; contract technical specifications shall govern over contract general provisions, plans, cited standards for materials or testing, and cited FAA advisory circulars; contract general provisions shall govern over plans, cited standards for materials or testing, and cited FAA advisory circulars; plans shall govern over cited standards for materials or testing and cited FAA advisory circulars. If any paragraphs contained in the Special Provisions conflict with General Provisions or Technical Specifications, the Special Provisions shall govern.

From time to time, discrepancies within cited standards for testing occur due to the timing of changing, editing, and replacing of standards. In the event the Contractor discovers any apparent discrepancy within standard test methods, he shall immediately call upon the Engineer for his/her interpretation and decision, and such decision shall be final.

The Contractor shall not take advantage of any apparent error or omission on the plans or specifications. In the event the Contractor discovers any apparent error or discrepancy, he shall immediately call upon the Engineer for his/her interpretation and decision, and such decision shall be final.

50-1.4 COOPERATION OF CONTRACTOR

The Contractor will be supplied with two copies each of the plans and specifications. He shall have available on the work at all times, one copy each of the plans and specifications. Additional copies of plans and specifications may be obtained by the Contractor for the cost of reproduction.

The Contractor shall give constant attention to the work to facilitate the progress thereof, and he shall cooperate with the Engineer and his/her inspectors and with other contractors in every way possible. The Engineer shall allocate he work and designate the sequence of construction in case of controversy between contractors. The Contractor shall have a competent superintendent on the work at all times who is fully authorized as his/her agent on the work. The superintendent shall be capable of reading and thoroughly understanding the plans and specifications and shall receive and fulfill instructions from the Engineer or his/her authorized representative.

50-1.5 COOPERATION BETWEEN CONTRACTORS

The owner reserves the right to contract for and perform other or additional work on or near the work covered by this contract.

When separate contracts are let within the limits of any one project, each Contractor shall conduct his/her work so as not to interfere with or hinder the progress of completion of the work being performed by other Contractors. Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with his/her contract and shall protect and save harmless the owner from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced by him because of the presence and operations of other Contractors working within the limits of the same project.

The Contractor shall arrange his/her work and shall place and dispose of the materials being used so as not to interfere with the operations of the other Contractors within the limits of the same project. He shall join his/her work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

50-1.6 CONSTRUCTION LAYOUT AND STAKES

The Engineer shall establish horizontal and vertical control only. The Contractor must establish all layouts required for the construction of the work. Such stakes and markings as the Engineer may set for either his/her own or the Contractor's guidance shall be preserved by the Contractor. In case of negligence on the part of the Contractor, or his/her employees, resulting in the destruction of such stakes or markings, an amount equal to the cost of replacing the same may be deducted from subsequent estimates due the Contractor at the discretion of the Engineer.

50-1.7 AUTOMATICALLY CONTROLLED EQUIPMENT

Whenever batching or mixing plant equipment is required to be operated automatically under the contract and a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods for a period 48 hours following the breakdown or malfunction, provided this method of operations will produce results which conform to all other requirements of the contract.

50-1.8 AUTHORITY AND DUTIES OF INSPECTORS

Inspectors employed by the owner shall be authorized to inspect all work done and all material furnished. Such inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. Inspectors are not authorized to revoke, alter, or waive any provision of the contract. Inspectors are not authorized to issue instructions contrary to the plans and specifications or to act as foreman for the Contractor.

Inspectors employed by the owner are authorized to notify the Contractor or his/her representatives of any failure of the work or materials to conform to the requirements of the contract, plans, or specifications and to reject such nonconforming materials in question until such issues can be referred to the Engineer for his/her decision.

50-1.9 INSPECTION OF THE WORK

All materials and each part or detail of the work shall be subject to inspection by the Engineer. The Engineer shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

If the Engineer requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be at the Contractor's expense.

Any work done or materials used without supervision or inspection by an authorized representative of the owner may be ordered removed and replaced at the Contractor's expense unless the owner's representative failed to inspect after having been given

reasonable notice in writing that the work was to be performed.

Should the contract work include relocation, adjustment, or any other modification to existing facilities, not the property of the (contract) owner, authorized representatives of the owners of such facilities shall have the right to inspect such work. Such inspection shall in no sense make any facility owner a party to the contract, and shall in no way interfere with the rights of the parties to this contract.

50-1.10 REMOVAL OF UNACCEPTABLE AND UNAUTHORIZED WORK

All work which does not conform to the requirements of the contract, plans, and specifications will be considered unacceptable, unless otherwise determined acceptable by the Engineer as provided in the subsection titled CONFORMITY WITH PLANS AND SPECIFICATIONS of this section.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner in accordance with the provisions of the subsection titled CONTRACTOR'S RESPONSIBILITY FOR WORK of Section 70.

Work done contrary to the instructions of the Engineer, work done beyond the lines shown on the plans or as given, except as herein specified, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the contract. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply forthwith with any order of the Engineer made under the provisions of this subsection, the Engineer will have authority to cause unacceptable work to be remedied or removed and replaced and unauthorized work to be removed and to deduct the costs (incurred by the owner) from any monies due or to become due the Contractor.

50-1.11 LOAD RESTRICTIONS

The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the work. A special permit will not relieve the Contractor of liability for damage which may result from the moving of material or equipment.

The operation of equipment of such weight or so loaded as to cause damage to structures or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited as directed. No loads will be permitted on a concrete pavement, base, or structure before the expiration of the curing period. The Contractor shall be responsible for all damage done by his/her hauling equipment and shall correct such damage at his/her own expense.

50-1.12 MAINTENANCE DURING CONSTRUCTION

The Contractor shall maintain the work during construction and until the work is accepted. This maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.

In the case of a contract for the placing of a course upon a course or sub-grade previously

constructed, the Contractor shall maintain the previous course or sub-grade during all construction operations.

All costs of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various contract items, and the Contractor will not be paid an additional amount for such work.

50-1.13 FAILURE TO MAINTAIN THE WORK

Should the Contractor at any time fail to maintain the work as provided in the subsection titled MAINTENANCE DURING CONSTRUCTION of this section, the Engineer shall immediately notify the Contractor of such non-compliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. The time specified will give due consideration to the exigency that exists.

Should the Contractor fail to respond to the Engineer's notification, the Engineer may suspend any work necessary for the owner to correct such unsatisfactory maintenance condition, depending on the exigency that exists. Any maintenance cost incurred by the owner, shall be deducted from monies due or to become due the Contractor.

50-1.14 PARTIAL ACCEPTANCE

If at any time during the prosecution of the project the Contractor substantially completes a usable unit or portion of the work, the occupancy of which will benefit the owner, he may request the Engineer to make final inspection of that unit. If the Engineer finds upon inspection that the unit has been satisfactorily completed in compliance with the contract, he may accept it as being completed, and the Contractor may be relieved of further responsibility for that unit. Such partial acceptance and beneficial occupancy by the owner shall not void or alter any provision of the contract.

50-1.15 FINAL ACCEPTANCE

Upon due notice from the Contractor of presumptive completion of the entire project, the Engineer and owner will make an inspection. If all construction provided for and contemplated by the contract is found to be completed in accordance with the contract, plans, and specifications, such inspection shall constitute the final inspection. The Engineer shall notify the Contractor in writing of final acceptance as of the date of the final inspection.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory, the Engineer will give the Contractor the necessary instructions for correction of same and the Contractor shall immediately comply with and execute such instructions. Upon correction of the work, another inspection will be made which shall constitute the final inspection, provided the work has been satisfactorily completed. In such event, the Engineer will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of final inspection.

50-1.16 CLAIMS FOR ADJUSTMENT AND DISPUTES

If for any reason the Contractor deems that additional compensation is due him for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized as extra work, he shall notify the Engineer in writing of his/her intention to claim such additional compensation before he begins the work on which he bases the claim. If such notification is not given or the Engineer is not afforded proper opportunity by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such

additional compensation. Such notice by the Contractor and the fact that the Engineer has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the Contractor shall, within l0 calendar days, submit his/her written claim to the Engineer who will present it to the owner for consideration in accordance with local laws or ordinances.

Nothing in this subsection shall be construed as a waiver of the Contractor's right to dispute final payment based on differences in measurements or computations.

END OF SECTION 50

SECTION 60

CONTROL OF MATERIALS

60-1.1 SOURCE OF SUPPLY AND QUALITY REQUIREMENTS

The materials used on the work shall conform to the requirements of the contract, plans, and specifications. Unless otherwise specified, such materials that are manufactured or processed shall be new (as compared to used or reprocessed).

In order to expedite the inspection and testing of materials, the Contractor shall furnish complete statements to the Engineer as to the origin, composition, and manufacture of all materials to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials.

At the Engineer's option, materials may be approved at the source of supply before delivery is stated. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources.

The Contractor shall furnish airport lighting equipment that conforms to the requirements of cited materials specifications. In addition, where an FAA specification for airport lighting equipment is cited in the plans or specifications, the Contractor shall furnish such equipment that is:

a. Listed in FAA Advisory Circular (AC) 150/5345-53D, Airport Lighting Equipment Certification Program, and Addendum that is in effect on the date of advertisement; and,

b. Produced by the manufacturer as listed in the Addendum cited above for the certified equipment part number.

60-1.2 SAMPLES, TESTS, AND CITED SPECIFICATIONS

All materials used in the work shall be inspected, tested, and approved by the Engineer before incorporation in the work. Any work in which untested materials are used without approval or written permission of the Engineer shall be performed at the Contractor's risk. Materials found to be unacceptable and unauthorized will not be paid for and, if directed by the Engineer, shall be removed at the Contractor's expense. Unless otherwise designated, tests in accordance with the cited standard methods of AASHTO or ASTM which are current on the date of advertisement for bids will be made by and at the expense of the owner. Samples will be taken by a qualified representative of the owner. All materials being used are subject to inspection, test, or rejection at any time prior to or during incorporation into the work. Copies of all tests will be furnished to the Contractor's representative at his/her request.

60-1.3 CERTIFICATION OF COMPLIANCE

The Engineer may permit the use, prior to sampling and testing, of certain materials or assemblies when accompanied by manufacturer's certificates of compliance stating that such materials or assemblies fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the work must be accompanied by a certificate of compliance in which the lot is clearly identified.

Materials or assemblies used on the basis of certificates of compliance may be sampled and tested at any time and if found not to be in conformity with contract requirements will be subject to rejection whether in place or not.

The form and distribution of certificates of compliance shall be as approved by the Engineer.

When a material or assembly is specified by "brand name or equal" and the Contractor elects to furnish the specified "brand name," the Contractor shall be required to furnish the manufacturer's certificate of compliance for each lot of such material or assembly delivered to the work. Such certificate of compliance shall clearly identify each lot delivered and shall certify as to:

a. Conformance to the specified performance, testing, quality or dimensional requirements;

b. Suitability of the material or assembly for the use intended in the contract work.

Should the Contractor propose to furnish an "or equal" material or assembly, he shall furnish the manufacturer's certificates of compliance as hereinbefore described for the specified brand name material or assembly. However, the Engineer shall be the sole judge as to whether the proposed "or equal" is suitable for use in the work.

The Engineer reserves the right to refuse permission for use of materials or assemblies on the basis of certificates of compliance.

60-1.4 PLANT INSPECTION

The Engineer or his/her authorized representative may inspect, at its source, any specified material or assembly to be used in the work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the work and to obtain samples required for his/her acceptance of the material or assembly.

Should the Engineer conduct plant inspections, the following conditions shall exist:

a. The Engineer shall have the cooperation and assistance of the Contractor and the producer with whom he has contracted for materials.

b. The Engineer shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of the materials being furnished.

c. If required by the Engineer, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Office or working space should be conveniently located with respect to the plant.

It is understood and agreed that the owner shall have the right to retest any material which has been tested and approved at the source of supply after it has been delivered to the site. The Engineer shall have the right to reject only material which, when retested, does not meet the requirements of the contract, plans, or specifications.

60-1.5 ENGINEER'S FIELD OFFICE AND LABORATORY

When specified and provided for as a contract item and as described in project special provisions, the Contractor shall furnish a building or field office space for the exclusive use of the Engineer as a field office and field testing laboratory. The building or field office space shall be furnished and maintained by the Contractor as specified herein and shall become property of the Contractor when the contract work is completed.

60-1.6 STORAGE OF MATERIALS

Materials shall be so stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located so as to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the Engineer. Materials to be stored on airport property shall not create an obstruction to air navigation nor shall they interfere with the free and unobstructed movement of aircraft. Unless otherwise shown on the plans, the storage of materials and the location of the Contractor's plant and parked equipment or vehicles shall be as directed by the Engineer. Private property shall not be used for storage purposes without written permission of the owner or lessee of such property. The Contractor shall make all arrangements and bear all expenses for the storage of materials on private property. Upon request, the Contractor shall furnish the Engineer a copy of the property owner's permission.

All storage sites on private or airport property shall be restored to their original condition by the Contractor at his/her entire expense, except as otherwise agreed to (in writing) by the owner or lessee of the property.

60-1.7 UNACCEPTABLE MATERIALS

Any material or assembly that does not conform to the requirements of the contract, plans, or specifications shall be considered unacceptable and shall be rejected. The Contractor shall remove any rejected material or assembly from the site of the work, unless otherwise instructed by the Engineer.

Rejected material or assembly, the defects of which have been corrected by the Contractor, shall not be returned to the site of the work until such time as the Engineer has approved its used in the work.

60-1.8 OWNER FURNISHED MATERIALS

The Contractor shall furnish all materials required to complete the work, except those specified herein (if any) to be furnished by the owner. Owner-furnished materials shall be made available to the Contractor at the location specified herein.

All costs of handling, transportation from the specified location to the site of work, storage, and installing owner-furnished materials shall be included in the unit price bid for the contract item in which such owner-furnished material is used.

After any owner-furnished material has been delivered to the location specified, the Contractor shall be responsible for any demurrage, damage, loss, or other deficiencies which may occur during the Contractor's handling, storage, or use of such owner-furnished material. The owner will deduct from any monies due or to become due the Contractor any cost incurred by the owner in making good such loss due to the Contractor's handling, storage, or use of owner-furnished materials.

END OF SECTION 60

SECTION 70

LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC

70-1.1 LAWS TO BE OBSERVED

The Contractor shall keep fully informed of all Federal and state laws, all local laws, ordinances, and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work, or which in any way affect the conduct of the work. He shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the owner and all his/her officers, agents, or servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by himself or his/her employees.

70-1.2 PERMITS, LICENSES, AND TAXES

The Contractor shall procure all permits and licenses, pay all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful prosecution of the work.

70-1.3 PATENTED DEVICES, MATERIALS, AND PROCESSES

If the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, he shall provide for such use by suitable legal agreement with the patentee or owner. The Contractor and the surety shall indemnify and save harmless the owner, any third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the owner for any costs, expenses, and damages which it may be obliged to pay by reason of an infringement, at any time during the prosecution or after the completion of the work.

70-1.4 RESTORATION OF SURFACES DISTURBED BY OTHERS

The owner reserves the right to authorize the construction, reconstruction, or maintenance of any public or private utility service, FAA or National Oceanic and Atmospheric Administration (NOAA) facility, or a utility service of another government agency at any time during the progress of the work.

The Contractor shall not permit any individual, firm, or corporation to excavate or otherwise disturb such utility services or facilities located within the limits of the work without the written permission of the Engineer.

Should the owner of public or private utility service, FAA, or NOAA facility, or a utility service of another government agency be authorized to construct, reconstruct, or maintain such utility service or facility during the progress of the work, the Contractor shall cooperate with such owners by arranging and performing the work in this contract so as to facilitate such construction, reconstruction or maintenance by others whether or not such work by others is listed above. When ordered as extra work by the Engineer, the Contractor shall make all necessary repairs to the work which are due to such authorized work by others, unless otherwise provided for in the contract, plans, or specifications.

It is understood and agreed that the Contractor shall not be entitled to make any claim for damages due to such authorized work by others or for any delay to the work resulting from such authorized work.

70-1.5 FEDERAL AID PARTICIPATION

For AIP contracts, the United States Government has agreed to reimburse the owner for some portion of the contract costs. Such reimbursement is made from time to time upon the owner's (sponsor's) request to the FAA. In consideration of the United Sates Government's (FAA's) agreement with the owner, the owner has included provisions in this contract pursuant to the requirements of the Airport Improvement Act of 1982, as amended by the Airport and Airway Safety and Capacity Expansion Act of 1987, and the Rules and Regulations of the FAA that pertain to the work.

As required by the Act, the contract work is subject to the inspection and approval of duly authorized representatives of the Administrator, FAA, and is further subject to those provisions of the rules and regulations that are cited in the contract, plans, or specifications.

No requirement of the Act, the rules and regulations implementing the Act, or this contract shall be construed as making the Federal Government a party to the contract nor will any such requirement interfere, in any way, with the rights of either party to the contract.

70-1.6 SANITARY, HEALTH, AND SAFETY PROVISIONS

The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his/her employees as may be necessary to comply with the requirements of the state and local Board of Health, or of other bodies or tribunals having jurisdiction.

Attention is directed to Federal, state, and local laws, rules and regulations concerning construction safety and health standards. The Contractor shall not require any worker to work in surroundings or under conditions that are unsanitary, hazardous, or dangerous to his/her health or safety.

70-1.7 PUBLIC CONVENIENCE AND SAFETY

The Contractor shall control his/her operations and those of his/her subcontractors and all suppliers, to assure the least inconvenience to the traveling public. Under all circumstances, safety shall be the most important consideration.

The Contractor shall maintain the free and unobstructed movement of aircraft and vehicular traffic with respect to his/her own operations and those of his/her subcontractors and all suppliers in accordance with the subsection titled MAINTENANCE OF TRAFFIC of Section 40 hereinbefore specified and shall limit such operations for the convenience and safety of the traveling public as specified in the subsection titled LIMITATION OF OPERATIONS of Section 80 hereinafter.

70-1.8 BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS

The Contractor shall furnish, erect, and maintain all barricades, warning signs, and markings for hazards necessary to protect the public and the work. When used during periods of darkness, such barricades, warning signs, and hazard markings shall be suitably illuminated.

For vehicular and pedestrian traffic, the Contractor shall furnish, erect, and maintain barricades, warning signs, lights and other traffic control devices in reasonable conformity with the Manual of Uniform Traffic Control Devices for Streets and Highways (published by the United States Government Printing Office).

When the work requires closing an air operations area of the airport or portion of such area, the Contractor shall furnish, erect, and maintain temporary markings and associated lighting

conforming to the requirements of AC 150/5340-1L, Standards for Airport Markings.

The Contractor shall furnish, erect, and maintain markings and associated lighting of open trenches, excavations, temporary stock piles, and his/her parked construction equipment that may be hazardous to the operation of emergency fire-rescue or maintenance vehicles on the airport in reasonable conformance to AC 150/5370-2F, Operational Safety on Airports during Construction.

The Contractor shall identify each motorized vehicle or piece of construction equipment in reasonable conformance to AC 150/5370-2F.

The Contractor shall furnish and erect all barricades, warning signs, and markings for hazards prior to commencing work which requires such erection and shall maintain the barricades, warning signs, and markings for hazards until their dismantling is directed by the Engineer.

Open-flame type lights shall not be permitted within the air operations areas of the airport.

70-1.9 USE OF EXPLOSIVES

When the use of explosives is necessary for the prosecution of the work, the Contractor shall exercise the utmost care not to endanger life or property, including new work. The Contractor shall be responsible for all damage resulting from the use of explosives.

All explosives shall be stored in a secure manner in compliance with all laws and ordinances, and all such storage places shall be clearly marked. Where no local laws or ordinances apply, storage shall be provided satisfactory to the Engineer and, in general, not closer than 1,000 feet (300 m) from the work or from any building, road, or other place of human occupancy.

The Contractor shall notify each property owner and public utility company having structures or facilities in proximity to the site of the work of his/her intention to use explosives. Such notice shall be given sufficiently in advance to enable them to take such steps as they may deem necessary to protect their property from injury.

The use of electrical blasting caps shall not be permitted on or within 1,000 feet (300 m) of the airport property.

70-1.10 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE

The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property markers until the Engineer has witnessed or otherwise referenced their location and shall not move them until directed.

The Contractor shall be responsible for all damage or injury to property of any character, during the prosecution of the work, resulting from any act, omission, neglect, or misconduct in his/her manner or method of executing the work, or at any time due to defective work or materials, and said responsibility will not be released until the project shall have been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the non-execution thereof by the Contractor, he shall restore, at his/her own expense, such property to a condition similar or equal to that existing before such damage

or injury was done, by repairing, or otherwise restoring as may be directed, or he shall make good such damage or injury in an acceptable manner.

70-1.11 RESPONSIBILITY FOR DAMAGE CLAIMS

The Contractor shall indemnify and save harmless the Engineer and the owner and their officers, and employees from all suits actions, or claims of any character brought because of any injuries or damage received or sustained by any person, persons, or property on account of the operations of the Contractor; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect, or misconduct of said Contractor; or because of any claims or amounts recovered from any infringements of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the "Workmen's Compensation Act," or any other law, ordinance, order, or decree. Money due the Contractor under and by virtue of his/her contract as may be considered necessary by the owner for such purpose may be retained for the use of the owner or, in case no money is due, his/her surety may be held until such suit or suits, action or actions, claim or claims for injuries or damages as aforesaid shall have been settled and suitable evidence to that effect furnished to the owner, except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence that he is adequately protected by public liability and property damage insurance.

70-1.12 THIRD PARTY BENEFICIARY CLAUSE

It is specifically agreed between the parties executing the contract that it is not intended by any of the provisions of any part of the contract to create the public or any member thereof a third party beneficiary or to authorize anyone not a party to the contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of the contract.

70-1.13 OPENING SECTIONS OF THE WORK TO TRAFFIC

Should it be necessary for the Contractor to complete portions of the contract work for the beneficial occupancy of the owner prior to completion of the entire contract, such "phasing" of the work shall be specified herein and indicated on the plans. When so specified, the Contractor shall complete such portions of the work on or before the date specified or as otherwise specified. The Contractor shall make his/her own estimate of the difficulties involved in arranging his/her work to permit such beneficial occupancy by the owner as described below:

Five phases of construction as indicated on the plans.

Upon completion of any portion of the work listed above, such portion shall be accepted by the owner in accordance with the subsection titled PARTIAL ACCEPTANCE of Section 50.

No portion of the work may be opened by the Contractor for public use until ordered by the Engineer in writing. Should it become necessary to open a portion of the work to public traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the Engineer, such portion of the work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provision of the contract. Any damage to the portion of the work so opened that is not attributable to traffic which is permitted by the owner shall be repaired by the Contractor at his/her expense.

The Contractor shall make his/her own estimate of the inherent difficulties involved in completing the work under the conditions herein described and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the contract work.

70-1.14 CONTRACTOR'S RESPONSIBILITY FOR WORK

Until the Engineer's final written acceptance of the entire completed work, excepting only those portions of the work accepted in accordance with the subsection titled PARTIAL ACCEPTANCE of Section 50, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomenon of nature, or acts of the public enemy or of government authorities.

If the work is suspended for any cause whatever, the Contractor shall be responsible for the work and shall take such precautions necessary to prevent damage to the work. The Contractor shall provide for normal drainage and shall erect necessary temporary structures, signs, or other facilities at his/her expense. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established planting, seeding, and sodding furnished under his/her contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

70-1.15 CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS

As provided in the subsection titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this section, the Contractor shall cooperate with the owner of any public or private utility service, FAA or NOAA, or a utility service of another government agency that may be authorized by the owner to construct, reconstruct or maintain such utility services or facilities during the progress of the work. In addition, the Contractor shall control his/her operations to prevent the unscheduled interruption of such utility services and facilities.

To the extent that such public or private utility services, FAA, or NOAA facilities, or utility services of another governmental agency are known to exist within the limits of the contract work, the approximate locations have been indicated on the plans.

It is understood and agreed that the owner does not guarantee the accuracy or the completeness of the location information relating to existing utility services, facilities, or structures that may be shown on the plans or encountered in the work. Any inaccuracy or omission in such information shall not relieve the Contractor of his/her responsibility to protect such existing features from damage or unscheduled interruption of service.

It is further understood and agreed that the Contractor shall, upon execution of the contract, notify the owners of all utility services or other facilities of his/her plan of operations. Such notification shall be in writing addressed to THE PERSON TO CONTACT as provided hereinbefore in this subsection and the subsection titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this section. A copy of each notification shall be given to the

Engineer.

In addition to the general written notification hereinbefore provided, it shall be the responsibility of the Contractor to keep such individual owners advised of changes in his/her plan of operations that would affect such owners.

Prior to commencing the work in the general vicinity of an existing utility service or facility, the Contractor shall again notify each such owner of his/her plan of operation. If, in the Contractor's opinion, the owner's assistance is needed to locate the utility service or facility or the presence of a representative of the owner is desirable to observe the work, such advice should be included in the notification. Such notification shall be given by the most expeditious means to reach the utility owner's PERSON TO CONTACT no later than two normal business days prior to the Contractor's commencement of operations in such general vicinity. The Contractor shall furnish a written summary of the notification to the Engineer.

The Contractor's failure to give the two days' notice hereinabove provided shall be cause for the Engineer to suspend the Contractor's operations in the general vicinity of a utility service or facility.

Where the outside limits of an underground utility service have been located and staked on the ground, the Contractor shall be required to use excavation methods acceptable to the Engineer within 3 feet (90 cm) of such outside limits at such points as may be required to ensure protection from damage due to the Contractor's operations.

Should the Contractor damage or interrupt the operation of a utility service or facility by accident or otherwise, he shall immediately notify the proper authority and the Engineer and shall take all reasonable measures to prevent further damage or interruption of service. The Contractor, in such events, shall cooperate with the utility service or facility owner and the Engineer continuously until such damage has been repaired and service restored to the satisfaction of the utility or facility owner.

The Contractor shall bear all costs of damage and restoration of service to any utility service or facility due to his/her operations whether or not due to negligence or accident. The contract owner reserves the right to deduct such costs from any monies due or which may become due the Contractor or his/her surety.

70-1.16 FURNISHING RIGHTS-OF-WAY
The owner will be responsible for furnishing all rights-of-way upon which the work is to be constructed in advance of the Contractor's operations.

70-1.17 PERSONAL LIABILITY OF PUBLIC OFFICIALS
In carrying out any of the contract provisions or in exercising any power or authority granted to him by this contract, there shall be no liability upon the Engineer, his/her authorized representatives, or any officials of the owner either personally or as an official of the owner. It is understood that in such matters they act solely as agents and representatives of the owner.

70-1.18 NO WAIVER OF LEGAL RIGHTS
Upon completion of the work, the owner will expeditiously make final inspection and notify the Contractor of final acceptance. Such final acceptance, however, shall not preclude or stop the

owner from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the owner be precluded or stopped from recovering from the Contractor or his/her surety, or both, such overpayment as may be sustained, or by failure on the part of the Contractor to fulfill his/her obligations under the contract. A waiver on the part of the owner of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor, without prejudice to the terms of the contract, shall be liable to the owner for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the owner's rights under any warranty or guaranty.

70-1.19 ENVIRONMENTAL PROTECTION

The Contractor shall comply with all Federal, state, and local laws and regulations controlling pollution of the environment. He shall take necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, bitumens, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

Water sprinkler trucks shall be used to prevent and control dust on haul roads and in construction areas. In the event of strong winds during earthwork operations, it may be necessary to suspend such operations until the conditions are favorable for such operation.

70-1.20 ARCHAEOLOGICAL AND HISTORICAL FINDINGS

Unless otherwise specified in this subsection, the Contractor is advised that the site of the work is not within any property, district, or site, and does not contain any building, structure, or object listed in the current National Register of Historic Places published by the United States Department of Interior.

Should the Contractor encounter, during his/her operations, any building, part of a building, structure, or object which is incongruous with its surroundings, he shall immediately cease operations in that location and notify the Engineer. The Engineer will immediately investigate the Contractor's finding and will direct the Contractor to either resume his/her operations or to suspend operations as directed.

Should the Engineer order suspension of the Contractor's operations in order to protect an archaeological or historical finding, or order the Contractor to perform extra work, such shall be covered by an appropriate contract modification (change order or supplemental agreement) as provided in the subsection titled EXTRA WORK of Section 40 and the subsection titled PAYMENT FOR EXTRA WORK AND FORCE ACCOUNT WORK of Section 90. If appropriate, the contract modification shall include an extension of contract time in accordance with the subsection titled DETERMINATION AND EXTENSION OF CONTRACT TIME of Section 80.

END OF SECTION 70

SECTION 80

PROSECUTION AND PROGRESS

80-1.1 SUBLETTING OF CONTRACT

The owner will not recognize any subcontractor on the work. The Contractor shall at all times when work is in progress be represented either in person, by a qualified superintendent, or by other designated, qualified representative who is duly authorized to receive and execute orders of the Engineer.

Should the Contractor elect to assign his/her contract, said assignment shall concur by the surety, shall be presented for the consideration and approval of the owner, and shall be consummated only on the written approval of the owner. In case of approval, the Contractor shall file copies of all subcontracts with the Engineer.

80-1.2 NOTICE TO PROCEED

The notice to proceed shall state the date on which it is expected the Contractor will begin the construction and from which date contract time will be charged. The Contractor shall begin the work to be performed under the contract within 10 days of the date set by the Engineer in the written notice to proceed, but in any event, the Contractor shall notify the Engineer at least 24 hours in advance of the time actual construction operations will begin.

80-1.3 PROSECUTION AND PROGRESS

Unless otherwise specified, the Contractor shall submit his/her progress schedule for the Engineer's approval within 10 days after the effective date of the notice to proceed. The Contractor's progress schedule, when approved by the Engineer, may be used to establish major construction operations and to check on the progress of the work. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the plans and specifications within the time set forth in the proposal.

If the Contractor falls significantly behind the submitted schedule, the Contractor shall, upon the Engineer's request, submit a revised schedule for completion of the work within the contract time and modify his/her operations to provide such additional materials, equipment, and labor necessary to meet the revised schedule. Should the prosecution of the work be discontinued for any reason, the Contractor shall notify the Engineer at least 24 hours in advance of resuming operations.

For AIP contracts, the Contractor shall not commence any actual construction prior to the date on which the notice to proceed is issued by the owner.

80-1.4 LIMITATION OF OPERATIONS

The Contractor shall control his/her operations and the operations of his/her subcontractors and all suppliers so as to provide for the free and unobstructed movement of aircraft in the AIR OPERATIONS AREAS of the airport.

When the work requires the Contractor to conduct his/her operations within an AIR OPERATIONS AREA of the airport, the work shall be coordinated with airport management (through the Engineer) at least 48 hours prior to commencement of such work. The Contractor shall not close an AIR OPERATIONS AREA until so authorized by the Engineer and until the necessary temporary marking and associated lighting is in place as provided

in the subsection titled BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS of Section 70.

When the contract work requires the Contractor to work within an AIR OPERATIONS AREA of the airport on an intermittent basis (intermittent opening and closing of the AIR OPERATIONS AREA), the Contractor shall maintain constant communications as hereinafter specified; immediately obey all instructions to vacate the AIR OPERATIONS AREA; immediately obey all instructions to resume work in such AIR OPERATIONS AREA. Failure to maintain the specified communications or to obey instructions shall be cause for suspension of the Contractor's operations in the AIR OPERATIONS AREA until the satisfactory conditions are provided. The AIR OPERATIONS AREA (AOA) cannot be closed to operating aircraft to permit the Contractor's operations on a continuous basis and will therefore be closed to aircraft operations intermittently as approved in writing by the Airport Operations Staff.

80-1.5 CHARACTER OF WORKERS, METHODS, AND EQUIPMENT

The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the work to full completion in the manner and time required by the contract, plans, and specifications.

All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily.

All equipment which is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the work shall be such that no injury to previously completed work, adjacent property, or existing airport facilities will result from its use.

When the methods and equipment to be used by the Contractor in accomplishing the work are not prescribed in the contract, the Contractor is free to use any methods or equipment that will accomplish the work in conformity with the requirements of the contract, plans, and specifications.

When the contract specifies the use of certain methods and equipment, such methods and equipment shall be used unless others are authorized by the Engineer. If the Contractor desires to use a method or type of equipment other than specified in the contract, he may request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing work in conformity with contract requirements. If, after trial use of the substituted methods or equipment, the Engineer determines that the work produced does not meet contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality, or take such other corrective action as the Engineer may direct. No change will be made in basis of payment for the contract items involved nor in contract time as a result of authorizing a change in methods or equipment under this subsection.

80-1.6 TEMPORARY SUSPENSION OF THE WORK

The Engineer shall have the authority to suspend the work wholly, or in part, for such period or

periods as he may deem necessary, due to unsuitable weather, or such other conditions as are considered unfavorable for the prosecution of the work, or for such time as is necessary due to the failure on the part of the Contractor to carry out orders given or perform any or all provisions of the contract.

In the event that the Contractor is ordered by the Engineer, in writing, to suspend work for some unforeseen cause not otherwise provided for in the contract and over which the Contractor has no control, the Contractor may be reimbursed for actual money expended on the work during the period of shutdown. No allowance will be made for anticipated profits. The period of shutdown shall be computed from the effective date of the Engineer's order to suspend work to the effective date of the Engineer's order to resume the work. Claims for such compensation shall be filed with the Engineer within the time period stated in the Engineer's order to resume work. The Contractor shall submit with his/her claim information substantiating the amount shown on the claim. The Engineer will forward the Contractor's claim to the owner for consideration in accordance with local laws or ordinances. No provision of this article shall be construed as entitling the Contractor to compensation for delays due to inclement weather, for suspensions made at the request of the Contractor, or for any other delay provided for in the contract, plans, or specifications.

If it should become necessary to suspend work for an indefinite period, the Contractor shall store all materials in such manner that they will not become an obstruction nor become damaged in any way. He shall take every precaution to prevent damage or deterioration of the work performed and provide for normal drainage of the work. The Contractor shall erect temporary structures where necessary to provide for traffic on, to, or from the airport.

80-1.7 DETERMINATION AND EXTENSION OF CONTRACT TIME

The number of calendar or working days allowed for completion of the work shall be stated in the proposal and contract and shall be known as the CONTRACT TIME.

Should the contract time require extension for reasons beyond the Contractor's control, it shall be adjusted as follows:

CONTRACT TIME based on WORKING DAYS shall be calculated weekly by the Engineer. The Engineer will furnish the Contractor a copy of his/her weekly statement of the number of working days charged against the contract time during the week and the number of working days currently specified for completion of the contract (the original contract time plus the number of working days, if any, that have been included in approved CHANGE ORDERS or SUPPLEMENTAL AGREEMENTS covering EXTRA WORK).

The Engineer shall base his/her weekly statement of contract time charged on the following considerations:

1. No time shall be charged for days on which the Contractor is unable to proceed with the principal item of work under construction at the time for at least 6 hours with the normal work force employed on such principal item. Should the normal work force be on a double-shift, 12 hours shall be used. Should the normal work force be on a triple-shift, 18 hours shall apply. Conditions beyond the Contractor's control such as strikes, lockouts, unusual delays in transportation, temporary suspension of the principal item of work under construction or temporary suspension of the entire work

which have been ordered by the Engineer for reasons not the fault of the Contractor, shall not be charged against the contract time.

2. The Engineer will not make charges against the contract time prior to the effective date of the notice to proceed.

3. The Engineer will begin charges against the contract time on the first working day after the effective date of the notice to proceed.

4. The Engineer will not make charges against the contract time after the date of final acceptance as defined in the subsection titled FINAL ACCEPTANCE of Section 50.

5. The Contractor will be allowed 1 week in which to file a written protest setting forth his/her objections to the Engineer's weekly statement. If no objection is filed within such specified time, the weekly statement shall be considered as acceptable to the Contractor.

The contract time (stated in the proposal) is based on the originally estimated quantities as described in the subsection titled INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES of Section 20. Should the satisfactory completion of the contract require performance of work in greater quantities than those estimated in the proposal, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in contract time shall not consider either the cost of work or the extension of contract time that has been covered by change order or supplemental agreement and shall be made at the time of final payment.

a) CONTRACT TIME based on CALENDAR DAYS shall consist of the number of calendar days stated in the contract counting from the effective date of the notice to proceed and including all Saturdays, Sundays, holidays, and non-work days. All calendar days elapsing between the effective dates of the Engineer's orders to suspend and resume all work, due to causes not the fault of the Contractor, shall be excluded.

At the time of final payment, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in the contract time shall not consider either cost of work or the extension of contract time that has been covered by a change order or supplemental agreement. Charges against the contract time will cease as of the date of final acceptance.

b) When the contract time is a specified completion date, it shall be the date on which all contract work shall be substantially completed.

If the Contractor finds it impossible for reasons beyond his/her control to complete the work within the contract time as specified, or as extended in accordance with the provisions of this subsection, he may, at any time prior to the expiration of the contract time as extended, make a written request to the Engineer for an extension of time setting forth the reasons which he believes will justify the granting of his/her request. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the Engineer finds that the work was delayed because of conditions beyond the control and without the fault of the Contractor, he may extend the time for completion

in such amount as the conditions justify. The extended time for completion shall then be in full force and effect, the same as though it were the original time for completion.

80-1.8 FAILURE TO COMPLETE ON TIME

For each calendar day or working day, as specified in the contract, that any work remains uncompleted after the contract time (including all extensions and adjustments as provided in the subsection titled DETERMINATION AND EXTENSION OF CONTRACT TIME of this Section) the sum specified in the contract and proposal as liquidated damages will be deducted from any money due or to become due the Contractor or his/her surety. Such deducted sums shall not be deducted as a penalty but shall be considered as liquidation of a reasonable portion of damages that will be incurred by the owner should the Contractor fail to complete the work in the time provided in his/her contract.

Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, will in no way operate as a wavier on the part of the owner of any of its rights under the contract.

80-1.9 DEFAULT AND TERMINATION OF CONTRACT

The Contractor shall be considered in default of his/her contract and such default will be considered as cause for the owner to terminate the contract for any of the following reasons if the Contractor:

a. Fails to begin the work under the contract within the time specified in the “Notice to Proceed,” or

b. Fails to perform the work or fails to provide sufficient workers, equipment or materials to assure completion of work in accordance with the terms of the contract, or

c. Performs the work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable, or

d. Discontinues the prosecution of the work, or

e. Fails to resume work which has been discontinued within a reasonable time after notice to do so, or

f. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency, or

g. Allows any final judgment to stand against him unsatisfied for a period of 10 days, or

h. Makes an assignment for the benefit of creditors, or

i. For any other cause whatsoever, fails to carry on the work in an acceptable manner.

Should the Engineer consider the Contractor in default of the contract for any reason hereinbefore, he shall immediately give written notice to the Contractor and the Contractor’s surety as to the reasons for considering the Contractor in default and the owner’s intentions to terminate the contract.

If the Contractor or surety, within a period of 10 days after such notice, does not proceed in accordance therewith, then the owner will, upon written notification from the Engineer of the facts of such delay, neglect, or default and the Contractor’s failure to comply with such

notice, have full power and authority without violating the contract, to take the prosecution of the work out of the hands of the Contractor. The owner may appropriate or use any or all materials and equipment that have been mobilized for use in the work and are acceptable and may enter into an agreement for the completion of said contract according to the terms and provisions thereof, or use such other methods as in the opinion of the Engineer will be required for the completion of said contract in an acceptable manner.

All costs and charges incurred by the owner, together with the cost of completing the work under contract, will be deducted from any monies due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the contract, then the Contractor and the surety shall be liable and shall pay to the owner the amount of such excess.

80-1.10 TERMINATION FOR NATIONAL EMERGENCIES

The owner shall terminate the contract or portion thereof by written notice when the Contractor is prevented from proceeding with the construction contract as a direct result of an Executive Order of the President with respect to the prosecution of war or in the interest of national defense.

When the contract, or any portion thereof, is terminated before completion of all items of work in the contract, payment will be made for the actual number of units or items of work completed at the contract price or as mutually agreed for items of work partially completed or not started. No claims or loss of anticipated profits shall be considered.

Reimbursement for organization of the work, and other overhead expenses, (when not otherwise included in the contract) and moving equipment and materials to and from the job will be considered, the intent being that an equitable settlement will be made with the Contractor.

Acceptable materials, obtained or ordered by the Contractor for the work and that are not incorporated in the work shall, at the option of the Contractor, be purchased from the Contractor at actual cost as shown by receipted bills and actual cost records at such points of delivery as may be designated by the Engineer.

Termination of the contract or a portion thereof shall neither relieve the Contractor of his/her responsibilities for the completed work nor shall it relieve his/her surety of its obligation for and concerning any just claim arising out of the work performed.

END OF SECTION 80

SECTION 90

MEASUREMENT AND PAYMENT

90-1.1 MEASUREMENT OF QUANTITIES

All work completed under the contract will be measured by the Engineer, or his/her authorized representatives, using United States Customary Units of Measurement or the International System of Units.

The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures (or leave-outs) having an area of 9 square feet (0.8 square meter) or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the plans or ordered in writing by the Engineer.

Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions.

Unless otherwise specified, all contract items which are measured by the linear foot such as electrical ducts, conduits, pipe culverts, under drains, and similar items shall be measured parallel to the base or foundation upon which such items are placed.

In computing volumes of excavation the average end area method or other acceptable methods will be used.

The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fraction of inches.

The term “ton” will mean the short ton consisting of 2,000 lb (907 kg) avoirdupois. All materials which are measured or proportioned by weights shall be weighed on accurate, approved scales by competent, qualified personnel at locations designated by the Engineer. If material is shipped by rail, the car weight may be accepted provided that only the actual weight of material is paid for. However, car weights will not be acceptable for material to be passed through mixing plants. Trucks used to haul material being paid for by weight shall be weighed empty daily at such times as the Engineer directs, and each truck shall bear a plainly legible identification mark.

Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable to the Engineer, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.

When requested by the Contractor and approved by the Engineer in writing, material specified to

be measured by the cubic yard may be weighed, and such weights will be converted to cubic yards for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Engineer and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

Bituminous materials will be measured by the gallon or ton, unless otherwise specified in contract documents. When measured by volume, such volumes will be measured at 60 F or will be corrected to the volume at 60 F using ASTM D 1250 for asphalts or ASTM D 633 for tars.

Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when bituminous material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work.

When bituminous materials are shipped by truck or transport, net certified weights by volume, subject to correction for loss or foaming, may be used for computing quantities.

Cement will be measured by the ton or hundredweight.

Timber will be measured by the thousand feet board measure (M.F.B.M.) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.

The term “lump sum” when used as an item of payment will mean complete payment for the work described in the contract.

When a complete structure or structural unit (in effect, “lump sum” work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

Rental of equipment will be measured by time in hours of actual working time and necessary traveling time of the equipment within the limits of the work. Special equipment ordered by the Engineer in connection with force account work will be measured as agreed in the change order or supplemental agreement authorizing such force account work as provided in the subsection titled PAYMENT FOR EXTRA AND FORCE ACCOUNT WORK of this section.

When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gage, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected, and maintained by the Contractor, or be certified permanently installed commercial scales.

Scales shall be accurate within one-half percent of the correct weight throughout the range of use. The Contractor shall have the scales checked under the observation of the inspector before beginning work and at such other times as requested. The intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed one-tenth of 1 percent of the nominal rated capacity of the scale, but not less than 1 pound. The use of spring balances will not be permitted.

Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and the inspector can safely and conveniently view them.

Scale installations shall have available ten standard 50-pound weights for testing the weighing equipment or suitable weights and devices for other approved equipment.

Scales must be tested for accuracy and serviced before use at a new site. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end.

Scales “overweighing” (indicating more than correct weight) will not be permitted to operate, and all materials received subsequent to the last previous correct weighting-accuracy test will be reduced by the percentage of error in excess of one-half of 1 percent.

In the event inspection reveals the scales have been “under weighing” (indicating less than correct weight), they shall be adjusted, and no additional payment to the Contractor will be allowed for materials previously weighed and recorded.

All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other items specified in this subsection, for the weighing of materials for proportioning or payment, shall be included in the unit contract prices for the various items of the project.

When the estimated quantities for a specific portion of the work are designated as the pay quantities in the contract, they shall be the final quantities for which payment for such specific portion of the work will be made, unless the dimensions of said portions of the work shown on the plans are revised by the Engineer. If revised dimensions result in an increase or decrease in the quantities of such work, the final quantities for payment will be revised in the amount represented by the authorized changes in the dimensions.

90-1.2 SCOPE OF PAYMENT

The Contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials, for performing all work under the contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the prosecution thereof, subject to the provisions of the subsection titled NO WAIVER OF LEGAL RIGHTS of Section 70.

When the “basis of payment” subsection of a technical specification requires that the contract price (price bid) include compensation for certain work or material essential to the item, this same work or material will not also be measured for payment under any other contract item which may appear elsewhere in the contract, plans, or specifications.

90-1.3 COMPENSATION FOR ALTERED QUANTITIES

When the accepted quantities of work vary from the quantities in the proposal, the Contractor shall accept as payment in full, so far as contract items are concerned, payment at the original contract price for the accepted quantities of work actually completed and accepted. No allowance, except as provided for in the subsection titled ALTERATION OF WORK AND QUANTITIES of Section 40 will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor which results directly from such alterations or indirectly from his/her unbalanced allocation of overhead and profit among the contract items, or from any other cause.

90-1.4 PAYMENT FOR OMITTED ITEMS
As specified in the subsection titled OMITTED ITEMS of Section 40, the Engineer shall have the right to omit from the work (order nonperformance) any contract item, except major contract items, in the best interest of the owner.

Should the Engineer omit or order nonperformance of a contract item or portion of such item from the work, the Contractor shall accept payment in full at the contract prices for any work actually completed and acceptable prior to the Engineer's order to omit or non-perform such contract item.

Acceptable materials ordered by the Contractor or delivered on the work prior to the date of the Engineer's order will be paid for at the actual cost to the Contractor and shall thereupon become the property of the owner.

In addition to the reimbursement hereinbefore provided, the Contractor shall be reimbursed for all actual costs incurred for the purpose of performing the omitted contract item prior to the date of the Engineer's order. Such additional costs incurred by the Contractor must be directly related to the deleted contract item and shall be supported by certified statements by the Contractor as to the nature of the amount of such costs.

90-1.5 PAYMENT FOR EXTRA AND FORCE ACCOUNT WORK
Extra work, performed in accordance with the subsection titled EXTRA WORK of Section 40, will be paid for at the contract prices or agreed prices specified in the change order or supplemental agreement authorizing the extra work. When the change order or supplemental agreement authorizing the extra work requires that it be done by force account, such force account shall be measured and paid for based on expended labor, equipment, and materials plus a negotiated and agreed upon allowance for overhead and profit.

a. **Miscellaneous.** No additional allowance will be made for general superintendence, the use of small tools, or other costs for which no specific allowance is herein provided.

b. **Comparison of Record.** The Contractor and the Engineer shall compare records of the cost of force account work at the end of each day. Agreement shall be indicated by signature of the Contractor and the Engineer or their duly authorized representatives.

c. **Statement.** No payment will be made for work performed on a force account basis until the Contractor has furnished the Engineer with duplicate itemized statements of the cost of such force account work detailed as follows:

    (1) Name, classification, date, daily hours, total hours, rate and extension for each laborer and foreman.

    (2) Designation, dates, daily hours, total hours, rental rate, and extension for each unit of machinery and equipment.

    (3) Quantities of materials, prices, and extensions.

    (4) Transportation of materials.

(5) Cost of property damage, liability and workman's compensation insurance premiums, unemployment insurance contributions, and social security tax.

Statements shall be accompanied and supported by a receipted invoice for all materials used and transportation charges. However, if materials used on the force account work are not specifically purchased for such work but are taken from the Contractor's stock, then in lieu of the invoices the Contractor shall furnish an affidavit certifying that such materials were taken from his/her stock, that the quantity claimed was actually used, and that the price and transportation claimed represent the actual cost to the Contractor.

90-1.6 PARTIAL PAYMENTS

Partial payments will be made at least once each month as the work progresses. Said payments will be based upon estimates prepared by the Engineer of the value of the work performed and materials complete in place in accordance with the contract, plans, and specifications. Such partial payments may also include the delivered actual cost of those materials stockpiled and stored in accordance with the subsection titled PAYMENT FOR MATERIALS ON HAND of this section.

No partial payment will be made when the amount due the Contractor since the last estimate amounts to less than five hundred dollars.

The Contractor is required to pay all subcontractors for satisfactory performance of their contracts no later than 30 days after the Contractor has received a partial payment. The Owner must ensure prompt and full payment of retainage from the prime contractor to the subcontractor within 30 days after the subcontractor's work is satisfactorily completed. A subcontractor's work is satisfactorily completed when all the tasks called for in the subcontract have been accomplished and documented as required by the Owner. When the Owner has made an incremental acceptance of a portion of a prime contract, the work of a subcontractor covered by that acceptance is deemed to be satisfactorily completed.

From the total of the amount determined to be payable on a partial payment, 10 percent percent of such total amount will be deducted and retained by the Owner until the final payment is made, except as may be provided (at the Contractor's option) in the subsection titled PAYMENT OF WITHHELD FUNDS of this section. The balance (90 percent) of the amount payable, less all previous payments, shall be certified for payment. Should the Contractor exercise his/her option, as provided in the subsection titled PAYMENT OF WITHHELD FUNDS of this section, no such percent retainage shall be deducted.

When at least 95 percent of the work has been completed, the Engineer shall, at the Owner's discretion and with the consent of the surety, prepare estimates of both the contract value and the cost of the remaining work to be done.

The Owner may retain an amount not less than twice the contract value or estimated cost, whichever is greater, of the work remaining to be done. The remainder, less all previous payments and deductions, will then be certified for payment to the Contractor.

When not less than 95 percent of the work has been completed the Engineer may, at his/her discretion and with the consent of the surety, prepare an estimate from which will be retained an amount not less than twice the contract value or estimated cost, whichever is greater, of the work remaining to be done. The remainder, less all previous payments and

deductions, will then be certified for payment to the Contractor.

It is understood and agreed that the Contractor shall not be entitled to demand or receive partial payment based on quantities of work in excess of those provided in the proposal or covered by approved change orders or supplemental agreements, except when such excess quantities have been determined by the Engineer to be a part of the final quantity for the item of work in question.

No partial payment shall bind the owner to the acceptance of any materials or work in place as to quality or quantity. All partial payments are subject to correction at the time of final payment as provided in the subsection titled ACCEPTANCE AND FINAL PAYMENT of this section.

The Contractor shall deliver to the Owner a complete release of all claims for labor and material arising out of this contract before the final payment is made (the Contractor shall use the attached forms). If any subcontractor or supplier fails to furnish such a release in full, the Contractor may furnish a bond or other collateral satisfactory to the Owner to indemnify the Owner against any potential lien or other such claim. The bond or collateral shall include all costs, expenses, and attorney fees the Owner may be compelled to pay in discharging any such lien or claim.

90-1.7 PAYMENT FOR MATERIALS ON HAND

Partial payments may be made to the extent of the delivered cost of materials to be incorporated in the work, provided that such materials meet the requirements of the contract, plans, and specifications and are delivered to acceptable sites on the airport property or at other sites in the vicinity that are acceptable to the owner. Such delivered costs of stored or stockpiled materials may be included in the next partial payment after the following conditions are met:

a) The material has been stored or stockpiled in a manner acceptable to the Engineer at or on an approved site.

b) The Contractor has furnished the Engineer with acceptable evidence of the quantity and quality of such stored or stockpiled materials.

c) The Contractor has furnished the Engineer with satisfactory evidence that the material and transportation costs have been paid.

d) The Contractor has furnished the owner legal title (free of liens or encumbrances of any kind) to the material so stored or stockpiled.

e) The Contractor has furnished the owner evidence that the material so stored or stockpiled is insured against loss by damage to or disappearance of such materials at any time prior to use in the work.

It is understood and agreed that the transfer of title and the owner's payment for such stored or stockpiled materials shall in no way relieve the Contractor of his/her responsibility for furnishing and placing such materials in accordance with the requirements of the contract, plans, and specifications.

In no case will the amount of partial payments for materials on hand exceed the contract price for such materials or the contract price for the contract item in which the material is intended to be

used.

No partial payment will be made for stored or stockpiled living or perishable plant materials.

The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this subsection.

90-1.8 PAYMENT OF WITHHELD FUNDS

At the Contractor's option, if an Owner withholds retainage in accordance with the methods described in subsection 90-06 PARTIAL PAYMENTS, the Contractor may request that the Owner deposit the retainage into an escrow account. The Owner's deposit of retainage into an escrow account is subject to the following conditions:

a) The Contractor shall bear all expenses of establishing and maintaining an escrow account and escrow agreement acceptable to the Owner.

b) The Contractor shall deposit to and maintain in such escrow only those securities or bank certificates of deposit as are acceptable to the Owner and having a value not less than the retainage that would otherwise be withheld from partial payment.

c) The Contractor shall enter into an escrow agreement satisfactory to the Owner.

d) The Contractor shall obtain the written consent of the surety to such agreement.

90-1.9 ACCEPTANCE AND FINAL PAYMENT

When the contract work has been accepted in accordance with the requirements of the subsection titled FINAL ACCEPTANCE of Section 50, the Engineer will prepare the final estimate of the items of work actually performed. The Contractor shall approve the Engineer's final estimate or advise the Engineer of his/her objections to the final estimate which are based on disputes in measurements or computations of the final quantities to be paid under the contract as amended by change order or supplemental agreement. The Contractor and the Engineer shall resolve all disputes (if any) in the measurement and computation of final quantities to be paid within 30 calendar days of the Contractor's receipt of the Engineer's final estimate. If, after such 30-day period, a dispute still exists, the Contractor may approve the Engineer's estimate under protest of the quantities in dispute, and such disputed quantities shall be considered by the owner as a claim in accordance with the subsection titled CLAIMS FOR ADJUSTMENT AND DISPUTES of Section 50.

After the Contractor has approved, or approved under protest, the Engineer's final estimate, final payment will be processed based on the entire sum, or the undisputed sum in case of approval under protest, determined to be due the Contractor less all previous payments and all amounts to be deducted under the provisions of the contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

If the Contractor has filed a claim for additional compensation under the provisions of the subsection titled CLAIMS FOR ADJUSTMENTS AND DISPUTES of Section 50 or under the provisions of this subsection, such claims will be considered by the owner in accordance with local laws or ordinances. Upon final adjudication of such claims, any additional payment determined to be due the Contractor will be paid pursuant to a supplemental final estimate.

END OF SECTION 90

END OF GENERAL PROVISIONS

SECTION III-B

TECHNICAL SPECIAL PROVISION SPECIFICATIONS

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SECTION III-B

TECHNICAL SPECIAL PROVISION SPECIFICATIONS

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TECHNICAL SPECIAL PROVISION SPECIFICATIONS

1. TRAFFIC CONTROL REGULATIONS

General. All traffic and/or traffic control devices on this project shall be provided, maintained and/or controlled by the Contractor, as specified in the City of Phoenix *Traffic Barricade Manual*, 2017 edition, with revisions as shown below:

a. The following shall be considered major streets:
- Deer Valley Road;
- 19th Avenue;
- Williams Drive.
- Pinnacle Peak Road

b. Permission to restrict City streets, sidewalks and alleys using Temporary Restrictions and Closures (TRACS) permits shall be requested as specified in the *Traffic Barricade Manual*, 2017 edition.

c. Unless otherwise provided in Special Provision Item 41, "Airport Safety and Security (M-003)", all traffic on this project shall be regulated as specified in the *Traffic Barricade Manual*, 2017 edition.

d. No deviation to Special Provision Item 41, "Airport Safety and Security (M-003)" will be allowed or implemented unless submitted to the City for review and approval one (1) week prior to the proposed work.

e. Off peak hours at Deer Valley Airport are from 11:00PM to 5:00AM for lane restrictions.

f. No complete road closures are allowed.

g. The Contractor shall submit for each construction phase, a Landside Traffic Control Plan containing traffic control drawings with barricade layouts to the City for approval. This submittal must be transmitted to the City a minimum of one (1) week prior to instituting the particular Traffic Control Plan.

Measurement and Payment. No Separate measurement for payment will be made for this item. Measurement and payment for this item is considered incidental to General Provision Section 105, Mobilization.

2. PLANS AND SPECIFICATIONS

The Contractor shall keep one (1) copy of the contract documents constantly accessible on the work site**.**

The City of Phoenix Supplements will govern over the MAG Standard Specifications and Details. In case of a discrepancy or conflict between these Contract Documents and the City of Phoenix Supplements or the MAG Standard Specifications and Details, the Plans will govern over both the City of Phoenix Supplements and MAG Standard Specifications and Details. The Technical Provisions and Special Provisions will govern over the City of

Phoenix Supplements and the MAG Standard Specifications and Details. The following is the precedence of the Contract Documents:

a. Technical Special Provision Specifications

b. Technical Specifications including Civil and Electrical

c. Cited Standards for Materials and Testing

d. Cited Federal Aviation Administration (FAA) Advisory Circulars

e. General Provision Specifications

f. Plans

g. City of Phoenix Supplement to MAG Standard Specifications and Details

h. MAG Uniform Standard Specifications and Details for Public Works Construction

Calculated dimensions will govern over scaled dimensions. The Contractor shall not take advantage of any apparent error or omission on the Plans or Specifications. In the event the Contractor discovers any apparent error or discrepancy, he shall immediately call upon the Engineer for his/her interpretation and decision, and such decision shall be final.

Electronic files (CAD files) are not a part of the contract documents. Information contained on CAD files may not be compatible with the coordinates, elevations, details, and dimensions shown on the Project Plans. The Contractor may be provided with CAD files, however, the Contractor shall survey and construct the project from the information shown on the Project Plans, and as specified in the Project Specifications and Contract Documents.

3. WATER

All water required for and in connection with the work to be performed shall be provided by the Contractor and at the Contractor's expense. The Contractor shall arrange for the installation of an appropriate meter and bear the cost of such installation and the cost of the water.

When the Contractor needs a temporary waterline to the staging area, he shall coordinate the temporary waterline installation with the City of Phoenix Aviation Department Inspection Staff. There shall be no separate pay item for the construction of temporary water lines. These costs shall be included in items for which direct payment is made.

Prior to the actual water line shut down, the Contractor shall follow the following sequence of events:

a. Construct all new waterlines, except for connections to existing water lines.

b. Test the new water line in accordance with MAG and the City of Phoenix

Supplemental specifications.

c. Demonstrate that all fittings and waterlines are on site available to connect the new waterline to the existing waterline.

d. Notify all customers in writing who will experience interrupted water service.

e. Notify the Fire Department of possible low pressures to firelines and satisfy Fire Department requirements.

f. Complete the connection of new proposed waterline under this Contract, to existing, with a minimum of disruption to the waterline system.

4. SECURITY FENCES AND GATES

General. All existing security fences and gates affected by the work shall be maintained by the Contractor until final completion and acceptance of the work. Existing security fence and gates that interfere with construction operations shall not be relocated or dismantled until permission is obtained from the Deer Valley Airport (DVT) Airside Operations, through the Engineer. The duration that the security fence or gate may be left relocated or dismantled shall be agreed upon.

The Contractor shall submit to the City, a Security Gate Access Plan for review prior to the work, and prior to relocation or removal of any security gates or fence. The Contractor shall restore all security fences and gates that are affected by the work, to their original or to a better condition.

Measurement and Payment. No Separate measurement for payment will be made for this item. Measurement and payment for this item is considered incidental to Special Provision Item 41, Airport Safety and Security (M-003).

5. POWER

All power for lighting, operation of Contractor’s plant or equipment, or for any other use as may be required in the execution of the work to be performed under the provisions of these contract documents shall be provided by the Contractor at his expense. Subject to the approval of the City, he may be permitted to connect to existing facilities where available, but he shall meter and bear the cost of such power.

Should electrical power not be immediately available for the Contractor's field offices, batch plant or the engineer's field offices and testing laboratories, the Contractor shall provide a generator(s) until such electrical power is available.

6. OPERATIONAL SAFETY AND MARKING

This project is within the limits of the DVT Air Operations Area, and as such, strict safety and security requirements are in effect. The Contractor’s attention is directed to the City of Phoenix, *Airport Construction Safety Manual* and the following FAA Advisory Circulars:

a. Federal Aviation Advisory Circulars.

i. Advisory Circular AC 150/5340-1M, "Standards for Airport Markings", which is incorporated into these Contract Documents by reference. The requirements of section 10 of the Advisory Circular regarding marking closed or hazardous areas shall also be adhered to.

ii. Advisory Circular AC 150/5210-5D, "Painting, Marking and Lighting of Vehicles Used on an Airport", which is incorporated into these contract documents by reference. All Contractor vehicles and equipment shall be provided with orange and white checkered flags during hours with sufficient daylight. Fully functional amber rotating beacons shall be provided during all hours of work, as described in Special Provision Item 41, Airport Safety and Security (M-003).

iii. Advisory Circular AC 150/5370-2G, "Operational Safety on Airport During Construction", which is incorporated into these Contract Documents by reference. The Special Safety requirements during construction shall be strictly observed.

b. Portable Light Plants.

i. The height, placement and orientation of light plants used during night construction will be subject to the review and approval of the City of Phoenix Aviation Department. Special care must be made to light plant position, orientation and use in order to avoid impairing both aircraft movements and the Air Traffic Control Tower (ATCT) operations.

ii. A minimum of seven (7) days prior to the start of night construction the Contractor shall submit a Construction Lighting Plan for review and approval by the Engineer. This lighting plan shall be updated and re-submitted for approval, as and when dictated by changes to the Plan during the progression of the work, or if a revised Plan is requested by the Engineer.

c. Contractor Operational Assistance.

i. The Contractor shall provide trained personnel with vehicles, to escort the Contractor employees, subcontractors, vendors, truckers and any other person who are required to perform work that allows them to have access to the secured areas of the Airport.

ii. The Contractor provided Operational Assistance shall hold security badges and attend escort training/airfield drivers training that will be conducted by Airside Operations.

iii. These Contractor operational assistance personnel shall be under the direction of the DVT Airside Operations.

d. Open Trenching Limitations.

i. Open storm drain trenches, electrical duct or conduit trenches, utility trenches or any other trench shall be limited to 500-feet accumulative in length at any time. Open trenches in the runway safety area shall be properly and completely backfilled and compacted in sufficient time before the end of the work shift.

e. Availability of Water Trucks and Vacuum Sweepers.

i. Vacuum sweepers and highway 4M water trucks shall be available and in operating condition to control dust and remove foreign object debris seven (7) days per week and 24 hours per day, including Holidays. A minimum of one (1) vacuum sweeper and one (1) 4M highway water trucks shall be operating continuously at all times the Contractor or any subcontractor is working on the project.

f. Paint Striping and Obliteration. Asbestos and lead based paint identification and/or remediation shall be performed by the City of Phoenix unless otherwise indicated by an authorized City of Phoenix representative. Prior to starting Work:

i. Paint marking trucks and obliteration by water blasting shall be on call and available to respond to the project site within twelve (12) hours.

ii. The Contractor shall fabricate aluminum stencils/templates for all surface painted numbers and letters. Upon project completion, the Contractor shall deliver to the City of Phoenix, all stencils/templates for surface painted numbers and letters. The gauge of the aluminum stencil/template shall match the gauge of the City's existing stencils/templates. Refer to Item P-620 for this requirement.

g. Barricades.

i. All barricades with flashing light and battery, as specified in Special Provision Item 41, “Airport Safety and Security (M-003)”, shall become the property of the City of Phoenix at final completion of the project.

ii. Damaged barricades, flashing lights and batteries shall be replaced with new barricades, flashing lights and batteries prior to delivery to the City of Phoenix storage facility.

Measurement and Payment. Operational Safety and Marking shall not be measured for payment under this Special Provision. All costs in relation herewith will be considered incidental to the item of work to which it pertains.

7. RECORDS

The City of Phoenix, the FAA, the Comptroller General of the United States, or any of their authorized representatives, shall be allowed access to any books, documents, papers, and records of the Contractor which are directly pertinent to the Airport Improvement Program project for the purpose of making audit, examination, excerpts, and transcriptions for a period of three (3) years following completion of the work.

8. SOIL CONDITIONS

The Geotechnical Investigation Report and Laboratory Analysis for this project was prepared by Hoque & Associates, Inc., dated October 20th, 2023. The report contains existing pavement thickness summaries, laboratory test summaries along with asphalt core data and graphical bore logs, subgrade treatment recommendations, and new pavement design options.

This report provided a pre-design analysis on existing pavement thickness and subsurface soil conditions, and this information is shown on the plans. However, this information shall not be used for contractual purposes as a warranty of interpreted subsurface conditions such as those indicated by borings, corings, cross sections or discussion of the subsurface conditions contained in the reports. The Geotechnical services were provided, the findings obtained and recommendations were prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

9. SHOP DRAWINGS AND SUBMITTALS

The Contractor shall submit through Unifier®, all submittals including shop drawings, working drawings or supplementary drawings to the Engineer for review for general conformance in accordance with MAG 105.2 and as modified herein. Each submittal shall be numbered sequentially and shall be submitted as to cause no delay in the work.

A partial list of submittals has been provided below, and it is intended to provide the Contractor with the minimum of required submittals. This list may not be complete, and it may be revised from time to time as the project progresses. Additional submittals may be required throughout the duration of the project at the discretion of the Engineer.

The date when the Contractor provides the submittal(s) to the Engineer shall be included in the Contractor's schedule using a distinct schedule activity ID number for each submittal. All submittals shall have assigned due dates. Due dates shall correspond with the approved CPM schedule start dates for related activities allowing a minimum of fifteen (15) calendar days, or otherwise specified in the Technical Specifications, for the Engineer's review as well as adequate time for fabrication and delivery of the material. The Engineer and the City of Phoenix shall not be held responsible for late or inadequate submittals provided by the Contractor. Failure to submit by the submittal date may result in withholding of payment either in part or in full until the submittals are received. Materials shall not be incorporated into the work without the submittal reviewed, or the material certification reviewed by the City of Phoenix Materials Laboratory.

Submittal Number	Submittal Description
1.	Dust control plan (Civil Technical Specification Item P-156)*
2.	Preliminary CPM Contractor's construction schedule
3.	A schedule of values
4.	Revisions to the CPM construction schedule and monthly report
5.	Certification that the control points set by the Engineer are acceptable and adequate to allow for construction staking (Special Provision Item SP-30)
6.	A detailed lighting plan for night work (Special Provision Item 41)*
7.	Contractor's emergency names and phone number list (Special Provision Item 41)*
8.	Request for taxiway closing, 72-hours advance written notice (Special Provision Item 41)
9.	A detailed work plan for each phase and sub-phase of construction (Special Provision Item 41)
10.	An airside barricade plan and traffic control plan (Special Provision Item 41).
11.	A security badge control plan (Special Provision Item 41)*
12.	A list designating those portions of the work to be performed by subcontractor's and the Contractor's own forces (City of Phoenix Requirement)
13.	Video tape and written report of the conditions of existing facilities, documenting the results of the inspection performed prior to the start of the work (Special Provision Item SP-10)
14.	A list of subcontractors and material suppliers with an experience statement (City of Phoenix Requirement)
15.	Written safety and security program for the work (City of Phoenix Requirement)
16.	Copy of all executed subcontracts, including material suppliers (to be submitted before any subcontractor or material supplier begins work)
17.	A list of proposed construction equipment (FAA Requirement)
18.	Certification from the Contractor's registered land surveyor or professional Engineer that the primary control established are acceptable and adequate to allow the Contractor's construction staking to meet the accuracy requirements of the specifications
19.	Duplicate original certified payroll reports and statement of compliance, with sworn affidavits from the Contractor (Special Provision Specification, and to be submitted weekly)
20.	Three (3) week look ahead project schedule at weekly construction meetings (Special Provision Specifications)
21.	A landside barricade plan and traffic control plan for each phase of construction (Special Provision Specifications)
22.	Security gate access plan (Special Provision Specifications)
23.	Contractor's quality control plan, to be submitted 5-days prior to the pre-construction conference (General Provision Specifications)
24.	Contractor's quality control records, including daily inspection reports and daily test reports, to be submitted daily (General Provision Specifications)
25.	Temporary fencing plan for Contractor's staging area (Special Provision Item 41)
26.	Controlled low strength material (CLSM) mix design with test data (Civil Technical Specification P-153)
27.	Storm water pollution prevention plan, including certification of compliance Form* (Civil Technical Specification Item P-156)
28.	Storm water pollution prevention plan notice of intent.* (Civil Technical Specification Item P-156)
29.	Storm water pollution prevention plan inspection and maintenance reports, monthly

submission required, or when precipitation exceeds 0.5-inches (Civil Technical Specification Item P-156)
30. Storm water pollution prevention plan notice of termination (Civil Technical Specification Item P-156)
31. Material gradation, fractured face(s), percentage of wear, Atterberg Limits, and sodium sulfate soundness loss for crushed aggregate base course (Civil Technical Specification Item P-209)
32. A letter of certification for Portland cement concrete pavement curing compound(s), together with a material safety data sheet(s) (Civil Technical Specification Item P-610)
33. Certification of compliance for bituminous tack coat (Civil Technical Specification Item P-603)
34. Structural Portland cement concrete mix design(s) (Civil Technical Specification Item P-610)
35. A letter of certification for any admixture used in structural Portland cement concrete (Civil technical specification Item P-610)
36. Manufacturer's certified test reports for all paint shipped to the project (Civil Technical Specification Item P-620)
37. A letter of compliance for the rubber gasket reinforced concrete D-load pipe (Civil Technical Specification Item D-701)
38. Gradation and physical requirements for the pipe bedding (Civil Technical Specification Item D-701)
39. Shop drawings for junction structures, manholes and catch basins (Civil Technical Specification Item D-751)
40. MAG concrete mix design(s) (MAG Standard Specifications)
41. A new copy of the sealed and certified weighing and metering devices used for the purpose of proportioning Portland cement, sealed and certified as to accuracy and tolerance prescribed by the weights and measures division of the state of Arizona
42. Shop drawings and material lists of manufacture's brochures containing complete dimensional and performance characteristics, installation and operation instructions, etc. for each item, the FAA specification number, the manufactures name, the manufactures catalog number, and the size, type and/or rating of each item used on the project
43. Pre-testing results for all cable on the reel prior to installation per FAA-C-1217, Section 5.3 and FAA-C-1391, Section 4.
44. Pre-testing results for all cable installed on the project per FAA-C-1217, Section 5.3 and FAA-C-1391, Section 4
45. Encased and direct bury conduit (Electrical Technical Specification Item L-110)
46. Manufacturers' certifications for Conduit fittings, and Conduit carrier fittings
47. Shop drawings shall be submitted showing the installation requirements, such as the foundation size, anchor bolt location, etc. and sign assembly, including all fabrication assembly and internal and external wiring diagrams; and tabulation of total volt-ampere (VA) for each light
48. Manufacturers' statement of warrantee for each item used on the project
49. Materials list shall be submitted listing each specification paragraph number and stating whether the materials proposed are as specified or are substitutions
50. Contractor's affidavit regarding settlement of claims (Project Close out Requirement)
51. Submit a disadvantaged business enterprise (DBE) utilization percent obtained for the project (Project Close out Requirement)
52. Original affidavit acknowledging that all subcontractors, material suppliers, payrolls, bills for materials and equipment, and other indebtedness connected with the work have been paid or otherwise satisfied (Project Close out Requirement)
53. A written consent of the surety to final payment (Project Close out Requirement)
54. Record drawings with a written certification that the drawings are accurate and complete, due

at substantial completion (Project Close out Requirement)

55. An Original, with Notary Signature, Full and Final Release and Waiver on Liens from the Contractor and for each subcontractor and material supplier that documents that they have been paid in full (Project Close out Requirement)
56. A lien release documenting that all subcontractors and material suppliers have been paid for the previous months work (Project Close out Requirement)
57. Certificate of final completion (Project Close out Requirement)
58. Written warrantee, due at final completion (Project Close out Requirement)
59. Information contained in the submittals shall be submitted in Acrobat Reader PDF format and uploaded to Unifer®. Cut sheets, shop drawings, and pages from suppliers catalogs must also be furnished in electronic format as indicated above (Special Provision Item SP-9)

* Indicates that the submittal or shop drawing is due at the pre-construction conference.

The Contractor shall submit a detailed listing of all submittals (e.g., mix designs, material certifications) and shop drawings as required by the Civil and Electrical Technical Specifications and elsewhere in these contract documents. The listing can be developed in a spreadsheet format and shall include:

a. Specification item number

b. Item description

c. Description of submittal

d. Specification paragraph requiring submittal, and

e. Scheduled date of submittal to be returned to Contractor

The Contractor shall certify each submittal and shop drawing by providing an original signed and dated letter to the City, that he has reviewed and approved the submittal and that it conforms to the requirements of the contract documents.

If this original certification is not included, the submittal and/or shop drawing will be returned without any action by the City. At the time of each submittal, the Contractor shall define and delineate in writing on the certification, any deviations from the contract documents.

The City's review will be only for general conformance with the design concept of the work and for compliance with the information contained in the contract documents. The review of a specified item, as such, will not indicate review of the assembly in which the item functions. Review by the City will not relieve the Contractor from responsibility for any errors or omissions in the submittal or shop drawings, nor from his responsibility for complying with the contract documents.

After all submittals and shop drawings are reviewed, the Contractor shall upload to Unifer® all the information contained in the submittal. The information shall be submitted in Acrobat Reader PDF format. Cut sheets, shop drawings, and pages from suppliers catalogs must also be furnished in electronic format as indicated above, or otherwise approved by the

City.

10. PROTECTION OF EXISTING FACILITIES

General. Prior to the start of the construction, periodically as requested, and at the completion of the project, a representative of the Aviation Department and the Contractor's authorized representative will inspect the excavation and embankment areas, staging area, haul roads and job site to evaluate the condition of existing facilities. The City may videotape these inspections. The Contractor will be held responsible for any damage to existing facilities in accordance with MAG Uniform Standard Specifications Section 107.9. The Quality Control Program Administrator and the Contractor shall video tape and inspect the condition of existing facilities. The video tape and the written report shall be submitted to the Engineer, documenting the results of the inspection performed prior to the start of the work.

Measurement and Payment. No separate measurement or payment will be made for Protection of Existing Facilities. This work shall be considered as a subsidiary obligation of the Contractor and covered under the other contract items.

11. PROJECT FIELD OFFICE

General. During the performance of this Contract, the Contractor shall maintain a project field office at the Airport project site (specific site is shown on the plans) deemed as suitable by the City of Phoenix Aviation Department, that shall be the headquarters of his representative authorized to receive drawings, instructions or other communication or articles.

The Contractor shall be responsible for maintaining the offices and all facilities and equipment therein in good working condition for the full duration of the project. All utility costs shall be the responsibility of the Contractor as well as any fees for permits, cleaning services, sanitary, water, electrical and gas hookups, installation charges, etc.

Any communication given to the said representative or delivered at Contractor's office at the site of the work in his absence shall be deemed to have been delivered to the Contractor. Copies of the drawings, specifications and other Contract Documents shall be kept at Contractor's office at the site of the work and available for use at all times.

Measurement and Payment. The measurement and payment for the Project Field Office shall be by the lump sum.

Item SP-11.1 **Project Field Office** - per Lump Sum

12. TELEPHONE SERVICE

General. Contractor shall make all necessary arrangements with the telephone utility for telephones in his offices at the site and separate telephones in the office of the Engineer. The Contractor shall pay all monthly charges therefore, including long-distance calls from the office of the Engineer, not to exceed $250.00 per month.

Measurement and Payment. There shall be no separate measurement and payment for this item. The cost of this item shall be incidental to Special Provision Item SP-11.1, Project Field Office.

13. SANITARY FACILITIES

General. The Contractor shall furnish temporary sanitary facilities at the site, as provided herein, for the needs of all construction workers and others performing work or furnishing services on the project. Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least one (1) or more toilets will be furnished at each secured site, as required by the Arizona State Department of Health Services. The Contractor shall enforce the use of such sanitary facilities by all personnel at the site.

For construction phases or sub-phases where the work hours are limited and the area is to be re-opened at the end of the work shift, the Contractor shall provide mobile chemically treated facilities to be mobilized and demobilized to the work area daily.

Measurement and Payment. No separate measurement or payment will be made for Protection of Existing Facilities. This work shall be considered as a subsidiary obligation of the Contractor and covered under the other contract items.

14. PARKING

The Contractor shall provide and maintain suitable off-site parking areas outside of the Air Operations Areas for the use of all construction workers and others performing work or furnishing services in connection with the project, as required to avoid any need for parking personal vehicles where they may interfere with public traffic, aircraft and Owner's operations, or construction activities. A preliminary parking location is shown in the plans, however, the Contractor's parking area will be determined in the pre-construction conference. The Contractor shall restore all parking areas to original (pre-construction) condition, including fence, gates and ground surfaces following all construction activities.

15. CONSTRUCTION SCHEDULE

Refer to City of Phoenix specifications for project schedule requirements. There will be no work (with exception to vacuum sweeping for the clean up of foreign object debris) as described in the following:

a. The night shift on New Years Eve, all day on New Years day, the night shift on New Years day

b. The night shift prior to Labor day, all day on Labor day, the night shift on Labor day

c. The night shift prior to Memorial day, all day on Memorial day, the night shift on Memorial day

d. The night shift prior to the 4th of July, all day on the 4th of July, the night shift on the 4th of July

e. The night shift prior to Thanksgiving day, all day on Thanksgiving day, the night shift on Thanksgiving day, the Sunday day shift and the Sunday night shift following Thanksgiving

f. The night shift on Christmas Eve, all day on Christmas day, the night shift on Christmas day

The Contractor shall develop his schedule, plan his work, and provide sufficient manpower materials and equipment to complete all work within the allotted contract time utilizing five (5) day work weeks and multiple shift operations as needed.

16. DELAYS AND EXTENSIONS OF TIME

Delete MAG Section 110 and substitute the following:

a. Notice of Claim for Additional Time. Claims for additional time must be made by the Contractor per Article 6. Notice of any Contractor claims of time extension entitlement due to extra work must be included in the Contractors change order request regarding the extra work. Failure to provide the notice required by this section shall constitute a waiver of any entitlement the Contractor may otherwise have. Notices shall include: (1) the nature of the delay; (2) the critical path activities being affected; (3) the probably effect of the delay on progress of the work; (4) a description of efforts the Contractor intends to make to mitigate the delay, and; (5) a cost estimate. If the notice includes adverse weather delays, the notice shall also include data substantiating the adverse weather.

b. Notice of Claim for Additional Cost. If the Contractor wishes to make a claim for an increase in the contract sum, written notice shall be given before proceeding to execute the work. The written notice shall be given to the City within five (5) calendar days after the occurrence of the event giving rise to the claim. Prior notice is not required for claims relating to an emergency endangering life or property. The Contractor shall provide notice of claims relating to emergencies within five (5) days after the occurrence of the emergency. Failure to strictly comply with this notice requirement shall constitute waiver of such claims.

c. Out-of-Sequence Work. The Contractor and Owner contemplate that changes in the Contractor's schedule and the performance of out-of-sequence work may be necessary for the beneficial and timely completion of the project, safety of the flying public or convenience of the Owner. The Contractor expressly waives any claim for additional costs resulting from out-of-sequence work beneficial to the overall project.

d. Continuing Contract Performance. Pending final resolution of a claim, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract other than amounts in dispute.

e. Claim Documentation. Within thirty (30) calendar days after the Contractor submits a notice of claim, the Contractor shall submit a "Claim," which shall include the following documentation:

1. The date of the occurrence and the nature and circumstances of the issue for which the notice of claim was given.

2. The identity of any documents and the substance of any oral communication related to the issue.

3. The basis for an assertion that the work required is a change from the original Contractor work or schedule.

4. The identity of particular elements of contract performance for which a change in compensation and/or time may be sought including:

5. A previously submitted project schedule demonstrating that any affected activities were identified as on the project's critical path or were made critical by the delay.

    a. Pay item(s) that have been or may be affected by the issue and any adjustments to unit price(s) that are required;

    b. Labor and/or materials that will be added, deleted or wasted by the problem and what equipment will be idled or required.

    c. Delay and disruption in the manner and sequence of performance that has been or will be required.

    d. Adjustments to delivery schedule(s), staging, and contract time due to the dispute and

    e. An estimate of time within which the Owner must respond to the notice to minimize cost, delay, or disruption of issue.

6. Any other items or information germane to the dispute.

7. "I, _____, being the _____ (must be an officer) of _____ (Contractor), declare under penalty of perjury under the laws of the State of Arizona, and do personally certify and attest that: I have thoroughly reviewed the attached Claim for additional compensation and/or extension of time, and know it's contents, and said claim is made in good faith; the supporting data is truthful and accurate; that the amount requested accurately reflects the contract adjustment for which the Contractor believes the City of Phoenix is liable; and, further, that I am familiar with Federal Acquisition Regulation (FAR) clause 52.214-27, found in 48 CFR Part 52; and further know and understand that submission or certification of a false claim may lead to fines, imprisonment, and/or other severe legal consequences."

    By:_____
    Title: _____

Date: _____

The Contractor's written certification, under oath: If any subcontractor or any lower tier subcontractor wishes to make a Claim, the subcontractor shall also provide the certification (in addition to the General Contractor).

f. Claims for Consequential Damages. The Contractor waives claims against the Owner for consequential damages arising out of or relating to this contract. This waiver includes the Contractor's principal office expenses including the compensation of personnel stationed there, financing losses, business and reputation and lost profits.

g. Claim Review. Claims shall be submitted to the Engineer, who will review the Claim and provide a recommendation to the Owner. The Engineer's recommendation shall not be binding on the Owner. The Owner may meet with the Contractor review the claim.

h. Owner's Audit Rights. The submission of a Claim by the Contractor shall entitle the Owner to audit all Contractor records and documents relating to the project, including but not limited to the Contractor's bid documents, job cost records and ledgers, payrolls, schedules, communications with its subcontractor and material suppliers and subcontract agreements. The Contractor's failure to timely provide these documents shall constitute a material breach of the Contract.

17. COORDINATION BETWEEN CONTRACTORS

There may be work on other airport projects that could affect this project, The Contractor on this project shall work with airport personnel and other Contractors to coordinate his activities and access to the project.

18. SEQUENCE OF CONSTRUCTION

The following scheduling requirements are being provided to serve as supplemental information in preparation of the Bid, as well as the sequencing of construction. It is not the intent of these Special Provisions or the construction plans to dictate to the Contractor his method of construction for this project. The Contractor shall review these specifications and submit to the Engineer prior to construction, his construction plan on how he will meet the project schedule for review.

a. Limitations of Operations. The Contractor shall conduct all his operations in such a manner so as to maintain a smooth, safe, uninterrupted flow of aircraft and vehicular traffic adjacent to the work site. He shall conduct all his earthwork construction in such a manner so as to minimize any potential differential settlement between the edges of existing pavements. Unless noted otherwise on the plans, no work shall be performed within 125-feet of a runway centerline. The Contractor shall remove all equipment from the active Runway and Taxiway safety areas including the infields prior to re-opening the Runway or Taxiway.

Limits of the various phases of work shall be clearly delineated with barricades, barricade lights, mandatory signs, taxiway signs (temporary and permanent) and paint markings as shown on the plans and specified herein, in order to deter aircraft and vehicles from entering the construction areas. The Contractor shall work closely with Airport Operations personnel, City of Phoenix Inspectors and the Engineer to ensure that the work is accomplished with minimal interference with aircraft movements.

Aircraft always have the “right-of-way”. When the Contractor is working adjacent to an active apron, runway or taxiway and an aircraft approaches the work area, the Contractor may be required to "pull back" his operations, i.e., move workers, materials and equipment away from the taxiway or runway, outside of object free area, or as directed by City of Phoenix Inspection personnel.

The Contractor shall maintain all active runway and taxiway lighting systems at all times, unless otherwise specified. When temporary bypasses of active circuits are to be constructed in order to work on portions of the circuits, the circuits shall be de-energized and re-energized in conformance with the procedures specified by the City of Phoenix Aviation Department.

b. Opening Inspections. When the Contractor requests in writing to open an individual phase of work, or areas that are scheduled to be reopened to aircraft traffic, the Engineer will conduct an observation of the construction area before opening to aircraft traffic. The conditions which observations will consider potentially hazardous and which must be corrected prior to reopening the taxiway prior to the end of a work shift (day shift or night shift as the case may be) include but are not limited to, the following:

1. Trenches, holes, or excavations on, or adjacent to any open taxiway, runway, apron or related safety area.

2. Un-marked or un-lighted holes, trenches or excavations near any runway, apron, taxiway, or related safety area.

3. Mounds or piles of earth, temporary stockpiles, construction materials, temporary structures, or other objects on or in the vicinity of any open runway, apron, taxiway object free area, or in a related safety, approach or departure area.

4. Vehicles or equipment (whether operating or idle) on any open apron, taxiway, or in any related safety, approach or departure area.

5. Vehicles, equipment, excavations, stockpiles, or other materials which could impinge upon Navigational Aid (NAVAID) critical areas and degrade or otherwise interfere with electronic signals from radios or electronic NAVAIDs or interfere with visual NAVAID facilities.

6. Objects (whether marked/flagged or not) or activities anywhere on or in the vicinity of the airport which could be distracting, confusing, or alarming to pilots during aircraft operations.

7. Un-flagged or un-lighted low visibility vehicles and equipment including cranes in the vicinity of an active runway, taxiway or apron or near any approach or departure surface.

8. Misleading or malfunctioning obstruction lights or barricade lights.

9. Inadequate approach/departure surfaces (needed to assure adequate landing/takeoff clearance over obstructions or work or storage areas).

10. Inadequate, confusing, or misleading (to user pilots) marking/lighting of any open apron, runway, taxiway, or in any related safety, approach or departure area.

11. Water, dirt, debris, or other transient accumulation that temporarily obscures pavement marking, pavement edges, or derogates the visibility of runway/taxiways marking, lighting or of construction and maintenance areas. There is zero tolerance for foreign object debris.

12. Inadequate or improper methods of marking, barricading, or lighting of temporarily closed portions of airport operation areas including unlighted or missing construction and barricade lights.

13. Construction materials, trash or other materials with foreign object debris (FOD) potential, whether on aprons, runways, taxiways, service road, public streets or related safety areas. Inspectors will be watchful for debris that can be ingested into aircraft engines creating a potential for FOD. Such items include rock, aggregate, soil, loose polyethylene and other light materials capable of being blown onto aircraft movement areas by wind.

14. Construction/maintenance activities or materials that could hamper airport rescue and fire-fighting (ARFF) vehicle access from ARFF stations to all parts of the runway/taxiway system, runway approach and departure areas, or aircraft parking locations.

15. The time allowances for all work is inclusive of the Contractor moving onto the site, performing work activities, performing all clean-up, having the work area and haul routes inspected and approved by the Engineer, and moving off the site. The Contractor shall provide adequate lighting for the needs of the inspection personnel.

16. Any Aircraft Operating Areas (AOA), open apron, runway, taxiway, or in any related safety, approach or departure area that does not pass inspection must remain closed until such time cleanup is performed and approved.

c. Construction Phasing. Typical work to be done during each construction phase is given as supplemental information and is not intended to be a complete listing of all work to be accomplished. All work called for on the plans and all items necessary to construct a complete, operational section of a concrete taxiway within

the limits of the work area shall be completed in the individual phase and/or sub-phases, prior to proceeding with the next phase or sub-phase.

19. ARCHAEOLOGICAL FEATURES

Although the City of Phoenix Aviation Department has made every effort prior to construction to identify all cultural resources in the project area, previously unidentified archaeological materials may be found during the construction of this project.

If human remains are encountered during any phase of the construction, the Contractor shall suspend all work in the vicinity of the find and shall take steps to secure the protection of the remains. The Archaeological Consultant and the City of Phoenix Archaeologist shall be contacted immediately to determine an appropriate course of action. In the event of suspension of work pursuant to this Special Provision, the Contractor may be entitled to an adjustment of contract time.

If satisfactory fulfillment of the Contract involves alterations to the contract time that affect the Contractor's completion time, the Contractor may request a supplemental agreement that extends that Contract time. The supplemental agreement shall be in the form of a Request for Extension of Contract time and shall include the Contractor's revised schedule and all other pertinent data. The request shall show why an increase of Contract time is warranted.

An extension of contract time will not be considered unless the work affected by the Archaeological investigation and suspension of a construction activity becomes a critical item on the Contractor's CPM schedule.

20. RED OBSTRUCTION LIGHTS

General. Red obstruction lights shall be 100-watt fixtures, with 360-degree beam spread, and in compliance with the Federal Aviation Administration (FAA) specification found in Advisory Circular AC150/5345-43J “Specification for Obstruction Lighting Equipment”, L-810. The Contractor shall provide a minimum of two (2) red obstruction lights each, for all stationary cranes, batch plants, pug mills or other equipment erected on the Airport, and erected at the other sites that are near the Airport. The red obstruction lights shall be supplemented with additional red obstruction lights as directed by the City of Phoenix Airside Operations personnel or the Engineer. All movable cranes shall be provided with red obstruction lights at their highest point, and the boom shall be lowered during the hours of darkness or periods of low visibility.

The City of Phoenix Aviation Department will issue local Notice to Airmen (NOTAM) for obstruction lighting and the Contractor shall notify the Engineer a minimum of five (5) working days in advance, if any relocation of the obstruction lights is necessary. The Contractor shall not relocate any red obstruction lights(s) without prior approval from the Engineer. All such equipment is to be erected and removed from the Air Operations Area (AOA) during the off peak hours.

Measurement and Payment. No Separate measurement for payment will be made for this item. Measurement and payment for this item is considered incidental to Civil

Technical Specification Item C-105, Mobilization.

21. YELLOW WARNING LIGHTS FOR VEHICLES

General. The Contractor will provide flashing yellow warning lights at all times during construction, including periods of low visibility, as well as orange and white checkered flags during daylight, for all vehicles and all mobile construction equipment on the construction site, per Advisory Circular 150/5210-5D, "Painting, Marking and Lighting of Vehicles Used on an Airport" as included in the Appendix. Yellow warning lights and orange and white checkered flags must be displayed in a prominent visible position and kept operational at all times. The Contractor must rectify the condition of any lights or flags not found to be acceptable to the City of Phoenix Operations immediately. If not rectified within six (6) hours, or a lesser time, at the discretion of the City of Phoenix, or if a clearly unsafe condition exists, work may be suspended at no cost to the City of Phoenix, until the situation is addressed.

All construction motor vehicles must display adequate company identification logos on both sides of the vehicle and at all times while within the AOA. Failure to comply will result in the issuing of a Notice of Violation (NOV) and the appropriate fine.

Measurement and Payment. There will be no separate pay item for yellow warning lights, checkered flags or Company Identification Logos. The cost will be included in other bid items. Refer to Special Provision Item 41, “Airport Safety and Security (M-003)” for additional requirements.

22. AIRCRAFT TRAFFIC REGULATIONS

Aircraft traffic will continue to use existing runways, aprons, and taxiways of the airport during the time that work under this contract is being performed. The Contractor shall at all times so conduct his work as to create no hindrance, hazard, or obstacle to aircraft using the airport and must, at all times, conduct the work in conformance with requirements of the Airport Director and FAA Control Tower or their authorized representative.

Any proposed haul routes across aircraft movement areas will require controlled crossings with flagmen at each side of the controlled crossing, in accordance with Aviation Department details and requirements. Nighttime crossings shall be equipped with light plants on both sides of the crossing. The Contractor shall provide traffic control, crossing guards, barricades, and temporary fencing plan(s) to the Engineer for approval five (5) days prior to instituting operations in the Air Operations Area.

When absolutely essential, in order to permit construction under this contract, taxiways may be closed at the Aviation Department's discretion to aircraft operations upon advance written application by the Contractor to the Engineer. The Contractor will schedule and organize his work so that a minimum of crossings or crossings of Taxiways will be required during the performance of the entire project.

23. DISPOSAL OF SURPLUS MATERIAL WHICH DOES NOT CONTAIN ASBESTOS

No measurement or direct payment will be made for the hauling and disposal of surplus

and/or waste material, the cost shall be incidental to the cost of the project. All surplus and/or waste material shall be disposed of by Contractor, at and off-site location such as a landfill, subject to the following conditions:

a. If the City landfills are used, the Contractor shall pay the normal dumping fee. The Estes Landfill will not be available to dispose of surplus materials.

b. If private property within the City limits is used, the Contractor shall obtain written permission from the property Owner and deliver a copy of this Agreement to the Engineer prior to any hauling or dumping. All disposal and grading shall be in strict conformance with the City of Phoenix Grading and Drainage Ordinance. The Contractor shall obtain and pay for the necessary permit(s).

c. If the surplus material is disposed of outside the City limits, the Contractor shall comply with all applicable laws/ordinances of the agency concerned and be responsible for all cost incurred.

24. HAUL PERMIT

Obtaining the haul permit and the approval by Street Transportation does not release the Contractor from strict compliance with MAG Subsection 108.5, Limitation of Operations. On any project, when the quantity of fill or excavation to be hauled exceeds 10,000 cubic yards, or when the duration of the haul is for more than twenty (20) working days, the Contractor shall:

a. Obtain and pay for a written haul permit from the Development Services Department.

b. Obtain approval of the proposed haul route, number of trucks, etc., by the Street Transportation Department.

25. UNDERGROUND FACILITIES

The Contractor will make whatever investigation it deems necessary to verify the location of underground utility facilities, by providing a private utility locating company to verify the location of all on-site utilities prior to construction. The utility locator company shall mark all utilities that may or may not conflict with construction. The Contractor shall field survey these utilities and plot this information on the Record Drawings that the Contractor will be preparing. If such facilities are not in the location shown in the drawings, then (regardless of whether this is discovered prior to or during construction) the Contractor's remedies, if any, pursuant to Article 6.3, Chapter 2, Title 40, A.R.S. (A.R.S. 40-360.21 through 40-360.32, "Underground Facilities"), shall be the Contractor's sole remedy for extra work, delays, and disruption of the job, or any other claim based on the location of utility facilities. Locations of utility facilities are shown on drawings and were furnished by the City, are to be regarded as preliminary information only, subject to further investigation by the Contractor. The City does not warrant the accuracy of these locations, and the Contractor, by entering into this Contract, expressly waives and disclaims any claim or action against the City under any theory for damage resulting from location of utility facilities.

The Contractor shall be responsible for obtaining all utility location information, and for performing all requirements as prescribed in A.R.S. 40-360.21 through .29, for all underground facilities, including those that have been installed on the current project, until the project is accepted by the City.

At least two (2) working days prior to commencing any excavation, the Contractor shall call the Blue Stake Center, between the hours of 7:00 a.m. and 4:30 p.m., Monday through Friday, for information relative to the location of buried utilities that are located on landside. The number to be called is as follows: Maricopa County: (602) 263-1100.

Several utility owners, including the City of Phoenix, the Federal Aviation Administration, and others may have utilities in the proposed work area and these utilities shall be located and potholed by the Contractor prior to starting construction. The Contractor is advised that several underground monitoring wells exist within the project work limits. Refer to Civil Technical Specification Item U-200 for method of measurement and basis of payment.

26. CHANGE ORDER REQUEST MARKUPS

The Contractor shall conform to the following markups for change order work, or for the allowance work that is self-performed by the Contractor and/or performed by a subcontractor. The Contractor shall also utilize the Change Order Request Summary Worksheet. The Contractor shall submit all required backup and supplemental information, calculations, invoices, etc., that are required to justify and support all Contractor and subcontractor costs.

a. **General Contractor Self-Performed Work and Subcontractor Work Markups.** For overhead and profit, the actual or approved costs for equipment, material, and labor shall be marked up by twelve percent (12%) for profit and overhead.

b. **General Contractor Markups of Subcontractor Work and Subcontractor Markups of Lower Tier Subcontractors.** The Contractor shall be allowed to markup actual or approved subcontractor costs for equipment, material, and labor (excluding subcontractor overhead and profit) by seven and one half percent (7.5%). Subcontractors shall be allowed to markup actual or approved lower tier subcontractor costs for equipment, material, and labor (excluding lower tier subcontractor overhead and profit) by seven and one half percent (7.5%).

c. **Bond.** No markups for bond will be permitted until the contract monetary amount has been exceeded for which the bond has been issued. No bond markups will be permitted for work performed by subcontractors and lower tier subcontractors.

d. **Insurance.** The Contractor shall be allowed to markup the cost for change order work plus bond costs for property damage/public liability insurance, utilizing the same percentage used on the initial contract. Verification, from insurance carriers, of this percentage shall be submitted with the initial change order request.

e. **Sales Tax.** The Contractor shall be allowed to markup the cost for change order work plus bond and insurance costs by the current, approved sales tax multiplier.

27. EXTENSIONS OF CONTRACT TIME

MAG General Condition Specification 108.7, DETERMINATION AND EXTENSION OF CONTRACT TIME, is deleted in its entirety and substitute the following:

a. Weather Delay. "Extensions of time due to adverse weather conditions not reasonably anticipated will be granted only if such inclement weather prevents the execution of critical path items of work at the time of the inclement weather. Extensions of time for weather delays will be considered only if such actual monthly inclement weather exceeds the monthly average for that month as shown in the Table below. The extension would be considered on the day after the rainfall exceeds the monthly average listed in the Table. The Contractor shall base his CPM Schedule using at least three (3) weather delay days per month between January and March, and at least one (1) weather delay day per month between April and December. These weather days will not be considered for an extension of contract time.

The Contractor shall request an extension of time in writing within forty-eight (48) hours after the event that caused the delay. This written notification is required regardless if the request is based on inclement weather or based on other factors. No extension of time will granted if the written request is not received within forty-eight (48) hours.

TABLE – City of Phoenix Average Monthly Precipitation Data.

Month	*Average Monthly Precipitation*
January	0.94-inches
February	1.05-inches
March	1.13-inches
April	0.32-inches
May	0.11-inches
June	0.05-inches
July	0.88-inches
August	0.98-inches
September	0.75-inches
October	0.65-inches
November	0.67-inches
December	0.94-inches

b. Notice of Claim for Additional Time. If the Contractor wishes to make a claim for an increase in the Contract Time, written notice shall be given. The notice shall be made in writing to the Engineer within five (5) days of the delay causing occurrence except for notice of adverse weather caused delays, which shall be made within forty-eight (48) hours. The notice shall set forth (a) the cause of the delay, (b) a description of the portion or portions of Work affected by the delay, (c) the specific number of days of delay for which an extension of time is requested, (d) all actions the Contractor is taking to mitigate the delay (e) any actions the Owner or others could take to mitigate the delay (f) the latest schedule showing the delayed activity's relationship to the project's critical path and (g) all details pertaining thereto. In the case of a continuing delay, the Contractor shall weekly

submit an updated notice. Failure to give notice of a claim for extension of time in strict compliance with this provision shall constitute a waiver of such claim.

c. **Critical Path**. No extension of time shall be granted to the Contractor for a delay caused by the Owner, Engineer, other contractors or any other party, or other causes beyond the Contractor's control, unless the delay affects the critical path of the Project as defined on a critical path method schedule or monthly update provided to the Owner before the delaying occurrence and then only to the extent that the delay affects the critical path. If the delay event forces a previously non-critical path activity onto the project critical path, this change must be shown on the next monthly update and expressly identified in the narrative report. Failure to so identify critical path changes shall be deemed to waive the Contractor's right to recover any costs associated with the delay event's impact on the activity. Delays not identified on the Contractor's next monthly update shall be waived. No extension of time shall be granted to the Contractor to the extent that, notwithstanding the existence of any such circumstance beyond the Contractor's control, delay would have resulted in any event due to a concurrent unexcused delay.

d. **Changes in the Work.** For changes in the work that significantly affect the time and progress of the work, any time extensions shall be requested no later than when the change in the work is requested. Any change order negotiated and signed by the Contractor and Owner that does not include an express time extension shall be deemed conclusive evidence that no time extensions related to the changed work is warranted and the Contractor shall forever waive its right to claim entitlement to such a time extension.

   Change order requests shall include all costs necessary to perform the extra work within the contract period unless a time extension is granted. This shall include but not be limited to necessary acceleration costs. The Contractor may reserve the right to request a time extension at a later date. However, if the Contractor elects to do so, the Engineer will withhold ten (10) percent of the change order amount until the Contractor submits a critical path method schedule analysis that complies with all Contract requirements and identifies the resultant delay. If the Contractor fails to timely do so, the Owner may use the withheld amount to perform a schedule analysis to identify the resulting delay.

e. **Overhead Costs During Time Extensions.** The Contractor and Owner contemplate that the entire contract period may be reasonably necessary to complete this Contract's scope of work. It is the contemplation of the parties that any home office or field overhead or supervision costs necessary to perform work during the entire contract period is incorporated into the Contractor's overall Bid. The Contractor shall not be entitled to recover home office or field overhead and supervision costs during the performance period, even if the Contractor originally planned to complete the work before the contract period expired. Acceptance by the Owner of schedules showing early completion by the Contractor shall not constitute a waiver of this provision.

28. STOCKPILED MATERIAL

Stockpiled materials shall not be allowed in the air operations area, unless permitted by the City of Phoenix. Material shall not be stored near aircraft turning areas or movement areas.

The maximum stockpile height, if permitted by the City of Phoenix, shall not exceed 3-feet above the adjacent pavement elevation. Therefore, the Contractor shall prepare his bid on the basis of hauling the material off-site of the Airport, and importing the material at a later date when the work area on site is available to receive the material.

All unsuitable materials, as defined in Civil Technical Specification Item P-152, shall be disposed of at an offsite legal location, such as a landfill, at the time the material is excavated, and shall not be temporarily stockpiled on the Airport.

When asphalt pavement is milled, the material shall be hauled off site of the airport at the time the pavement is milled. Any asphalt millings that are not used in the formation of subbase shall become property of the Contractor and exported from the site.

Storm drain pipe shall not be stockpiled in the Air Operations Area.

Open trenches shall be limited to no more than 500 linear feet. Any open trench greater than 500 linear feet shall be backfilled prior to the end of the work shift.

29. MAG SPECIFICATION MODIFICATIONS

In addition to any other modifications to the MAG specifications contained elsewhere in this Contract, the following changes are made:

a. MAG Section 104.2.4 is deleted and replaced with:

"104.2.4 At the Contractor's Request: Changes in the plans or specifications, which do not materially affect and are not detrimental to the work or to the interests of the Contracting Agency, may be granted to facilitate the work. Requests shall be in writing and submitted to the Engineer for approval. The Contracting Agency shall be entitled to a reduction in cost equal to one-hundred percent of any cost reductions to the Contractor caused by the change. In no event shall a Contractor requested change result in any additional cost to the Contracting Agency. The Contractor assumes sole responsibility and liability for changes it requests and the Contracting Agency's approval of a proposed change shall not create any liability on the part of the Contracting Agency.

b. MAG Section 105.11 is deleted and replaced with:

"105.11 REMOVAL OF UNACCEPTABLE, UNATHORIZED AND COVERED WORK:

(A) *Duty to Uncover Work:* If a portion of the work is covered contrary to the Engineer's request or to requirements specifically expressed in the Contract, the Engineer may order in writing that it either be uncovered for observation and/or replaced. The cost of uncovering or replacing the work shall be solely at the Contractor's expense. The Contractor shall not be entitled to any associated time extensions or impact costs associated with such a request.

(B) *Cost of Uncovering Work:* If a portion of the work has been covered that the Engineer has not specifically requested to observe prior to

it's being covered or the Contract does not provide for inspection, the Engineer may request the Contractor to uncover the work. If the uncovered work is in compliance with Contract requirements, the Contracting Agency shall bear the cost of uncovering and replacing the work. If the uncovered work is not in compliance with Contract requirements, the Contractor shall bear such costs.

(C) *Duty to Correct Rejected Work:* Work done contrary to the instruction of the Engineer, work done beyond the lines shown on the plans, or as given, any extra work done without authority, unacceptable work, poor workmanship, work done with defective materials, work damaged through carelessness or found unacceptable by the Engineer, whether observed before or after substantial completion of the work and whether or not fabricated, installed or completed shall be promptly corrected by the Contractor. The Contractor shall bear all costs of correcting such work, including the replacement or repair of other work affected, additional testing and inspection costs, and additional Engineer costs. The Contractor shall not be entitled to recover any impact costs or delay damages and shall not be entitled to any time extensions in any way relating to correcting the work. Work rejected by the Engineer shall be promptly corrected. All work rejected before final acceptance shall be corrected prior to final payment.

(D) *One Year Duty to Correct Work:* Without limiting the Owner's statutory, common law, or other contractual rights, if within one (1) year after the date of final acceptance, or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty or guarantee required by the Contract, any defective work or work not in accordance with the Contract shall be promptly corrected by the Contractor after written notice by the Engineer or Owner to do so. The Contractor shall bear all costs of correcting such work, including replacement or repair of other work affected by the defect and any other damages resulting from such defect. This obligation shall survive Final Payment to the Contractor.

(E) *Owner's Right to Correct Non-Conforming Work:* If the Contractor fails to correct nonconforming or defective work within a reasonable time, the Owner may correct it with its own forces. If the Contractor does not correct the work within a reasonable time, the Owner may provide written notice to the Contractor and then remove and store the salvable materials or equipment at the Contractor's expense. If the Contractor does not pay the Owner's expenses within ten (10) days thereafter, the Owner may sell such materials and equipment and shall deduct its expenses, including additional services by the Engineer.

(F) *Acceptance of Non-Conforming Work:* If the Owner prefers to

accept defective or non-conforming work rather than require its removal and correction, the Owner shall be entitled to recover one-hundred and fifty (150) percent of the cost of removing and correcting the work. Such adjustment shall be effected whether or not final payment has been made."

c. Delete MAG Section 107.1(A)

d. Delete MAG Section 108.4 and substitute the following:

"The Contractor shall furnish the Engineer a construction schedule and monthly updates to the schedule. The Engineer's review of the Contractor's schedule is for purposes of: (1) determining the Contracting Agency's staffing requirements; (2) to ensure general compliance with the contract documents as it relates to the completion of all work; (3) to monitor and evaluate the construction status for purposes of approving progress payments; (4) to evaluate project delays and claims for additional time and compensation; and (5) to identify methods for mitigating delay impacts. In the event the schedule does not contain sufficient information to meet the above purpose, or does not comply with the Contract's schedule and monthly update requirements, the Contractor shall resubmit a new schedule or update with the required information. The Contractor shall not change an accepted construction schedule without the written consent of the Engineer. The orderly procedure of all work to be performed shall be the full responsibility of the Contractor.

Review of a submitted schedule by the Engineer shall in no way be construed as an affirmation or admission that the schedule is reasonable or workable, which responsibility remains the Contractor's obligation. When the schedule shows a completion prior to the completion date, this extra time between the contract completion date and the scheduled completion date (float), may be used by the Contracting Agency without additional compensation to the Contractor, including extended field and home office overhead and supervision costs. The Contracting Agency shall not be liable to the Contractor for any damages for delay if the Contractor complete the work prior to expiration of the original Contract completion date or as modified by approved change orders, if any."

e. Delete MAG section 108.11 and substitute the following:

A. Termination for Convenience: The Owner may, without cause, terminate the Contract for its convenience, even if the Contractor has not failed to perform any part of the Contract. Termination of the Contract shall be effected by written notice to the Contractor. Upon receipt of such notice, the Contractor shall, unless the notice directs otherwise:
    i. Immediately discontinue the work and the placing of all orders and subcontracts in connection with this Contract;

    ii. Immediately cancel all of the existing orders and subcontracts

made hereunder;

iii. Immediately transfer to the Owner all materials, supplies, work in progress, appliances, facilities, machinery and tools acquired by the Contractor in connection with the performance of the Contract, and take such action as may be necessary or as the Owner may direct for protection and preservation of the Work relating to this Contract;

iv. Deliver all plans, Drawings, Specifications and other necessary information to the Owner;

v. Take all necessary steps to secure the project site and work.

B. *Contractor's Exclusive Remedy:* If the Owner terminates the Contract for convenience, the following shall be the Contractor's exclusive remedy.

i. Reimbursement of all actual expenditures and costs approved by the Owner as having been made or incurred in performing the work;

ii. Reimbursement of expenditures made and costs incurred with the Owner's prior written approval in settling or discharging outstanding commitments entered into by the Contractor in performing the Contract; and

iii. Payment of profit, in so far as profits is realized hereunder, of an amount equal to the actual profit on the entire Contract at the time of termination multiplied by the percentage of the completed work. In no event shall the Contractor be entitled to anticipated fees or profits on Work not required to be performed.

C. *Warranties, Guarantees and Indemnities to Remain in Effect.* All obligations of the Contractor under the Contract with respect to completion of the work, including but not limited to all warranties, guarantees and indemnities, shall apply to all work completed or substantially completed by the Contractor prior to a convenience or for cause termination by the Owner. Notwithstanding the above, any termination by the Owner or payments to the Contractor shall be without prejudice to any claims or legal remedies that the Owner may have against the Contractor for any cause.

D. *Conversion of Termination for Cause to Termination for Convenience.* If a termination for convenience by the Owner is determined to be wrongful or improper for any reason, such termination shall automatically be converted to a convenience termination and the

Contractor's remedy for such wrongful termination shall be limited to the recoveries for a convenience termination.

E. *Remedy Limited to Damages:* In the event that the Contractor is terminated, whether for cause or convenience, the Contractor's sole remedy shall be for damages. In no event shall the Contractor be entitled to reinstatement or other equitable relief from a court or other forum.

F. *Termination For Cause:* The Owner may terminate the Contract if the Contractor:

i. fails or refuses to supply enough properly skilled workers or proper materials to ensure compliance with approved schedules or as directed by the Engineer;

ii. fails to make payment to subcontractors for labor or materials in accordance with the respective agreements between the Contractor and subcontractors or A.R.S. § 34-221.

iii. disregards laws, ordinances, rules, regulations or orders of a public authority having jurisdiction;

iv. breaches any provision of the Contract;

v. fails to furnish the Owner with satisfactory assurances evidencing the Contractors ability to complete the work in compliance with all Contract requirements.;

vi. fails to comply with approved schedules or fails to comply with Contract schedule requirements; or

vii. fails after commencement of the work to proceed diligently and continuously with the construction and completion of the work for more than seven (7) days, except as permitted under the Contract.

G. *Contractor Right to Receive Payment:* When the Owner terminates the Contract for cause; the Contractor shall not be entitled to receive further payment until the work is finished. If it appears the Contractor would have sustained a loss on the entire Contract had it been completed, the Contractor shall not be entitled to any profit and an appropriate adjustment shall be made reducing the Contractor's payment to reflect the Contractor's anticipated rate of loss for the entire Contract.

H. *Cost of Finishing Work.* If the unpaid balance of the Contract exceeds costs of finishing the work, including compensation to the Engineer and other Owner representatives, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the

Contractor or Owner shall be certified by the Engineer and this obligation for payment shall survive the Contract's termination.

30. CONSTRUCTION SURVEY LAYOUT

The Contractor shall set all construction stakes, establishing lines, grades and elevations to construct the Project, including necessary utilities, appurtenances and shall be responsible for their conformance with plans and specifications. The Engineer has established survey control points and bench marks for the project. Refer to the Survey Control Plan.

a. Initial Verification. Prior to setting any construction stakes, the Contractor shall first verify the accuracy of the control points established by the Engineer. If errors are discovered during this verification process, and the control points do not agree with the geometry shown in the plans, the Contractor shall immediately notify the Engineer in writing, explaining the issue in detail. Upon completion of this verification process, the Contractor shall employ an Arizona register land surveyor to certify in writing that all control points established by the Engineer are acceptable and adequate to allow the Contractor's construction staking to meet the accuracy requirements of the specifications.

b. General Description. After the Contractor's registered land surveyor has submitted his written certification verifying the accuracy of the control points established by the Engineer, the Contractor shall set all stakes including, but not necessarily limited to: centerline stakes, offset stakes, reference point stakes, slope stakes, pavement lines, grade stakes, blue tops for subgrade and subbase course, stakes for utilities, drainage, pipe, base and pavement courses, paint striping layouts, supplemental bench marks and permanent record drawing elevations of concrete pavement at each concrete paving joint intersection, as the record drawing elevations prior to placing AC on P-209, as well as all other horizontal and vertical controls necessary for complete and accurate layout of the construction work.

c. Materials, Personnel and Equipment. All work shall be done under the direction of a registered land surveyor employed by the Contractor. All survey crew chiefs shall be a registered civil engineer, a registered land surveyor, an engineer in training or a CICET level III (or a higher level NICET level) certified technician. The Contractor shall furnish all materials, personnel and equipment necessary to perform all surveying, staking and verification of the accuracy of all existing control points, which have been provided by the Engineer and/or the City. Included in this work shall be all calculations required for the satisfactory completion of the project in conformance with the plans and specifications.

Materials and equipment shall include, but shall not necessarily be limited to, vehicles for transporting personnel and equipment, properly adjusted and accurate survey equipment, stakes, flagging and all other devices necessary for checking, marking, establishing and maintaining lines, grades and layout to perform the work called for in the contract. The Contractor shall furnish a sufficient quantity of

competent personnel to perform the survey work and layout.

d. **Light Bases.** The Contractor shall stake all airfield light bases.

e. **Discrepancies.** Any discrepancies in the grade, alignment, quantities, locations or dimensions detected by the Contractor shall immediately be brought to the attention of the Engineer. Changes to the project plans will not be allowed without the written approval of the Engineer.

f. **Record Drawings.** The work shall include establishing and marking the "Record Drawings" with coordinates, elevations and changes to the design, as well as locating existing utilities with coordinates and elevations. Refer to Article 2.10 for project record requirements.

Measurement and Payment. Survey will be measured for payment by the lump sum. Travel time shall not be measured for payment. Survey work for quality control surveys shall not be measured for payment, but shall be considered incidental to the Contractor Quality Control program.

Payment will be made under:

Item SP-30.1 Construction Survey Layout – per Lump Sum

31. MISCELLANEOUS REMOVALS AND OTHER WORK.

General. The work under this item shall consist of removing and disposing of items not specifically identified as another item of work. This may include storm drain pipe, catch basins, asphalt covered concrete pavement, concrete, obliterating existing paint striping, and other miscellaneous work necessary to complete the project that involves a removal or relocation that is not specifically identified as another item of work.

Measurement and Payment. Miscellaneous Removals and Other Work will be measured and paid for based on the actual costs billed to the project by the contractors used to complete the work is deemed necessary by the Owner.

Payment will be made under:

Item SP-31.1 Miscellaneous Removals and Other Work (Allowance) – per Allowance

32. WORK DONE BY CITY FORCES

There are items of work that are to be performed by the City that the Contractor will have to build into his schedule. This includes paint removal of any paint containing lead, prior to pavement removal, and asbestos testing of the concrete. It is anticipated that the paint removal will take approximately twelve working days and will need to be completed prior to the asphalt removal and after the area is barricaded. Coordination between the Contractor and City is a non-pay item.

33. ADJUST EXISTING STRUCTURE TO FINISHED GRADE

General. The work under this item shall consist of adjusting existing structures (such as storm drain manholes/inlets) to finished grade in accordance with the locations shown on the plans. The adjustments of the existing structures shall be in accordance with the details referenced on the project plans per each structure type.

Measurement and Payment. Adjust existing structure to finished grade will be measured and paid for at the contract unit price per each structure adjusted to finished grade in accordance with the specifications and accepted by the Engineer. This price shall be full compensation for all labor, materials, and equipment necessary to complete the item.

Payment will be made under:

Item SP-33.1 Adjust Existing Structure to Finished Grade - per Each

34. UNFORESEEN UTILITY LOCATING (ALLOWANCE)

General. The work under this item shall consist of locating unforeseen existing utilities in the project area not covered under Special Provision Item 42 and as needed to support utility relocations under Item SP-35.1. The Contractor shall take all necessary precautions to identify and protect all utilities, if any unidentified utilities are found the Contractor shall determine the type of material, depth and route of that utility.

Measurement and Payment. The Unforeseen Utility Locating item will be measured and paid for based on the actual costs billed to the project by the utility agency or contractors used to complete the work is deemed necessary by the Owner.

Payment will be made under:

Item SP-34.1 Unforeseen Utility Locating (Allowance) – per Allowance

35. EXISTING UTILITY RELOCATIONS (ALLOWANCE)

General. The Existing Utility Relocation item is provided for the purpose of encumbering funds to cover the costs of utility relocations or modifications needed to complete electrical work. This item will be used to relocate any existing utility that is in conflict with the proposed pavement section, including subgrade preparation. This item may also be used to address unknown electrical issues. The amount of the allowance is determined by the Owner and is not subject to individual bid pricing. All bidders shall incorporate the amount pre-entered in the bid proposal and shall reflect the same in the total amount bid for this project. It shall be understood that this allowance is an estimate only. It is further understood that authorized work, if any, may be less than the allowance item.

Measurement and Payment. The Existing Utility Relocation item will be measured and paid for based on the actual costs billed to the project by the utility agency or contractors used to complete the work as is deemed necessary by the Owner.

Payment will be made under:

Item SP-35.1 Existing Utility Relocations (Allowance) – per Allowance

36. PROTECTION OF EXISTING UTILITIES

General. This item shall consist of protecting existing utilities in the project area. There are existing utilities including electrical lines in the project area including Runway Guard Light circuits. It is estimated that these line are located 20 to 24 inches below the existing finished grade. The Contractor shall hand dig to expose the existing slurry or concrete encasement of these line. The encasement shall remain intact at the top of the proposed subgrade level. The location of the service lines shall be clearly marked and identified. Heavy equipment traffic shall not be permitted over these lines and the Contractor should use extreme caution when driving any type of equipment over or in the vicinity of these slurry trenches.

All utilities in the project area shall be located and clearly identified in the field. Modifications to the depth of the subgrade compaction will be determined by the Engineer.

Should the Contractor damage or interrupt any operation of any utility service or facility by accident or otherwise, he shall immediately notify the proper authority and the Engineer and he shall take all reasonable measures to prevent further damage or interruption of service. The Contractor, in such events, shall cooperate with the utility service or facility owner and the Engineer continuously until such damage has been repaired and service restored to the satisfaction of the utility or facility owner.

The Contractor shall bear all costs of damage and restoration of service to any utility service or facility due to his/her operations whether due to negligence or accident. The Owner reserves the right to deduct such costs from any monies due or which may become due to the Contractor or his/her surety.

Measurement and Payment. There will be no separate measurement or payment for Protection of Existing Utilities, the cost for which shall be considered incidental to other items of work.

37. REMOVE, HAUL, AND STOCKPILE OF CRUSHED AGGREGATE SLOPE PROTECTION.

General. This item consists of the removal, salvaging and storage of the existing infield crushed aggregate slope protection required for areas of new construction and corresponding construction activities/operations. The material shall be stored at locations on airport property, as identified on the plans. The depth of the existing aggregate material is approximately four (4) +/- inches.

The existing material shall be removed in a manner to minimize disturbance to the existing underlying soil grade and to minimize mixing the aggregate with the underlying soil. The aggregate material shall be salvaged and stored at the designated locations such that it does

not become damaged or mixed with other materials, such as soil, organics, smaller aggregate, millings, etc. The material shall not be stored in piles or windrows greater than four (4) feet in height. The Contractor shall take care to not drive over or otherwise unnecessarily disturb the stored material once it has been placed.

All designated salvageable crushed aggregate within grading limits and/or disturbed area shall be removed and transported by the Contractor at a specified site for stockpiling on airport property as approved by DVT Operations Staff. Stockpiling of the removed material will not be allowed within the Runway Safety Area, Taxiway Safety Area or Taxiway Object Free Area limits

Materials. All other materials used in conjunction with this work shall be furnished by the Contractor and will be considered incidental to the item.

Measurement and Payment. Measurement and payment shall be made by the number of square yards of the area of crushed aggregate removed, hauled, and stockpiled, as measured in place prior to removal. The price shall include the furnishing of all required equipment, labor, hauling, materials/parts, tools, and incidentals necessary to complete the Item.

Payment will be made under:

Item SP-37.1 Remove, Haul, and Stockpile Crushed Aggregate Slope Protection – per Square Yard

38. PLACEMENT OF CRUSHED AGGREGATE SLOPE PROTECTION.

General. This item consists of the hauling and placing of the existing stored and salvaged crushed aggregate slope protection material on an already prepared surface from existing on-airport stockpile(s) as directed by the City of Phoenix Aviation Department.

The finished (rolled) in-place material depth shall be approximately 4 inches, with the top of finished grade of the aggregate matching the proposed grades shown in the plans. The previously constructed layer should be cleaned of loose and foreign material prior to placing the protection course. Upon completion of placing the protection course the Contractor will apply sufficient water to the entire surface area in order to settle all fines to the bottom of the course.

Finishing. The surface of the aggregate protection course shall be finished by blading or with automated equipment especially designed for this purpose. The finished surface shall be rolled a minimum of two passes with a steel wheel power roller weighing not less than 8 tons.

Surface Tolerance. The finished surface shall be of such smoothness that it does not vary more than 0.10-foot, and shall not be more than 0.10-foot from true grade as established by grade hubs (blue tops) or pins. The surface shall be evaluated by the Engineer with a 16-foot straightedge (or string line). The Contractor shall provide the straight edge and the labor to handle and apply the straight edge (or string line). Measurements will be made continuously along the evaluation grid lines. The evaluation grid shall be as described in Technical Special

Provision Item 30 “Construction Survey Layout”, for all applicable subgrade and grading sections. Any deviation in excess of this amount shall be corrected by the Contractor at the Contractor’s expense.

Thickness Control. The completed thickness of the protection course shall be within 0.05 foot of the design thickness. Where the thickness is deficient by more than 0.05 foot, the Contractor shall correct such areas at no additional cost by excavating to the required depth and replacing with new material. Additional test holes may be required to identify the limits of deficient areas.

Maintenance. The protection course shall be maintained in a condition that will meet all specification requirements until the work is accepted.

Method of Measurement. Placement of the salvaged slope protection crushed aggregate shall be by the square yards of material actually placed and compacted in accordance with this specification and accepted by the Airport within the area limits shown on the plans.

Method of Payment. Payment for salvaged crushed aggregate slope protection shall be made at the contract unit price per square yard. This price shall be full compensation for furnishing all materials, for preparing and placing these materials including hauling, compaction, and all labor, equipment, tools, and incidentals necessary to complete the item as shown in the plans and as directed herein.

Payment will be made under:

Item SP-38.1 Haul and Place Crushed Aggregate Slope Protection – per Square Yard

39. STENCILS FOR SURFACE PAINTED SIGNS

General. Stencils shall be aluminum, 0.080 gage, and will become the property of the Owner upon completion of the project. For ease of handling, stencils shall be provided in two (2) pieces, such that no dimension exceeds eight feet (8’).

Stencils shall be sized to accommodate the painted sign dimensions shown on the plans. The shape and style of the characters shall be in accordance with FAA Advisory Circular AC 150/5340-1M, Appendix B.

Measurement and Payment. There will be no separate measurement or payment for Stencils for Surface Painted Signs, the cost for which shall be considered incidental to other items of work.

40. OVER EXCAVATION OF UNSUITABLE MATERIALS AND BACKFILL WITH SELECT MATERIAL

Work under this item consists of the Over excavation of unsuitable material, or undercut excavation, and shall consist of the removal of material that is unsuitable and unsatisfactory for use as subgrade to a depth of one foot below existing grade, or an additional depth as directed by the Engineer. The Contractor shall protect existing utilities while excavating unsuitable material. This material may be made up of rock, hardpan,

loose rock, boulders, muck, clay, wet clay and silt or other unsuitable materials.

Method of Measurement. The quantity of Over Excavation of Unsuitable Materials and Backfill with Select Material shall be the number of cubic yards measured in its original position and authorized to be removed and replaced with the material as ordered by the Engineer. Measurement of Over Excavation of Unsuitable Materials and Backfill with Select Material for payment shall be by the cubic yard of in-place volume of unsuitable material removed.

The quantity shown for bid purposes is a projected amount that could have to be replaced; the actual amount may vary based on actual field conditions at the time of construction.

Method of Payment. For Over Excavation of Unsuitable Material and Backfill with Select Materials, payment shall be made at the unit price per cubic yard. This price shall be full compensation for furnishing all materials (including geotextile fabric), labor, equipment, tools, and incidentals necessary to complete the item. It shall be understood that this allowance is an estimate only. It is further understood that authorized work, if any, may be less than the allowance item. The Over Excavation of Unsuitable Material and Backfill with Select Materials item will be measured and paid for based on the actual costs billed to the project by the contractors used to complete the work that is deemed necessary by the Owner.

Payment will be made under:

Item SP-40.1 Over Excavation of Unsuitable Materials and Backfill with Select Material (Allowance) – per Cubic Yard

41. AIRPORT SAFETY AND SECURITY (M-003)

General. The Contractor shall carry out his operations in a manner that will cause a minimum of interference with air traffic, and shall cooperate with the FAA, the City, the Phoenix Deer Valley Airport (DVT) tenants, flight schools and Fixed Base Operators, and other contractors working in the area.

All work shall be completed in accordance with the Construction Safety and Phasing Plan (CSPP) adopted for the project, the Contractor prepared Safety Plan Compliance Document (SPCD), FAA Advisory Circular 150/5370-2G or current series, and the City of Phoenix Department of Aviation's Airport Construction Safety Manual and the Supplementary Conditions, Special Provisions and Technical Specifications of these Contract Documents.

Phasing of the work will be necessary to minimize impacts on airport operations during construction. The DVT priorities for phasing of the work are shown in the CSPP Appendix E, Exhibit B.

Runways 7R/25L and 7L/25R will be closed when working in their respective Runway Safety Areas (RSA). Construction within the RSA shall take place during night time airport closures between hours specified in the CSPP, or as approved by DVT Operations Staff. The airport operations personnel will provide "Lighted X's" to mark all

runway closures in accordance with the provisions of the CSPP and the Construction Contract Documents. **All work within the Runway Safety Area will require that the runway be closed.**

The preparation of a Safety Plan Compliance Document (SPCD) by the Contractor to indicate how it will comply with the CSPP, the project Supplementary Conditions, and Special Provisions is included in the Contractor's scope of work.

Any conflicts between the CSPP, the Contract Documents and Special Provision Item 41, Airport Safety and Security (M-003) shall be reported to the Aviation Department Project Manager, DVT Aviation Supervisor and the Engineer of Record for resolution. Until resolved, the Contractor shall comply with the most stringent requirement.

The Contractor shall hold weekly airfield coordination meetings with DVT Airport Operations. Additionally, the Contractor shall meet with Airport Operations prior to the start of each shift to discuss the day's anticipated work activities.

All vehicles shall have flashing amber lights in accordance with the CSPP and Special Provision Item 41. All vehicles shall be required to have the headlights and flashing amber lights on at all times while on the airfield.

The Contractor shall be required to supply, place, maintain, move and store the items listed herein, as appropriate, to facilitate construction and protect air traffic. The Contractor shall keep on site an adequate extra supply of these items.

MATERIALS

41-2.1 Red warning lights. Red warning lights shall be flashing lights meeting the requirements of the "Manual on Uniform Traffic Control Devices for Streets and Highways" for Type A and Type B flashers or as shown in the *Airport Construction Safety Manual*. All warning lights used on the airfield shall be RED only.

41-2.2 Warning markers. (For use on roadways and service roads only) Warning markers shall be the type and size detailed on the plans or shown in the CSPP. Markers shall be equipped with a red warning light per paragraph 003-2.1.

41-2.3 Temporary Runway/Taxiway closed devices and symbol. The airport operations personnel will provide "Lighted X's" to mark all runway closures. The closed devices shall be portable lighted "X", SWEEPSTER Model LX Runway Closure Marker conforming to FAA AC 150/5345-55A *Specification for L-893 Lighted Visual Aid to Indicate Temporary Runway Closure* or approved equal.

All other temporary closure symbols, including vinyl "X's", shall be painted or applied on the pavement surface in accordance with the CSPP, plans and Civil Technical Specification Item P-620.

41-2.4 Low and medium level barrier systems. Medium and low-level barriers shall be the Airport Runway Safety Barricade Model AR-1 and AR-2 Multi-Barrier as manufactured by Off The Wall Products, LLC, or approved equal. The AR-1 barrier

medium level sections shall be eight (8) feet long and two (2) feet high and the AR-2 low level barrier sections shall be eight (8) feet long and ten (10) inches high and shall have reflective sheeting on the side facing the active airfield. Both sections shall be interlocking and shall be ballasted with water to prevent damage from jet blast. Each barricade section shall be equipped with a Model: SL-H867R Solar Powered Safety lights as manufactured by Leotek Electronics USA Corp., or approved equal. The barriers shall be furnished, maintained and relocated during each phase by the Contractor, and at the completion of the Contract they shall become property of the City.

41-2.5 Vacuum sweeper. Vacuum Sweeper shall be Tymco, Model HSP-600 or Elgin Model Crosswind, or approved equal. A sweeper and operator shall be available at all times during construction activities.

41-2.6 Safety area support. Reinforced structural steel plates, precast slabs or other approved material necessary to cover open excavation in the Runway Safety Area shall conform to Paragraph 003-5.1(1)(c)(i). Excavations that cannot be covered to provide the required protection shall be backfilled.

41-2.7 Security check points and controlled crossings. Provide as shown on the plans, in the CSPP, in Appendix A of the SPCD, and as detailed within this specification, the items necessary to control access to the Air Operations Area (AOA) through Entry Gate #2 and control crossings at active taxiways. These items include, but are not limited to the following:

1) Flaggers equipped for day time and nighttime operations.

2) Marking, symbols, barrier systems and warning markers in accordance with the CSPP and this specification.

RESPONSIBILITIES

41-3.1 Control requirements. The Contractor's responsibilities for work areas are as follows:

1) The Contractor shall be held responsible for controlling his employees, subcontractors, and their employees with regard to traffic movement. The Contractor is required to submit a Safety Plan Compliance Document (SPCD) to indicate how he/she will comply with the Construction Safety and Phasing Plan (CSPP) and how he/she will safely operate within the AOA. This SPCD shall conform to Chapter 2, Safety Plans, *Operational Safety on Airports During Construction,* AC 150/5370-2G and the Aviation Department Airport Construction Safety Manual, June 2006. It shall be submitted and approved by the Airside Operations Manager before the commencement of any construction. Information needed for preparation of the SPCD is located in AC 150/5370-2G, the CSPP and at the end of this section.

2) The Contractor shall rebuild, repair, restore, and make good at his own expense all injuries or damages to any portion of the work occasioned by his use of these facilities before completion and acceptance of his work.

3) The Contractor shall submit to the Engineer in writing a detailed work plan for each construction phase. The work plan shall include, but not be limited to, paving sequence, marking sequence, maintenance of airfield electrical and NAVAID power and control circuits. This plan shall be submitted 14 calendar days prior to the start of each construction phase. No work within the construction phase may commence until the phase work plan is approved.

4) The Contractor shall submit to the Engineer in writing a plan, by construction phase, for controlling construction equipment and vehicular movements, including material haul roads, in the Air Operations Area (AOA). This plan shall be submitted at the Pre-Construction Meeting and prior to each construction phase. No work may commence until this plan is approved by DVT Airport Operations. The plan must include material haul roads.

5) **Paved surfaces shall be kept clear at all times and specifically must be kept free from all Foreign Object Debris (FOD) which might damage aircraft.**

6) The Contractor shall prepare a security badge control plan for review by Airport Operations. The plan shall be submitted prior to or at the Pre-Construction Meeting. No work may commence until this plan is approved. The plan shall be prepared on the Contractor's company letterhead and signed by the company representative who is authorized to sign the badge applications. The plan shall describe in detail the Contractor's and/or subcontractor's plan to control badges.

7) The Contractor shall ensure that no personnel or equipment enters the active movement areas or their associated Object Free Areas without the appropriate Airport Operations escort. **Access into movement areas or Object Free Areas without an Airport Operations escort is prohibited!**

8) The Contractor will be required to coordinate his work so as to satisfy clearance requirements for arrival and departure of aircraft in compliance with the CSPP and in compliance with FAA Advisory Circular 150/5370-2G concerning Operational Safety on Airports during Construction.

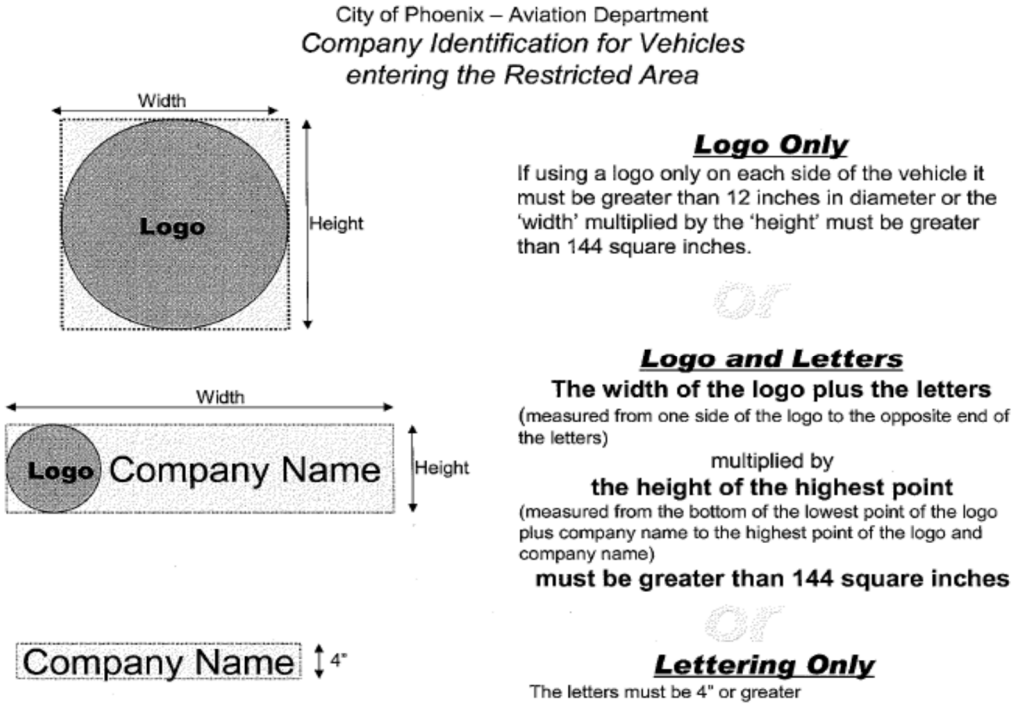
41-3.2 Vehicle and pedestrian control. Vehicle and access routes for airport construction shall be controlled as necessary to prevent inadvertent or unauthorized entry of persons, vehicles or animals onto Air Operation areas. No vehicle shall enter the AOA except at predetermined locations. The amount of construction traffic will require a flag person to control traffic crossing taxiways and other aircraft movement areas. Contractor personnel who operate vehicles in the AOA shall comply with the Airport

Operations rules and regulations for vehicle marking, lighting, and operation. Failure to comply may result in contract non-compliance costs and Notice of Violation assessments, per paragraph 003-3.10.

41-3.3 Control and warning devices. During construction operations near active taxiways or runways the Contractor shall furnish and maintain medium and low level barricades equipped with red warning lights along the edges of the runway and taxiway safety areas to warn construction equipment to stay clear of the active airfield pavement as well as warn pilots of areas having construction hazards. Per paragraph 003-2.4 barricades shall be equipped with red lights acceptable to the Airport Operations. The Contractor shall furnish and maintain warning markers with red warning lights along the edges of the runway safety area as designated and detailed on the plans. The Contractor shall maintain red warning lights and warning flags around all equipment, stockpiles, or other areas as directed by the Engineer and Airport Operations.

The Contractor shall provide the phone numbers of five (5) of its responsible personnel, including the project superintendent, and three (3) each responsible personnel, from the paving and safety subcontractors, each of whom may be contacted in an emergency. Personnel shall be on call 24 hours per day for maintaining construction hazard lighting and barricades. The Contractor shall employ watchmen to maintain and service all traffic control equipment. The project superintendent, foreman and on-site manager for the Contractor and all subcontractors shall have cell phones with a “602”, “480” or “623” area code.

41-3.4 Vehicle marking and identification. All permitted vehicles operating in the AOA shall display in full view above the vehicle a 3' x 3' or larger, orange and white checkerboard flag, each checkerboard color being 1' square. Any vehicle operating on the AOA shall be equipped with a flashing amber dome-type light, mounted on top of the vehicle and of such intensity to conform to local codes for maintenance and emergency vehicles. All vehicles operating within the airfield boundary which are approved for unescorted access shall be identified with a painted or magnetic sign on each side of the vehicle bearing the name and logo of the company. The sign shall conform to the requirements below:



Rented or leased vehicles cannot be granted unescorted access unless the above signage is placed on it. All vehicles with unescorted access must have available for inspection, when entering the Restricted area or while in the Restricted area, the current registration and proof of insurance for the vehicle.

Vehicles making only occasional visits to the job site are exempt from the identification requirements contained above provided that the Airside Operations Manager is notified and a properly identified vehicle escorts them into, through, and out of the airport secured area. These and other vehicles needing intermittent identification may be marked with tape or with magnetically attached markers that are commercially available to meet identification size and content requirements.

41-3.5 Vehicle traffic and operations. When any vehicle other than those approved for use in the AOA is required to travel to or from the work area or over any portion of the work area, shall be escorted by a vehicle properly identified to operate in the area and be provided with a flag on a staff attached to the vehicle. All construction vehicles/equipment shall have automatic signaling devices to sound an alarm when moving in reverse. All equipment shall be operated within the approved speed limits.

All vehicles and/or construction equipment operating inside the active AOA, but outside of the designated haul roads, shall be escorted by Airport Operations, who will maintain radio contact with the ATCT. Crossing the active runway shall not be permitted. Vehicular traffic routes which need to cross an active taxiway shall be coordinated in advance (at least 72 hours) with Airport Operations to ensure that proper Notices to Airmen (NOTAMs) are in place. These prearranged traffic routes must be controlled by flag-persons as detailed on the plans. Aircraft ***always*** have the right-of-way. Construction equipment shall ***always*** yield to aircraft. Construction vehicle traffic shall

never cross an active taxiway unless escorted by Airport Operations or at the pre-approved crossing points while crossing guards are stationed.

At such a pre-approved taxiway crossing point, the Contractor shall have a flag-person stationed on each side of the crossing point to monitor aircraft movement and to direct construction traffic. The flag-person shall be equipped with handheld signs or flags to assist in directing construction traffic. For nighttime construction operations, the flag-person shall also be equipped with lighted wands and light plants on each side of the taxiway. In addition, one vacuum sweeper and one water truck shall be dedicated to and stationed full time at each active taxiway crossing to maintain the surface of the taxiway free from construction traffic debris. Mud and other material tracked onto taxiway surfaces shall be removed by hand if necessary to achieve its complete removal.

Prior to entering any work site within the AOA, the Contractor will physically meet with Airport Operations to brief each other on the intended activities. The Contractor must also arrange a physical inspection of the work area with Airport Operations prior to leaving any area that has been closed for work, or that has been used for a crossing point or haul route by the Contractor.

41-3.6 Vehicle parking. All vehicles shall be parked and serviced in the designated staging and employee parking areas shown on the plans. The Contractor is responsible for transporting his/her employees from these areas to the jobsite.

41-3.7 Radio communications. The control of vehicular activity on the AOA is of the highest importance. This requires coordination with airport users and Air Traffic Control Tower (ATCT). The Contractor shall have no direct contact with the ATCT. All communications with the ATCT shall be coordinated through Airport Operations. However, the Contractor shall properly train his/her personnel, particularly flag-persons, on the proper procedures for monitoring radio frequencies.

41-3.8 Airport security requirements. The airport is operated in strict compliance with Federal, State and local rules and regulations, which prohibits unauthorized persons or vehicles in the AOA. Equipment and personnel will be restricted to the work areas defined on the plans. Any violations by Contractor’s personnel will subject the Contractor to the contract non-compliance assessments imposed by the Aviation Department.

Airport restricted areas are fenced and must remain fenced at all times. No temporary airport perimeter security fencing is required for this project. If, as the project progress, any temporary security fences and/or gates are required they shall be constructed by the Contractor according to specifications set by Airport Operations. The temporary fence and gate must be approved by Airport Operations before any of the regulated perimeter security fence may be altered. If needed, temporary fencing shall be constructed in accordance with FAA Specification F-162. The gates will remain closed and locked, or if used continuously for ingress and egress, the Contractor will provide approved guards trained by Airport Operations to monitor access to the Airport. The Contractor shall provide guards with a roster of his personnel and ensure that each individual has adequate identification. Contractor locks are not permitted on any airport gate. Gates will be staffed during shift working hours and will be secured when there is no activity at that location. The Contractor will be responsible for a 24-hour advance notification to Airport

Operations regarding the scheduling of the use of the various security check point gates. There will be a communications system for emergency responses, security breaches, etc.

Entrance to the airfield is subject to strict security regulations. All vehicles must meet minimum identification requirements and have proof of insurance on file with DVT Airport Operations.

The Contractor shall maintain the security integrity between the public and AOA. All barrier designs and their phasing shall be submitted to the Aviation Department and approved by them in writing prior to erection.

Construction personnel should wear company identification (company badge, shirt, hat, etc. which include the company logo) at all times, subject to the approval by the DVT Operations.

The Contractor shall restrict passage into the Airport Operations Area to badged persons, vehicles and equipment displaying his identification or that of the Airport. Should the Contractor wish to allow visitors, vendors or delivery through his access point, he shall provide an escort in accordance with escort procedures.

The Contractor shall be responsible to provide at his own cost a badged escort for all vehicles that do not operate on a daily basis within the AOA. Escorted vehicles shall not be left unattended. The badged escort shall remain with the escorted vehicle at all times while on the AOA and shall be escorted back and forth to the point of entry. There will be no exceptions to this requirement.

The Contractor is required to submit a plan on how he/she will safely operate within the AOA. This plan shall be submitted and approved by the DVT Airport Operations Manager before the commencement of any construction. The Contractor is required to prepare, submit for approval and maintain during construction a plan for managing Airport Access Cards for his/her employees, subcontractors or any other party recommended by the Contractor for badging. This plan shall be submitted to Airport Operations prior to the Pre-Construction Meeting.

The Contractor will contact Airport Operations**,** telephone (623) 869-0975 ten (10) days prior to start of construction to submit the necessary airport security information for all vehicles and personnel required inside the restricted area during construction.

41-3.9 Violation of responsibilities. Any violation of 003-3.1 - 003-3.8 shall be considered a violation of the Contract itself and shall be sufficient cause for halting the work without extending the time limit of the job.

41-3.10 Contract non-compliance. Due to both the safety and security precautions necessary at Phoenix Deer Valley Airport, failure of the Contractor to adhere to the prescribed requirements/regulations has consequences that may jeopardize the health, welfare and lives of the customers and employees at Phoenix Deer Valley Airport, as well as the Contractor's own employees. Therefore, if the Contractor is found to be in non-compliance with the security, airfield badging/licensing and airfield safety

requirements by either Airside Operation's Personnel or the Engineer or his representatives, the Airside Operations Division will issue Notices of Violation (NOV). The Contractor may appeal the NOV, however appeals must be made in writing, and within four (4) calendar days of the offending incident, to the City of Phoenix's Project Manager. The appeal would need to state, in sufficient detail, why the NOV/circumstances is unwarranted. A final and binding decision on the appeal will be made by the City of Phoenix's Project Management Team within ten (10) working days of receipt of the appeal, the Contractor will then be notified of this decision in writing. No further appeals to the specific NOV will be considered or accepted.

The City of Phoenix Airside Operations has the option to issue warnings on the first offense if the incident justifies it. Individuals involved in a non-compliance violation may be required to surrender their security badge and airfield driver's license pending investigations of the matter and the outcome of the possible appeal.

1) Should any violation caused by the Contractor result in an expense to the City of Phoenix, the City shall recover the total of those expenses from the Contractor. The expenses will be determined by the Aviation Department and will consist of the following:
   a) Labor hours of City staff or consultants which were devoted to investigate and resolve the violation, including overhead and labor burden mark-ups.
   b) Expenses for materials or equipment necessary to make the situation temporarily or permanently safe.
   c) Work by others, either contracts, or services, or by airlines, which were performed in order to rectify the situation.
   d) Any monetary sanctions assessed by the FAA, TSA or others

Incursions are defined as "any entrance onto an active runway, taxiway, taxilane or apron that may or may not subject any aircraft or crash fire rescue vehicle to yield, stop or change direction to avoid the sudden entrance."

The Airport's Notice of Violation (NOV) program also applies to all security badge holders and the companies they work for. Airport NOVs can result in the suspension or revocation of a companies or individual's privilege to do work at the airport. Responsibilities for security badge holders and their companies are communicated through the badge application process.

COORDINATION OF CONSTRUCTION ACTIVITIES

41-4.1 Work scheduling and accomplishment. The Contractor shall contact DVT Airport Operations each day before beginning work to coordinate the status and nature of work to be done that day. Access to work sites within the AOA will require daily coordination with Airport Operations prior to gaining access. The Contractor shall also report to Airport Operations at the end of each day to schedule the work he plans to do on the following day.

Violations of any coordination requirements shall be considered a violation of the Contract itself and shall be sufficient cause for halting the work without extending the time limit of the job.

SAFETY REQUIREMENTS

41-5.1 General. Before entering upon or crossing any runway or taxiway, or aircraft movement area, the Contractor shall receive proper clearance from DVT Airport Operations. Emergencies and operating conditions may necessitate sudden changes, both in airport operations and in the operations of the Contractor. Aircraft operations shall always have priority over any and all of the Contractor's operations. Should runways or taxiways be required for the use of aircraft and should Airport Operations deem the Contractor to be too close to active runways or taxiways the Contractor shall suspend his operations, remove his personnel, plant, equipment, and materials to a safe distance and stand by until the runways and taxiways are no longer required for use by aircraft. There will be no compensation for delays or inefficiencies due to these changes.

The Contractor shall ensure that no personnel or equipment enters into the active movement areas or their associated Object Free Area without the appropriate Airport Operations escort. **Access into movement areas or Object Free Areas without an Airport Operations escort is prohibited!**

Throughout the duration of the job, any practice or situation that Airport Operations or the Engineer determines to be unsafe or a hindrance to regular airport operations shall be immediately rectified.

Any violation of these or the following safety requirements shall be considered a violation of the Contract itself and shall be sufficient cause for halting the work without extending the time limit of the job.

(1) The following publications contain definitions/descriptions of critical airport operating areas. The areas defined below pertain to airfield safety requirements and are referenced throughout the Contract Documents. Copies of Advisory Circulars may be found at the FAA website:

http://www.faa.gov/airports_airtraffic/airports/resources/advisory_circulars/

and, Federal Aviation Regulations (FARs) can be found at:

http://www.faa.gov/regulations_policies/faa_regulations.

The Contractor is always to use the latest version of each AC or regulation.

(a) Advisory Circular 150/5370-2G, "Operational Safety on Airports During Construction" sets forth guidelines to assist airport operators in with the requirements of federally funded construction projects.

(b) FAR Part 77, "Objects Affecting Navigable Airspace," Current Edition: Establishes standards for determining obstructions to navigable airspace. Civil airport imaginary surfaces are defined in the publication. It also sets forth requirements for notice of certain proposed construction or alteration. Notice of construction provides a basis for recommendations for identifying the construction or alteration in accordance with AC 70/7460-1, "Obstruction Marking

and Lighting," Current Edition.

(c) AC 150/5300-13B, "Airport Design" Current Edition: Establishes design, operational and maintenance standards for airports. Standard terms used in the contract plans and specifications are defined below:

(i) Runway Safety Area (RSA) - The defined surface surrounding the runway over which aircraft should, in dry weather, be able to cross at normal operating speeds without incurring significant damage. A safety area is graded, drained and compacted. It is free of any holes, trenches, humps or other significant surface variations or objects, other than those which must be there because of their essential aeronautical function. The safety area requires the capability of supporting maintenance, firefighting, and rescue vehicles under normal (dry) conditions.

Prior to re-opening the runway each morning, the RSA must comply with the following:

1) The area(s) shall be able to support an aircraft at normal operating speeds without the aircraft incurring significant damage.

2) For the first 200 feet beyond the runway ends, the longitudinal grade of the RSA is between 0 and 3 percent, with any slope being downward from the runway ends. For the remainder of the RSA, the maximum allowable downward grade is 5 percent and the maximum allowable upward grade shall not penetrate the 20:1 approach surface from the end of the runway, as defined in FAR Part 77. However, limitations on longitudinal grade changes are plus or minus 2 percent per 100 feet.

3) For the RSA during construction (200 feet from runway centerline and up to 200 feet from the runway ends), the transverse grade from the edge of the runway pavement is 1.5 to 5 percent downward. For areas beyond 200 feet from the runway ends, the maximum allowable transverse grade shall be 5%, upward or downward. Transverse grade changes should be warped smoothly.

4) The maximum permissible drop-off at the edge of the runway pavement is 3 inches.

(ii) Object Free Area (OFA) – An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigations or aircraft ground maneuvering purposes.

(iii) Obstacle Free Zone (OFZ) – The OFZ is the airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance protection for aircraft landing or taking off from the runway, and for missed approaches. The OFZ is subdivided as follows:

1) Runway OFZ. The airspace above a surface centered on the runway centerline.
2) Inner-approach OFZ. The airspace above a surface centered on the extended runway centerline. It applies to runways with an approach lighting system.
3) Inner-transitional OFZ. The airspace above the surfaces located on the outer edges of the runway OFZ and the inner-approach OFZ. It applies to runways with approach visibility minimums lower than ¾-statute mile.

(iv) Taxiway Safety Area (TSA) – A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

(iv) The dimensioning of RSA's, OFA's and OFZ's are determined by the type of aircraft utilizing the runways and taxiways. AC 150/5300-13B provides detailed information for determing the required dimensioning for various safety areas. For the Phoenix Deer Valley Airport, the following are the locations of Runway and Taxiway Safety Areas, Object Free Areas and Obstacle Free Zones.

(1) Runways 7R/25L and 7L/25R: The RSA is 250 feet from each side of the runway centerline and extends 1,000 feet beyond each end of the runways. The OFA is 400 feet from each side of the runway centerline. The OFZ is 200 feet from each side of the runway centerline and beyond the ends of the runway.

(2) Group II aircraft is the Design Aircraft for Phoenix Deer Valley Airport. Workers and equipment are to provide 26' wingtip clearance during taxiing operations if Taxiway remains open to traffic. The TSA and OFA for the various groups of aircraft are:

Group II – TSA and OFA Dimensions
(a) TSA 39.5' from Taxiway Centerline
(b) OFA 65.5' from Taxiway Centerline

(5) The Contractor shall acquaint his supervisors and employees with the airport and operations that are inherent to Phoenix Deer Valley Airport and shall conduct his/her construction activities to conform to all routine and emergency air traffic requirements and guidelines for safety specified herein. **The Contractor shall be responsible for providing all safety devices as required for the protection of his personnel.**

(6) Protection of all persons shall be provided throughout the progress of the work. The work shall proceed in such a manner as to provide safe conditions for all workers and personnel. The sequence of operations shall be such that maximum protection is afforded to ensure that personnel and workers in the work area are not subject to any dangerous conditions. The Contractor must provide safety measures to guard against injury.

(7) During the performance of this contract, the airport facility shall remain in use to the

maximum extent possible. Use of areas near the Contractor's work will be controlled to minimize disturbance to the Airport's operation. The Contractor shall not allow employees, subcontractors, suppliers, or any other unauthorized person to enter or remain in any airport area which would be hazardous to persons.

(8) All work to be performed which is too close to an active runway, taxiway or apron under operational conditions shall be performed when the runway, taxiway or apron is not in use. Such work shall not be accomplished without prior permission from Airport Operations. Requested closings shall be directed to the Airport Operations in writing at least 72 hours in advance so that the proper Notice-to-Airmen (NOTAM) may be issued. Only Airport Operations have the authority to open or close runways or taxiways.

(9) The Contractor shall be aware of the following types of safety problems and/or hazards. These problems or hazards shall not be permitted. Should any of these problems or hazards arise during construction, the Contractor shall immediately rectify/correct the problem or hazard to the satisfaction of the Engineer and Airport Operations Personnel:

(a) Trenches, holes, or excavations on or adjacent to any open runway or in safety areas.

(b) Unmarked/unlighted holes or excavation in any apron, open taxiway, open taxilane, or related safety area.

(c) Mounds or piles of earth, construction materials, temporary structures, or other objects in the vicinity of any open runway, taxiway, taxilane, or in a related safety, approach, or departure area.

(d) Vehicles or equipment (whether operating or idle) on any open runway, taxiway, taxilane, or in any related safety, approach, or departure area.

(e) Vehicles, equipment, excavations, stockpiles, or other materials which could degrade or otherwise interfere with electronic signals from radios or electronic navigational aids (NAVAIDS).

(f) Runway surfacing projects resulting in excessive lips greater than 1 inch for runways and exceeding 3 inches for edges between the old shoulder and new surfaces at runway edges and ends.

(g) Unmarked utility, NAVAID, weather service, runway lighting, or other power or signal cables that could be damaged during construction.

(h) Objects (whether or not marked or flagged) or activities anywhere on or in the vicinity of the airport which could be distracting, confusing, or alarming to pilots during aircraft operations.

(i) Unflagged/unlighted low visibility items (such as tall cranes, drills, and the like) anywhere in the vicinity of active runways, or in any approach or

departure area.

(j) Misleading or malfunctioning obstruction lights or unlighted/unmarked obstructions in an approach to any open runway.

(k) Inadequate approach/departure surfaces needed to assure adequate landing/takeoff clearance over obstructions or work or storage areas.

(l) Inadequate, confusing or misleading (to user pilots) marking/lighting of runways, taxiways, or taxilanes, including displaced or relocated thresholds.

(m) Water, dirt, debris, or other transient accumulation which temporarily obscures pavement marking, pavement edges, or derogates visibility of runway/taxiway marking or lighting.

(n) Inadequate or improper methods of marking, barricading, and lighting of temporarily closed portions of AOA.

(o) Trash or other materials with foreign object damage (FOD) potential, whether on runways, taxiways, or aprons, or in related safety areas.

(p) Inadequate barricading or other marking which is placed to separate construction or maintenance areas form open aircraft operating areas.

(q) Failure to control vehicle and human access to open aircraft operating areas.

(r) Construction/maintenance activities or materials which could hamper the response of aircraft rescue and firefighting (ARFF) equipment from reaching all aircraft or any part of the runway/taxiway system, runway approach and departure areas, and aircraft parking locations.

(s) Bird attractants on airport, such as edibles (food scraps, etc.), miscellaneous trash, or ponded water.

(10) The Contractor shall conduct activities so as not to violate any safety standards contained herein. The Contractor shall inspect all construction and storage areas as often as necessary and promptly take all steps needed to prevent/remedy any unsafe or potentially unsafe conditions/activities discovered.

(11) Before actual commencement of construction activity, the Contractor shall notify Airport Operations and the Engineer in writing of his intentions to begin construction, stating the proposed time, date, and work area in order for the appropriate Notice-to-Airmen (NOTAM) to be issued. Only DVT Airport Operations have the authority to open or close runways or taxiways and to issue NOTAMs. In order to properly communicate these closures Airport Operation must receive these requests 72 hours prior to the scheduled closure. Upon completion of work and return of all related areas to standard conditions, the Contractor shall again notify Airport Operations and the Engineer in writing, and describe the area that is complete and available for normal airport operations.

(12) Debris. Debris, waste and loose material or any other FOD (including dust and dirt) capable of causing damage to aircraft landing gear, propellers or being ingested in jet engines shall not be allowed on active aircraft movement areas or adjacent infield areas. Materials observed to be within these areas shall be removed immediately and/or continuously by the Contractor. The Contractor shall be required to have a sweeping machine and operator on site, ready at all times during construction activity. Where travel on or across runways, ramp areas, taxiways, or aircraft aprons is required, the Contractor shall provide adequate personnel and equipment to keep such surfaces clear of debris at the discretion of the Engineer. Closed pavements shall be swept clean prior to reopening to aircraft traffic. Exposed earth in excavation areas within 75 feet of the centerline immediately adjacent to active taxiways shall be covered to prevent dust from jet blast. Cover material shall be weighted to prevent movement from jet blast.

(13) Flagpersons. In accordance with the specifications, the Contractor shall furnish, at his own expense, flagpersons as necessary to control his traffic unless otherwise directed by the Engineer.

(14) Trenches, Excavations and Stockpiled Material. Open trenches or excavations exceeding 3" in depth and 3" in width or stockpiled material will not be permitted within the limits of restricted areas of operational runways or taxiways. Covering for open trenches or excavations shall be of sufficient strength to support the weight of the heaviest aircraft operating on the runway or taxiway. Trenches and excavations that cannot be protected by covering shall be backfilled, and re-excavated if necessary at the end of each day or before opening the restricted area to operational use of the runway or taxiway. Open storm drain trenches, electrical duct or conduit trenches, utility trenches or any other trench shall be limited to 500-feet accumulative in length at any time. Open trenches in the runway safety area shall be properly and completely backfilled and compacted in sufficient time before the end of the work shift.

(15) Construction in Proximity to Active Runways and Taxiways.

Runway Sides: If appropriate construction/maintenance NOTAM has been issued, construction is permissible as close as 250 feet from the centerline of the active runway provided that all Airport Operations and FAA criteria are met. The 250 feet shall be clearly marked in the infield areas with approved barricades at 10-foot intervals. Runway Ends: No work will be permitted within 1,000 feet of the active runway threshold.

Taxiway Sides: If appropriate construction/maintenance NOTAM has been issued, construction is permissible as close as the dimensions shown on the Construction Safety and Phasing Plan (CSPP) provided that all Airport Operations and FAA criteria are met. This dimension(s) shall be clearly marked in the infield areas using approved barricades at 10-foot intervals. Personnel and equipment working within taxiway Object Free Areas (OFA) must at all times be able to give way to taxiing aircraft.

(16) Equipment Height Restrictions.

Maximum permissible equipment height varies by location and by construction phase. Maximum equipment height requirements are shown in the CSPP and shall not be exceeded unless prior approval is obtained from the Engineer and Airport Operations. Atop all equipment booms shall be mounted the white and orange checkered flag described in Paragraph 003-3.4. The top ten feet (10') of these booms shall be painted fluorescent orange and they shall be equipped with a red obstruction light. Any crane erections shall be coordinated with Airport Operations and the Engineer during every shift.

(17) Miscellaneous.

(a) Open flame, welding or torch cutting are prohibited unless adequate fire and safety precautions have been taken and the procedure has been approved by the Engineer.

(b) All materials and equipment when not in use shall be placed in approved areas where they will not constitute a hazard to aircraft and not penetrate clearance height restrictions as shown in the CSPP. All equipment shall be parked in the appropriate area(s) when not in use.

(c) The Contractor shall provide the Safety/Security Manager with a current list of all employees working on the airport. The list shall be maintained current by the Contractor and Subcontractors.

(d) For emergencies involving life safety (injuries, fires, security breaches, etc.), the Contractor shall immediately call 911 and simultaneously or as soon as possible contact DVT Airport Operations followed by notification to the Project Manager.

41-5.2 Closed runway and taxiway marking and lighting. Closed runway and taxiway markings shall be as shown in the CSPP. Closed runway and taxiway marking and lighting materials shall be approved for use by the Engineer prior to placement. Construction activities shall not begin until the layout of such marking and lighting has been approved by the Engineer.

41-5.3 Hazard marking. Hazard-marking barricades, flashers, etc. should be used: to identify and define the limits of construction making them visible to aircraft, personnel, or vehicles; to identify hazards such as open manholes, small areas under repair, stockpiled material, waste areas, etc.; to prevent aircraft from taxiing onto a closed runway for takeoff; and to identify FAA, airport, and National Weather Service facilities, cables, power lines and other sensitive areas to prevent damage, interference, and facility shutdown.

Traffic Cones shall not be used at any time on the Air Operations Area.

Hazardous areas, in which no part of an aircraft may enter, should be indicated by the use of barricades marked with diagonal, alternating orange and white reflective stripes.

During reduced visibility or night hours, the barricades should be supplemented with flashing red lights. The intensity of the lights and spacing for barricades, flags, and lights should be adequate to delineate the hazardous area without ambiguity. The Contractor shall have a designated person on call 24 hours a day for emergency maintenance of airport hazard lighting and barricades.

41-5.4 Construction area marking and lighting. Low profile lights, retroreflective taxiway edge markers, low level barriers, and warning flags shall be provided and erected by the Contractor as shown in the CSPP or as directed by the Engineer. All construction areas, including closed runways and taxiways, should be clearly and visibly separated from active air operation areas. Hazard areas, facilities, cables, and power lines should also be clearly identified by the Contractor. The Contractor is responsible for maintaining the condition and visibility of all markers identifying above-mentioned areas and that marking and lighting aids remain in place. Appropriate barriers, lights and signs should be used as necessary to clearly separate all construction/maintenance areas from other parts of the AOA. All barricades, temporary markers, flag line supports, and other objects placed and left in safety areas on any open runway, taxiway, or taxilane should be: as low as possible to the ground; of low mass; easily collapsible upon contact with an aircraft or any of its components; weighted down or sturdily attached to the surface to prevent displacement from prop wash, jet blast, wing vortex, or other surface wind currents; and if affixed to the surface, frangible at ground level.

41-5.5 Construction near navigational aids. Construction materials and equipment shall not be placed or parked where they may interfere with the line-of-sight of the ATCT and navigational aids in operation. DVT Operations shall determine if any materials or equipment will cause any type of interference.

41-5.6 Construction site access and haul roads. The Contractor will not be permitted to use any access or haul roads other than those designated on the contract drawings. The Contractor should submit specific proposed ingress and egress routes associated with specific construction activities to the Engineer for evaluation and approval prior to commencing construction activities. Aircraft Rescue and Firefighting (ARFF) right-of-way on access roads, haul roads, taxiways, and runways shall not be impeded at any time.

41-5.7 Trenches and excavations. Gaps or holes between paving lanes, open trenches or excavations are not permitted within an operational runway safety area. Coverings for open trenches or excavations such as reinforced structural steel plates, precast slabs or other methods should be of sufficient strength to meet the requirements of the RSA found in Paragraph 41-5.1(1)(c). Open trenches and excavations at the construction site outside of the RSA should be prominently marked with red or orange flags, as approved by the Engineer, and lighted with red light units during hours of restricted visibility or darkness.

Excavations and open trenches may be permitted up to the edge of structural taxiways provided the drop-off is adequately signed, marked, and lighted and the appropriate NOTAM is issued.

41-5.8 Construction materials stockpiling and equipment storage. There shall not be any equipment storage in the active runway and active taxiway safety areas or in the

infield areas. The Contractor shall remove pavers and other equipment from the active Runway and Taxiway Object Free Areas (OFA) including the infields (staging on apron areas will be allowed with prior approval) before re-opening the runway or taxiway. Stockpiled material or equipment should not be stored near aircraft turning areas or operational movement areas, aprons, or excavations and trenches. Stockpiled materials shall not be stored near NAVAIDs, visual or approach aids, nor shall they obstruct the ATCT's line of sight to any runway or taxiway. The Contractor shall ensure that stockpiled construction materials and equipment do not cause degraded or hazardous conditions to airport operations safety. This includes determining and verifying that stockpiled materials and equipment are stored or parked at an approved location, that they are properly stowed to prevent foreign object debris (FOD), attraction by wildlife, or obstruction of air operations either by their proximity to NAVAIDs or to aircraft movement areas.

41-5.9 Other limitations on construction. Open flame welding or torch cutting operations are prohibited unless adequate fire and safety precautions are provided and have been approved for use by the Engineer. Under no circumstances should flare pots be used near aircraft turning areas.

41-5.10 Foreign object debris (FOD) management. Waste and loose materials capable of causing damage to aircraft landing gear or propellers or capable of being ingested in jet engines should not be left or placed on or near active aircraft movement areas. Materials tracked onto these areas should be continuously removed during the construction project. It is also recommended that waste or loose materials which would attract wildlife be carefully controlled and removed on a continuous basis.

41-5.11 Runways and taxiways. Nothing shall be placed upon runways, taxiways, taxilanes, or aprons without authorization from Airport Operations.

41-6.1 Contractor quality control. The Contractor shall be responsible for developing and implementing a Safety Plan Compliance Document including inspections necessary to assure compliance with the requirements of this section and the approved Construction Safety and Phasing Plan.

METHOD OF MEASUREMENT

41-7.1 All items specified in this section will be measured as one lump sum.

41-7.2 Measurement and payment for "Landside Traffic Control" and for Uniform Off-Duty Officer as specified in Section III-2 Technical Special Provision Section 1.1 (if included) is incidental to Special Provision Item 41 Airport Safety and Security (M-003).

BASIS OF PAYMENT

41-8.1 Airport safety and security shall be paid for at the contract lump sum price in a proportionate manner, on the basis of current estimates. This price shall constitute full compensation for furnishing material and equipment, including but not limited to flagpersons, temporary gates, warning markers, temporary drainage items, low level barriers, other traffic control devices and necessary equipment, safety area support

material, and other material and equipment list herein, and the maintenance thereof and all other labor, materials, equipment, tools and incidentals including Landside Traffic Control and Uniform off-duty Officers necessary to accomplish this item.

Payment will be made under:

Item SP-41-8.1 Airport Safety and Security (M-003) – per lump sum

42. LOCATION OF UNDERGROUND UTILITIES (U-200)

Scope. This Item shall govern the field location of all underground existing utilities in areas to be improved, to avoid conflicts with proposed surface or underground improvements. Work under this section shall include designation and potholing as required on existing underground utilities. This shall include, but not be limited to, the location of electrical and communication ducts, airfield lighting and control cables, FAA NAVAID cables and environmental infrastructure. It is the intent of this specification to provide for the location of existing utilities and, by hand digging, particularly of direct burial cables and duct banks.

General Requirements. The contractor is hereby advised that the location of all utilities, as shown on the Plans, may not be complete or exact. The Contractor shall satisfy himself/herself as to the exact location of the utilities by contacting all utility companies before proceeding with the work and by having a private utility locating firm locate and identify all utilities at the work site prior to any construction. The Contractor shall be responsible for any and all costs as a result of damage caused by construction activities to public / private property and utilities.

CONSTRUCTION METHODS

General.

- **a.** Utilities, utility appurtenances and cables encountered by the Contractor during the construction of this project shall be protected by the Contractor as needed to permit construction and to conform to the finished grades on the project. Use of mechanical equipment of any kind to verify a utility location is expressly prohibited. The Contractor shall immediately repair any damaged utilities at his own expense.
- **b.** Coordinate all contacts with companies maintaining utilities at the Airport through the Resident Project Representative (RPR) prior to any excavation/digging. Provide the RPR with written documentation of how utility locations were verified.
- **c.** Continuously maintain utilities for facilities and/or systems which are or may be affected by work associated with the project. Prepare and maintain a contingency plan, approved by the RPR, to restore to service all utilities and/or control/signal cables which may be placed out of service or damaged during performance of the work. The Contractor shall provide the RPR, DVT Operations and FAA Sector Manager with written reports on all cable cuts.
- **d.** Take all measures necessary to accurately locate all the routing of underground cable and utilities within project areas to be excavated, trenched or drilled. Contractor shall locate underground cables and utilities by

designation, and where necessary, potholing and/or hand digging. Once located, place highly visible and durable markers along all such cable and utility route at intervals of not greater than 25 feet. The Contractor shall maintain these markers in their original location throughout the project. The Contractor shall also be responsible for providing and maintaining a field survey and plan of the maker locations and shall replace any disturbed markers at his own expense. Do not use power equipment with teeth when excavating where cables are marked. Obtain RPR approval of proposed marking devices. Use semi-permanent markers which are low profile, frangible and non-metallic within runway/taxiway safety areas and navigational and restricted zones.

e. Utilities located by potholing and/or hand digging shall be surveyed by the Contractor. Coordinates and elevations shall be submitted to the RPR and marked on the Contractor maintained record drawings.

CONTRACTOR QUALITY CONTROL

42-3.1 The Contractor shall be responsible for developing and implementing a Contractor Quality Control Program including inspection and testing to assure compliance with the requirements of this section in accordance with Civil Technical Specification Item C-100.

METHOD OF MEASUREMENT

42-4.1 All items of work specified in this section will be measured as one lump sum.

BASIS OF PAYMENT

42-5.1 Payment for location of underground utilities, measured as prescribed above, shall be paid as one lump sum. Such payment shall be full compensation for furnishing all labor, equipment, tools and materials and for all designation, preparation, excavation, backfilling and placing of materials; and for all incidentals necessary

Payment will be made under:

Item SP-42-5.1 Location of Underground Utilities (U-200) – per lump sum

END OF TECHNICAL SPECIAL PROVISION SPECIFICATIONS

SECTION III-C

CIVIL TECHNICAL SPECIFICATIONS

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Item C-100 Contractor Quality Control Program (CQCP)

100-1 General. Quality is more than test results. Quality is the combination of proper materials, testing, workmanship, equipment, inspection, and documentation of the project. Establishing and maintaining a culture of quality is key to achieving a quality project. The Contractor shall establish, provide, and maintain an effective Contractor Quality Control Program (CQCP) that details the methods and procedures that will be taken to assure that all materials and completed construction required by this contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors. Although guidelines are established and certain minimum requirements are specified here and elsewhere in the contract technical specifications, the Contractor shall assume full responsibility for accomplishing the stated purpose.

The Contractor shall establish a CQCP that will:

- **a.** Provide qualified personnel to develop and implement the CQCP.
- **b.** Provide for the production of acceptable quality materials.
- **c.** Provide sufficient information to assure that the specification requirements can be met.
- **d.** Document the CQCP process.

The Contractor shall not begin any construction or production of materials to be incorporated into the completed work until the CQCP has been reviewed and approved by the Resident Project Representative (RPR). No partial payment will be made for materials subject to specific quality control (QC) requirements until the CQCP has been reviewed and approved.

The QC requirements contained in this section and elsewhere in the contract technical specifications are in addition to and separate from the quality assurance (QA) testing requirements. QA testing requirements are the responsibility of the RPR or Contractor as specified in the specifications.

A Quality Control (QC)/Quality Assurance (QA) workshop with the Engineer, Resident Project Representative (RPR), Contractor, subcontractors, testing laboratories, and Owner's representative must be held prior to start of construction. The QC/QA workshop will be facilitated by the Contractor. The Contractor shall coordinate with the Airport and the RPR on time and location of the QC/QA workshop. Items to be addressed, at a minimum, will include:

- **a.** Review of the CQCP including submittals, QC Testing, Action & Suspension Limits for Production, Corrective Action Plans, Distribution of QC reports, and Control Charts.
- **b.** Discussion of the QA program.
- **c.** Discussion of the QC and QA Organization and authority including coordination and information exchange between QC and QA.
- **d.** Establish regular meetings to discuss control of materials, methods and testing.
- **e.** Establishment of the overall QC culture.

100-2 Description of program.

a. General description. The Contractor shall establish a CQCP to perform QC inspection and testing of all items of work required by the technical specifications, including those performed by subcontractors. The CQCP shall ensure conformance to applicable specifications and plans with respect to materials, off-site fabrication, workmanship, construction, finish, and functional performance. The CQCP shall be effective for control of all construction work performed under this Contract and shall specifically include surveillance and tests required by the technical specifications, in addition to other requirements of this section and any other activities deemed necessary by the Contractor to establish an effective level of QC.

b. Contractor Quality Control Program (CQCP). The Contractor shall describe the CQCP in a written document that shall be reviewed and approved by the RPR prior to the start of any production, construction, or off-site fabrication. The written CQCP shall be submitted to the RPR for review and approval at least 21 calendar days before the CQCP Workshop. The Contractor's CQCP and QC testing laboratory must be approved in writing by the RPR prior to the Notice to Proceed (NTP).

The CQCP shall be organized to address, as a minimum, the following:

1. QC organization and resumes of key staff
2. Project progress schedule
3. Submittals schedule
4. Inspection requirements
5. QC testing plan
6. Documentation of QC activities and distribution of QC reports
7. Requirements for corrective action when QC and/or QA acceptance criteria are not met
8. Material quality and construction means and methods. Address all elements applicable to the project that affect the quality of the pavement structure including subgrade, subbase, base, and surface course. Some elements that must be addressed include, but is not limited to mix design, aggregate grading, stockpile management, mixing and transporting, placing and finishing, quality control testing and inspection, smoothness, laydown plan, equipment, and temperature management plan.

The Contractor must add any additional elements to the CQCP that is necessary to adequately control all production and/or construction processes required by this contract.

100-3 CQCP organization. The CQCP shall be implemented by the establishment of a QC organization. An organizational chart shall be developed to show all QC personnel, their authority, and how these personnel integrate with other management/production and construction functions and personnel.

The organizational chart shall identify all QC staff by name and function, and shall indicate the total staff required to implement all elements of the CQCP, including inspection and testing for each item of work. If necessary, different technicians can be used for specific inspection and testing functions for different items of work. If an outside organization or independent testing laboratory is used for implementation of all or part of the CQCP, the personnel assigned shall be subject to the qualification requirements of paragraphs 100-03a and 100-03b. The

organizational chart shall indicate which personnel are Contractor employees and which are provided by an outside organization.

The QC organization shall, as a minimum, consist of the following personnel:

a. Program Administrator. The Contractor Quality Control Program Administrator (CQCPA) must be a full-time employee of the Contractor, or a consultant engaged by the Contractor. The CQCPA must have a minimum of five (5) years of experience in QC pavement construction with prior QC experience on a project of comparable size and scope as the contract.

Included in the five (5) years of paving/QC experience, the CQCPA must meet at least one of the following requirements:

(1) Professional Engineer with one (1) year of airport paving experience.

(2) Engineer-in-training with two (2) years of airport paving experience.

(3) National Institute for Certification in Engineering Technologies (NICET) Civil Engineering Technology Level IV with three (3) years of airport paving experience.

(4) An individual with four (4) years of airport paving experience, with a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology or Construction.

The CQCPA must have full authority to institute any and all actions necessary for the successful implementation of the CQCP to ensure compliance with the contract plans and technical specifications. The CQCPA authority must include the ability to immediately stop production until materials and/or processes are in compliance with contract specifications. The CQCPA must report directly to a principal officer of the construction firm. The CQCPA may supervise the Quality Control Program on more than one project provided that person can be at the job site within two (2) hours after being notified of a problem.

b. QC technicians. A sufficient number of QC technicians necessary to adequately implement the CQCP must be provided. These personnel must be either Engineers, engineering technicians, or experienced craftsman with qualifications in the appropriate field equivalent to NICET Level II in Civil Engineering Technology or higher, and shall have a minimum of two (2) years of experience in their area of expertise.

The QC technicians must report directly to the CQCPA and shall perform the following functions:

(1) Inspection of all materials, construction, plant, and equipment for conformance to the technical specifications, and as required by paragraph 100-6.

(2) Performance of all QC tests as required by the technical specifications and paragraph100-8.

(3) Performance of tests for the RPR when required by the technical specifications.

Certification at an equivalent level of qualification and experience by a state or nationally recognized organization will be acceptable in lieu of NICET certification.

c. Staffing levels. The Contractor shall provide sufficient qualified QC personnel to monitor each work activity at all times. Where material is being produced in a plant for incorporation into the work, separate plant and field technicians shall be provided at each plant and field placement location. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity. The CQCP shall state where different technicians will be required for different work elements.

100-4 Project progress schedule. Critical QC activities must be shown on the project schedule as required by Section 80, paragraph 80-03, *Execution and Progress*.

100-5 Submittals schedule. The Contractor shall submit a detailed listing of all submittals (for example, mix designs, material certifications) and shop drawings required by the technical specifications. The listing can be developed in a spreadsheet format and shall include as a minimum:

a. Specification item number

b. Item description

c. Description of submittal

d. Specification paragraph requiring submittal

e. Scheduled date of submittal

100-6 Inspection requirements. QC inspection functions shall be organized to provide inspections for all definable features of work, as detailed below. All inspections shall be documented by the Contractor as specified by paragraph 100-9.

Inspections shall be performed as needed to ensure continuing compliance with contract requirements until completion of the particular feature of work. Inspections shall include the following minimum requirements:

a. During plant operation for material production, QC test results and periodic inspections shall be used to ensure the quality of aggregates and other mix components, and to adjust and control mix proportioning to meet the approved mix design and other requirements of the technical specifications. All equipment used in proportioning and mixing shall be inspected to ensure its proper operating condition. The CQCP shall detail how these and other QC functions will be accomplished and used.

b. During field operations, QC test results and periodic inspections shall be used to ensure the quality of all materials and workmanship. All equipment used in placing, finishing, and compacting shall be inspected to ensure its proper operating condition and to ensure that all such operations are in conformance to the technical specifications and are within the plan dimensions, lines, grades, and tolerances specified. The CQCP shall document how these and other QC functions will be accomplished and used.

100-7 Contractor QC testing facility.

a. For projects that include Item P-401, Item P-403, and Item P-404, the Contractor shall ensure facilities, including all necessary equipment, materials, and current reference standards, are provided that meet requirements in the following paragraphs of ASTM D3666, *Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials*:

- 8.1.3 Equipment Calibration and Checks;
- 8.1.9 Equipment Calibration, Standardization, and Check Records;
- 8.1.12 Test Methods and Procedures

b. For projects that include P-501, the Contractor shall ensure facilities, including all necessary equipment, materials, and current reference standards, are provided that meet requirements in the following paragraphs of ASTM C1077, Standard Practice for Agencies

Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation:

- 7 Test Methods and Procedures
- 8 Facilities, Equipment, and Supplemental Procedures

100-8 QC testing plan. As a part of the overall CQCP, the Contractor shall implement a QC testing plan, as required by the technical specifications. The testing plan shall include the minimum tests and test frequencies required by each technical specification Item, as well as any additional QC tests that the Contractor deems necessary to adequately control production and/or construction processes.

The QC testing plan can be developed in a spreadsheet fashion and shall, as a minimum, include the following:

a. Specification item number (e.g., P-401)

b. Item description (e.g., Hot Mix Asphalt Pavements)

c. Test type (e.g., gradation, grade, asphalt content)

d. Test standard (e.g., ASTM or American Association of State Highway and Transportation Officials (AASHTO) test number, as applicable)

e. Test frequency (e.g., as required by technical specifications or minimum frequency when requirements are not stated)

f. Responsibility (e.g., plant technician)

g. Control requirements (e.g., target, permissible deviations)

The QC testing plan shall contain a statistically-based procedure of random sampling for acquiring test samples in accordance with ASTM D3665. The RPR shall be provided the opportunity to witness QC sampling and testing.

All QC test results shall be documented by the Contractor as required by paragraph 100-9.

100-9 Documentation. The Contractor shall maintain current QC records of all inspections and tests performed. These records shall include factual evidence that the required QC inspections or tests have been performed, including type and number of inspections or tests involved; results of inspections or tests; nature of defects, deviations, causes for rejection, etc.; proposed remedial action; and corrective actions taken.

These records must cover both conforming and defective or deficient features, and must include a statement that all supplies and materials incorporated in the work are in full compliance with the terms of the contract. Legible copies of these records shall be furnished to the RPR daily. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the CQCPA.

Contractor QC records required for the contract shall include, but are not necessarily limited to, the following records:

a. Daily inspection reports. Each Contractor QC technician shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations. These technician's daily reports shall provide factual evidence that continuous QC inspections have been performed and shall, as a minimum, include the following:

(1) Technical specification item number and description

(2) Compliance with approved submittals
(3) Proper storage of materials and equipment
(4) Proper operation of all equipment
(5) Adherence to plans and technical specifications
(6) Summary of any necessary corrective actions
(7) Safety inspection.
(8) Photographs and/or video

The daily inspection reports shall identify all QC inspections and QC tests conducted, results of inspections, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed.

The daily inspection reports shall be signed by the responsible QC technician and the CQCPA. The RPR shall be provided at least one copy of each daily inspection report on the work day following the day of record. When QC inspection and test results are recorded and transmitted electronically, the results must be archived.

b. Daily test reports. The Contractor shall be responsible for establishing a system that will record all QC test results. Daily test reports shall document the following information:

(1) Technical specification item number and description
(2) Test designation
(3) Location
(4) Date of test
(5) Control requirements
(6) Test results
(7) Causes for rejection
(8) Recommended remedial actions
(9) Retests

Test results from each day's work period shall be submitted to the RPR prior to the start of the next day's work period. When required by the technical specifications, the Contractor shall maintain statistical QC charts. When QC daily test results are recorded and transmitted electronically, the results must be archived.

100-10 Corrective action requirements. The CQCP shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of control (out of tolerance) and detail what action will be taken to bring the process into control. The requirements for corrective action shall include both general requirements for operation of the CQCP as a whole, and for individual items of work contained in the technical specifications.

The CQCP shall detail how the results of QC inspections and tests will be used for determining the need for corrective action and shall contain clear rules to gauge when a process is out of control and the type of correction to be taken to regain process control.

When applicable or required by the technical specifications, the Contractor shall establish and use statistical QC charts for individual QC tests. The requirements for corrective action shall be linked to the control charts.

100-11 Inspection and/or observations by the RPR. All items of material and equipment are subject to inspection and/or observation by the RPR at the point of production, manufacture or

shipment to determine if the Contractor, producer, manufacturer or shipper maintains an adequate QC system in conformance with the requirements detailed here and the applicable technical specifications and plans. In addition, all items of materials, equipment and work in place shall be subject to inspection and/or observation by the RPR at the site for the same purpose.

Inspection and/or observations by the RPR does not relieve the Contractor of performing QC inspections of either on-site or off-site Contractor's or subcontractor's work.

100-12 Noncompliance.

a. The Resident Project Representative (RPR) will provide written notice to the Contractor of any noncompliance with their CQCP. After receipt of such notice, the Contractor must take corrective action.

b. When QC activities do not comply with either the CQCP or the contract provisions or when the Contractor fails to properly operate and maintain an effective CQCP, and no effective corrective actions have been taken after notification of non-compliance, the RPR will recommend the Owner take the following actions:

(1) Order the Contractor to replace ineffective or unqualified QC personnel or subcontractors and/or

(2) Order the Contractor to stop operations until appropriate corrective actions are taken.

METHOD OF MEASUREMENT

100-13 Basis of measurement and payment. Contractor Quality Control Program (CQCP) is for the personnel, tests, facilities and documentation required to implement the CQCP. The CQCP will be paid as a lump sum with the following schedule of partial payments:

a. With first pay request, 25% with approval of CQCP and completion of the Quality Control (QC)/Quality Assurance (QA) workshop.

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 20%.

d. When 75% or more of the original contract is earned, an additional 20%

e. After final inspection and acceptance of project, the final 10%.

BASIS OF PAYMENT

100-14 Payment will be made under:

Item C-100	Contractor Quality Control Program (CQCP) – per lump sum

REFERENCES

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

National Institute for Certification in Engineering Technologies (NICET)

ASTM International (ASTM)

ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D3666	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

END OF ITEM C-100

Item C-102 Temporary Air and Water Pollution, Soil Erosion, and Siltation Control

DESCRIPTION

102-1.1 GENERAL. This project is subject to the terms and conditions of Arizona Pollutant Discharge Elimination System (AZPDES) General Permit No. AZG2013-001 for Storm Water Discharges from Construction Activities. Under the provisions of the AZPDES General Permit, both the City of Phoenix and the Contractor shall be designated as operators, and both must ensure compliance with the terms and conditions of the AZPDES General Permit. AZPDES General Permit No. AZG2013-001 was issued by the Arizona Department of Environmental Quality (ADEQ) on May 29, 2013 and expires at midnight of June 2, 2018.

Work under this item shall consist of preparing all required documents and certifications, performing inspections, and furnishing all materials, labor, and equipment necessary to comply with all requirements of AZPDES General Permit No. AZG2013-001 for Storm Water Discharges from Construction Activities. The work shall also include providing, installing, maintaining, removing and disposing of erosion and sediment control measures such as gravel filter berms, dikes, catch basin inlet protection, end-of pipe filtering devices, silt fences, dams, sediment traps and basins, netting, straw bale barriers, slope drains, and other erosion control devices or methods.

PERMIT REQUIREMENTS

102-2.1 Please note that the terms and conditions of AZPDES General Permit No. AZG2013-001, except to the extent that more explicit or more stringent requirements are written directly into the contract documents, have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith.

Both the City of Phoenix and the Contractor are designated as operators of the construction site, and both must complete a Notice of Intent (NOI) to comply with the terms and conditions of AZPDES General Permit No. AZG2013-001 for Storm Water Discharges from Construction Activities. The NOIs must be signed in accordance with the signatory requirements of the AZPDES General Permit and must contain all required eligibility certifications. The Project Manager for the City of Phoenix will ensure that both the Contractor’s and the City’s completed and signed NOIs are submitted to the ADEQ. A blank NOI form is attached to these project specifications for use by the Contractor.

It shall be the responsibility of both the City of Phoenix and the Contractor to prepare a joint Storm Water Pollution Prevention Plan (SWPPP) and ensure its compliance with the minimum conditions of the AZPDES General Permit, including measures to protect impaired or unique waters, measures to protect threatened and/or endangered species, and measures to protect properties eligible for protection under the National Historic Preservation Act. The SWPPP must reflect the Contractor’s entire scope of activities at the job site as anticipated for the duration of the construction activities. The Contractor must indicate in the SWPPP those changes in job site requirements and/or the order of work performance that will require modifications to the SWPPP and include those modifications in the SWPPP.

Once completed, it shall be the responsibility of the City of Phoenix to review and approve the joint SWPPP prior to the start of work. The preconstruction conference shall not be held and the Contractor shall not be allowed to start work until the City of Phoenix has approved the SWPPP as being adequate and in accordance with the requirements of the AZPDES General Permit. The City of Phoenix shall approve or not approve the SWPPP within seven (7) calendar days after receipt of the SWPPP from the Contractor for purposes of review. Failure of the Contractor and the City of Phoenix to reach agreement on the adequacy of the SWPPP prior to the preconstruction conference will delay the start of work. The Contractor shall not be entitled to additional compensation for costs that result from such delay in the construction start date.

The SWPPP is not to be submitted to the ADEQ unless directed to do so by the City's Project Manager or in response to a direct request from the ADEQ Director (or authorized representative). If the SWPPP must be submitted to the ADEQ for review and approval, authorization to discharge under the AZPDES General Permit may be withheld by ADEQ for up to thirty-two (32) business days after receipt of the SWPPP.

It shall be the responsibility of the Contractor to implement the SWPPP and ensure day-to-day compliance with the terms and conditions of the SWPPP and the AZPDES General Permit. The Contractor shall, with the approval of the City's Project Manager, update and revise the SWPPP as necessary throughout the duration of the project to ensure compliance with the AZPDES General Permit requirements.

The Contractor shall retain a copy of the SWPPP and the AZPDES General Permit at a central location on the job site for the use of all operators whenever they are on the construction site. A copy of the signed SWPPP must be retained on the construction site or at another location easily accessible during normal working hours.

All subcontractors and construction site operators having control over only a portion of the construction site shall comply with the requirements of the AZPDES General Permit and the common SWPPP under the supervision of the Contractor. The Contractor shall ensure that all partial site operators having day-to-day operational control of activities necessary to ensure compliance with the SWPPP or other permit requirements submit NOIs to ADEQ as required by the AZPDES General Permit. Subcontractors and partial site operators shall ensure that their activities do not render any other party's pollution prevention plan measures ineffective.

The Contractor shall obtain and incorporate into the SWPPP copies of all NOIs required by the AZPDES General Permit. The Contractor shall ensure that all required documents are complete and accurate, and all required NOIs are received by ADEQ at least two (2) business days before a contractor, subcontractor, or partial site operator is allowed to perform any work at the construction site.

The Contractor shall submit the Contractor's completed and signed NOI form to the ADEQ at the following address:

Arizona Department of Environmental Quality
Water Permits Section/Stormwater NOI (5415 B-3)
1110 West Washington Street
Phoenix, Arizona 85007
Or fax to (602) 771-4674

The Contractor shall provide a copy of the Contractor's completed and signed NOI form to the City's Project Manager at the preconstruction conference. The City's Project Manager shall ensure that a copy of the Contractor's completed NOI form along with a copy of the City's completed NOI form is incorporated into the SWPPP.

Failure by the Contractor to provide copies of the required completed NOI forms by the time of the preconstruction conference shall cause a delay in the construction start date. The Contractor shall not be entitled to additional compensation for costs that result from such delay in the construction start date.

The Project Manager for the City of Phoenix shall also send copies of the completed NOI forms to:

Development Services Department
City of Phoenix
200 West Washington Street, 3rd Floor
Phoenix, Arizona 85003-1611

The Contractor must submit an amended NOI if ADEQ provides notification that the previously submitted NOI is incomplete. The amended NOI must be submitted to the ADEQ, the City's Project Manager, and if so directed by the City's Project Manager, to the Development Services Department.

The Contractor may assume coverage under the AZPDES General Permit two (2) business days after receipt of the NOI by ADEQ; unless ADEQ provides notification that the NOI needs additional evaluation. Such notification may be made in writing, electronically, by fax, or by phone; and will typically be made within two (2) business days after receipt of the NOI. The Contractor cannot assume coverage under the permit and must delay the start of construction for a period of thirty-two (32) business days after receipt of the NOI by ADEQ, unless additional notice is received from ADEQ during this time period. If there is no additional notice, the Contractor may assume coverage under the AZPDES General Permit and initiate construction activities at the end of the 32 business days.

STORM WATER POLLUTION PREVENTION PLAN (SWPPP) REQUIREMENTS

102-3.1 The SWPPP must be prepared prior to submitting the NOI to ADEQ for coverage under AZPDES General Permit, and the Contractor must implement the SWPPP as written from the initial commencement of construction activity until final stabilization is complete. The SWPPP must be prepared in accordance with good engineering practice, and must:

a. Identify potential sources of pollution which may reasonably be expected to affect the quality of storm water discharges from the construction site;

b. Identify, describe and ensure implementation of best management practices (BMPs) that will be used to reduce the amount of pollutants in storm water discharges from the construction site;

c. Assure compliance with the terms and conditions of AZPDES General Permit No. AZG2013-001 for Storm Water Discharges from Construction Activities; and

d. Identify the party responsible for on-site implementation of the SWPPP.

Specific requirements for the contents of the SWPPP include identification of all operators of the project site, and the areas over which each operator has control. The SWPPP must also provide a description of the nature of the construction activity that includes:

a. A description of the project and its intended use after the Notice of Termination (NOT) is filed (e.g. a municipal park, a municipal building, high density housing, a city street, a water treatment plant, a municipal airport, etc.);

b. A description of the intended sequence of activities that disturb the soil at the site (e.g. grubbing, excavation, grading, utilities, infrastructure installation, etc.);

c. The total area of the site, and an estimate of the total area of the site expected to be disturbed by excavation, grading, or other activities, including off-site barrow and fill areas;

d. An estimate of the runoff coefficient of the site for both the pre-construction and post-construction conditions, and data describing the soil and any existent data on the quality of any discharge from the site;

e. A general location map (e.g. U.S.G.S quadrangle map, a portion of a city or county map, or other map) with enough detail to identify the location of the construction site and the receiving waters within one mile of the site.

The SWPPP must contain a legible site map completed to scale that shows the entire site, and identifies:

a. The directions of storm water flow (e.g. use arrows to show which way or ways storm water will flow on, through, and off the site), and the approximate slopes anticipated after major grading activities;

b. Areas of soil disturbance and areas of no soil disturbance;

c. Locations of structural and non-structural controls identified in the SWPPP;

d. Locations where stabilization practices are expected to occur;

e. Locations of off-site material, waste, borrow areas, or equipment storage areas;

f. Locations of all surface water bodies (including wetlands);

g. Locations where storm water discharges to surface water (including dry washes) and to the City's storm sewer system;

h. Locations and registration numbers of on-site drywells;

i. Areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.

The SWPPP must identify the nearest receiving water or waters, including ephemeral and intermittent streams, dry sloughs, and arroyos. If applicable, the SWPPP must also identify the areal extent and describe any wetlands near the site that could be disturbed or that could potentially receive discharges from the disturbed areas of the project.

The SWPPP must identify the location and describe any storm water or non-storm water discharges at the site associated with activity other than construction and other pollutant sources, such as fueling operations, on-site material storage areas, waste piles, etc. This includes discharges from dedicated asphalt plants and dedicated concrete plants that are covered by the AZPDES General Permit.

The SWPPP must identify and address off-site storage areas or borrow areas that are used solely for this construction project.

The SWPPP must describe all pollution control measures that will be implemented as part of the construction project to control pollutants in storm water discharges. For each major activity identified in the project description, the SWPPP must clearly describe appropriate control measures; the general sequence during the construction process when the measures will be implemented; and identify the construction site operator responsible for the implementation of the described control measures.

Off-site material storage areas (including overburden and stockpiles of dirt, borrow areas, etc.) used solely by the Contractor for the permitted construction project are considered a part of the project and must be addressed in the SWPPP.

For purposes of controlling erosion and sediment, the SWPPP must address the following:

a. Erosion and sediment controls must be designed to retain sediment on the construction site to the extent practicable.

b. All control measures must be properly selected, installed, and maintained per the manufacturer's specifications and good engineering practices. If periodic inspections or information is discovered that indicates a control has been used inappropriately, or installed incorrectly, the Contractor must replace or modify the control for site situations as soon as practicable and before the next anticipated storm event.

c. When sediment escapes the construction site, off-site accumulations of sediment must be routinely removed at a frequency sufficient to ensure no adverse effects on water quality.

d. The SWPPP must describe good housekeeping procedures to prevent litter, construction debris, and construction chemicals exposed to storm water from becoming a pollutant source for storm water discharges.

e. The SWPPP must include a description of and identify interim and permanent stabilization practices for the construction site, including a schedule of when the practices will be implemented. The SWPPP shall document those areas where existing vegetation will be preserved.

f. The Contractor must initiate stabilization measures within 14 calendar days in those areas where construction activities have temporarily or permanently ceased, except:

g. Where stabilization by the 14th day is precluded by snow cover or frozen ground conditions, stabilization measures must be initiated as soon as practicable.

h. Where construction activity on a portion of the site has temporarily ceased, but earth disturbing activities will resume in that area within the 14 days. In this event, temporary stabilization measures do not have to be initiated on that portion of the site.

i. When the site is using vegetative stabilization measures and it is during seasonally arid conditions, vegetative stabilization measures must be initiated as soon as practicable.

The Contractor must maintain the following records as part of the SWPPP:

a. Dates when major grading activities occur;

b. Dates when construction activities temporarily or permanently cease on a portion of the site;

c. Dates when stabilization measures are initiated and completed, and the reasons for any delay.

The SWPPP must describe structural practices to divert flows from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site to the degree attainable. Placement of structural practices in floodplains should be avoided to the degree attainable. A combination of sediment and erosion control measures is required to achieve maximum pollutant removal. Sediment basins and velocity dissipation devices must be utilized and placed in accordance with Part IV.D.5 of the AZPDES General Permit.

The SWPPP must include a description of post-construction storm water management measures that will be installed during the construction process to control pollutants in storm water discharges after construction operations have been completed. Structural measures shall be placed on upland soils to the degree attainable and must be designed and installed consistent with applicable City of Phoenix storm water management requirements.

The SWPPP must identify all allowable sources of non-storm water discharges listed in Part I.C.2 of AZPDES General Permit No. AZG2013-001 for Storm Water Discharges from Construction Activities except for flows from fire fighting activities. Non-storm water discharges are to be eliminated or reduced to the extent feasible. The Contractor must implement appropriate best management practices (BMPs) to minimize pollutants in any non-storm water discharges and must describe those BMPs in the SWPPP. Except if used in emergency firefighting, super-chlorinated wastewaters must be held on-site until the chorine dissipates, or otherwise de-chlorinated prior to discharge.

The SWPPP must describe:

a. Measures to prevent the discharge of solid materials, including building materials, to waters of the United States, except as authorized by a permit issued under section 404 of the Clean Water Act;

b. Measures to minimize off-site vehicle tracking of sediments, to the extent practicable, and the generation of on-site dust;

c. Construction and waste materials expected to be stored on-site with updates as appropriate. The SWPPP must also include a description of the controls to reduce pollutants from these materials including storage practices to minimize exposure of the materials to storm water, and spill prevention and response practices;

d. Any pollutant sources from areas other than construction (including storm water discharges from dedicated asphalt plants, dedicated concrete plants, and/or any other non-construction pollutant sources), with details of controls and measures that will be implemented at those sites to minimize pollutant discharges; and

e. Measures to sufficiently stabilize soil at culvert locations to prevent the formation of rills and gullies during construction.

The SWPPP must include a copy of AZPDES General Permit No. AZG2013-001 for Storm Water Discharges from Construction Activities. Copies of the NOIs submitted to ADEQ and/or copies of the certificates received from ADEQ specifying the authorization numbers must also be incorporated into the SWPPP as they become available. If any other agreements with state, federal, or local officials exist that would affect the provisions or implementation of the SWPPP, copies of these agreements must also be included in the SWPPP. (Please note, these types of agreements would include grading and drainage approvals and/or permits, and storm water management approvals and/or permits issued by the City of Phoenix, Development Services Department.)

The SWPPP must be consistent with applicable federal, state, and local requirements for soil and erosion control or storm water management. The SWPPP may incorporate by reference the appropriate elements of soil and erosion or storm water management plans required by other agencies. A copy of these requirements incorporated by reference must be provided as an attachment to the SWPPP and must be updated as necessary to remain consistent with any revisions made to the requirements by the responsible agency or agencies. Examples of appropriate requirements include the Phoenix Grading and Drainage Ordinance (Chapter 32A of the Phoenix City Code) and the Phoenix Storm Water Management Ordinance (Chapter 32C of the Phoenix City Code).

A schedule for routine inspections of the construction site must be included in the SWPPP. This schedule must comply with Part IV.H.1 and Part IV.H.2 of the AZPDES General Permit.

The Contractor must sign the SWPPP in accordance with Part VII.K of the AZPDES General Permit. A copy of the signed SWPPP must be retained on the construction site or at another location easily accessible during normal working hours.

SWPPP IMPLEMENTATION AND CONSTRUCTION REQUIREMENTS

102-4.1 The Contractor shall not begin any construction activity until all applicable SWPPP controls, devices, and practices have been put into place.

In accordance with the terms and conditions of the AZPDES General Permit, the Contractor shall post the following documents at the construction site near the main entrance:

- **a.** The AZPDES authorization number for the project or a copy of the NOI if an authorization number has not yet been assigned,
- **b.** The name and telephone number of a local office or site contact person,
- **c.** A brief description of the construction project, and
- **d.** The location of the SWPPP if the site is inactive or does not have an on-site location to store the plan, and the name of the contact person for accessing the SWPPP.

The Contractor shall provide adequate and timely maintenance of vegetation, erosion and sediment control measures, and other protective measures and/or best management practices (BMPs) identified in the site plan or SWPPP to ensure that they remain in effective operating condition. Maintenance needs identified through inspections or other means shall be accomplished as soon as practicable and before the next anticipated storm event. If existing protective measures need to be modified or additional measures added, implementation of these changes must be completed before the next anticipated storm event, if practicable. If not practicable, implementation must be completed as soon as it is practicable. Sediment and debris must be removed from sediment traps, sediment ponds, trash racks, and similar structures when the design capacity of the structure has been reduced by fifty (50) percent.

- **a.** The Contractor shall employ qualified personnel as defined by Part IV.H.3 of the AZPDES General Permit to inspect construction site areas in accordance with the requirements of Part IV.H.4 of the AZPDES General Permit. All inspection results shall be documented in reports that, at a minimum, include:
- **b.** The inspection date;
- **c.** The name, title, and qualifications of the person or persons performing the inspection. The qualifications must be either on or attached to the report. Alternatively, if the SWPPP documents the qualifications of the person or persons performing the inspection, then that portion of the SWPPP may be referenced;
- **d.** The weather information for the period since the last inspection (or since the start of construction if this is the first inspection), including the best estimate of the beginning of each storm event, the duration of each event, the time that has elapsed since the last storm event, and the approximate amount of rainfall for each event in inches;
- **e.** The location or locations of discharges of sediment or other pollutants from the site;
- **f.** The location or locations and identification of BMPs that need to be maintained, failed to operate as designed, or proved inadequate;
- **g.** The location or locations where additional BMPs that do not exist at the time of the inspection need to be implemented;

h. Any corrective actions required, including any changes to the SWPPP that are needed, and the dates for implementation;

i. Identification of all sources of non-storm water and their associated pollution prevention control measures; and

j. Identification of material storage areas, and any evidence of or potential for pollutant discharge from such areas.

The Contractor must retain the inspection reports and any records of follow-up actions taken for a period of at least three (3) years from the date permit coverage expires or is terminated. Inspection reports must identify any instance of non-compliance with the terms and conditions of the AZPDES General Permit. Where no instance of non-compliance is identified, the report must contain a certification that the construction project or site is being operated in compliance with the SWPPP and AZPDES General Permit No. AZG2013-001. The report shall be signed in accordance with Part VII.K of the permit. Copies of all inspection reports shall be provided to the City's Project Manager at least once each month throughout the duration of the project.

Based on the results of the inspection, the Contractor must modify the SWPPP to include additional or modified BMPs designed to correct problems identified. These revisions must be completed within seven (7) calendar days following the inspection. If existing BMPs need to be modified, or if additional BMPs are needed, implementation must be completed before the next anticipated storm event. If implementation before the next anticipated storm event is not practicable, implementation must occur as soon as it is practicable.

The Contractor, with the approval of the City's Project Manager, must amend the SWPPP within fifteen (15) business days whenever:

(1) There is a change in design, construction, operation, or maintenance at the construction site that has a significant effect on the discharge of pollutants to the waters of the United States, and such effect has not been previously addressed in the SWPPP; or

(2) Inspections, monitoring (if required), or investigations by the Contractor, the City of Phoenix, state officials, or federal officials determine the discharges are causing or contributing to water quality exceedances, or the SWPPP is ineffective in eliminating or significantly minimizing pollutants in storm water discharges from the construction site.

The SWPPP and all reports required under this contract shall be available to the public in accordance with the requirements of section 308(b) of the Clean Water Act. The Contractor shall make plans and reports available upon request to the ADEQ Director (or authorized representative); State, Tribal, or local agency with approval authority for sediment and erosion control plans, grading plans, or storm water management plans; local government officials; or to the operator of a municipal separate storm sewer receiving discharges from the site in accordance with the terms and conditions of the AZPDES General Permit.

The ADEQ Director (or authorized representative) may notify the Contractor and/or the City of Phoenix at any time that the SWPPP is inadequate, or does not meet one or more of the requirements of Part IV of AZDES General Permit. Within fifteen (15) business days of receipt of such notification from ADEQ (or as otherwise provided by ADEQ), the Contractor must make the required changes to the SWPPP and submit to the ADEQ a written certification that the requested changes were made and implemented. The ADEQ may request submittal or re-submittal of the SWPPP to verify that all deficiencies have been adequately addressed.

No condition of the AZPDES General Permit or the SWPPP shall release the Contractor from any responsibilities or requirements under any other environmental statutes or regulations, including requirements for the prevention or minimization of the discharge of hazardous substances or oil.

If there is a release containing a hazardous substance or oil in an amount equal to or greater than the reportable quantities established under federal regulations that has the potential to impact storm water discharges from this site, the Contractor must report the release to the regulatory agencies in accordance with regulatory requirements. In addition, the Contractor must modify the SWPPP within fourteen (14) calendar days after gaining knowledge of the release to provide a description of the release, the circumstances leading to the release, and the date of the release. The SWPPP must identify measures to minimize and/or prevent the occurrence of such releases, and appropriate measures for responding to such releases. The AZPDES General Permit does not authorize the discharge of any substance resulting from on-site spills, or the discharge of oil or chemicals.

The SWPPP (including a copy of AZPDES General Permit No. AZG003-001) shall be kept on the project site from the date of commencement of construction activities to the date of submittal of the Notice of Termination (NOT). A copy of the SWPPP and the permit shall be retained by the Contractor for a period of at least three (3) years following the date of final stabilization of the construction site. The Contractor shall also retain for the same three-year period all reports required by the AZPDES General Permit and all records of data used to complete the NOI.

It shall be the responsibility of the Contractor to ensure that copies of all documents and records retained by the Contractor in accordance with requirements of the AZPDES permit are also provided to the City's Project Manager.

Within thirty (30) days of the date of final stabilization of the construction site, the Contractor shall submit a completed and properly signed Notice of Termination (NOT) form to the City's Project Manager. The City of Phoenix will also complete a NOT form, and will submit both the Contractor's and the City's NOT to the ADEQ at the address specified on the NOT form; thereby terminating the Contractor's and the City's AZPDES permit coverage for the project. Copies of the NOT will also be sent to those agencies that received a copy of the NOI. A blank NOT form is enclosed with these project specifications for use by the Contractor.

DUST CONTROL

102-5.1 General. The Contractor shall obtain an Earthmoving Permit from the Maricopa County Air Quality Division which must be renewed on an annual basis. The Contractor shall also furnish all labor, equipment and means required to carry out effective measures wherever and as often as necessary to prevent his operations from producing dust in amounts damaging to property, cultivated vegetation and domestic animals, or which would cause a nuisance to persons living or occupying buildings in the vicinity. Airborne dust shall not exceed 20 percent visible emissions as stipulated by Rules 300 and 310 of the Maricopa County Air Pollution Control Rules and Regulations. The Contractor shall be responsible for any damage resulting from any dust originating from activities on or around the excavation sites. Dust abatement measures shall be continued until the Contractor has met the requirements of the County ordinance and is relieved of further responsibility by the Engineer. This dust abatement program shall include provisions to prevent excessive airborne dust in levels determined to be detrimental to aircraft operations by Phoenix Deer Valley Airport and its representatives. Contractor's operations may be halted if aircraft operations are determined to be unsafe. The Contractor shall take the following measures, at a minimum, to control and prevent a dust problem:

(1) To control dust on roadways, stockpiles and around the site, the areas shall be treated, as required, with dust suppressants approved by the Aviation Department Environmental Section.

(2) Temporary access roads shall be planned so travel on unpaved roads is minimized.

(3) Multiple vacuum sweepers shall be required on all paved access roads for dust control.

A Dust Control Plan shall be submitted at the Pre-construction Conference. The plan should include a description of the equipment required, manpower and methods for dust control. Any chemical additives used must be approved by the Aviation Department Environmental Section. The Contractor shall also address in the Dust Control Plan, a method to keep public thoroughfares free of mud, dust and debris at all times.

102-5.2 Site Preparation. The Contractor shall use water trucks at all times to minimize dust to supplement other control measures. The Contractor shall cover trucks when hauling materials, and shall stabilize the surface of stockpiles when not relocating immediately.

102-5.3 Construction. The Contractor shall provide a copy of the Air Quality Management Plan/Dust Control Plan to all adjacent site contractors and subcontractors. The Contractor must also post a copy of the Air Quality Management Plan/Dust Control Plan in a weather resistant location at the construction site where it may be seen by the workers.

The Contractor shall cover trucks when transferring materials and shall use dust suppressants on traveled paths, construction parking and staging areas that are fine grained materials and not paved. The Contractor shall also minimize unnecessary vehicular and machinery activities to reduce dust and shall minimize soil track-out on paved roads and streets by cleaning trucks and equipment before leaving non-paved roads.

102-5.4 Post Construction. The Contractor shall stabilize non-paved areas as required and shall remove unused materials and stockpiles at the end of construction.

BASIS OF PAYMENT

102-6.1 An allowance for the Contractor's participation in the preparation of the Storm Water Pollution Prevention Plan (SWPPP), the implementation of the SWPPP, and the modification of the SWPPP as necessary for compliance with AZPDES General Permit No. AZG2013-001 for the duration of this construction project is included in these contract documents. Payment shall be made monthly with equal payment during the entire construction period with any retention required by the terms and conditions of the construction contract to be paid after filing of the Notice of Termination (NOT).

No separate measurement or direct payment will be made for preparing the Notice of Intent (NOI), the Notice of Termination (NOT), Inspection and Maintenance Reports, or other documentation required to perform the work, the cost being considered as included in the allowance.

Payment will be made under:

Item C-102-6.1	Stormwater Pollution Prevention Plan – per lump sum

END OF ITEM C-102

Item C-105 Mobilization

105-1 Description. This item of work shall consist of, 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.

Further, Mobilization/Demobilization shall consist of preparatory work and operations, including but not limited to, installation of staging area(s) temporary utilities, the movement of personnel, equipment, materials, supplies and incidentals to the project site, and for transportation of buildings, quality control personnel, laboratory field testing equipment and tools, testing supplies, haul roads and other facilities necessary to complete the work on the project including providing one (1) or more staging areas with temporary security fence and gate(s). This item is also for the Contractor's operations, and material storage for the Contractor. This item is for other work and operations that the Contractor must perform or costs he must incur before beginning work on the project, and for necessary work and costs in completing the construction and demobilizing from the site.

Demobilization costs will include, but not be limited to, removal of temporary utilities to the staging area(s), removal of temporary field offices and materials laboratories, demobilization of equipment, and the clean-up and restoration of the construction staging area location to its original condition.

105-2 Mobilization limit. Mobilization shall be limited to four (4) percent of the total project cost.

105-3 Posted notices. Prior to commencement of construction activities, the Contractor must post the following documents in a prominent and accessible place where they may be easily viewed by all employees of the prime Contractor and by all employees of subcontractors engaged by the prime Contractor: Equal Employment Opportunity (EEO) Poster "Equal Employment Opportunity is the Law" in accordance with the Office of Federal Contract Compliance Programs Executive Order 11246, as amended; Davis Bacon Wage Poster (WH 1321) - DOL "Notice to All Employees" Poster; and Applicable Davis-Bacon Wage Rate Determination. These notices must remain posted until final acceptance of the work by the Owner.

105-4 Engineer/RPR field office. The Contractor shall provide dedicated space for the use of the field RPR and inspectors, as a field office for the duration of the project. This space shall be located conveniently near the construction and shall be separate from any space used by the Contractor. The Contractor shall furnish water, sanitary facilities, heat, air conditioning, and electricity in accordance with local building codes.

METHOD OF MEASUREMENT

105-5 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 Section 90, paragraph 90-11, *Contractor Final Project Documentation,* the final 10%.

BASIS OF PAYMENT

105-6 Payment will be made under:

Item C-105 Mobilization (4% Maximum) – per lump sum

REFERENCES

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

Office of Federal Contract Compliance Programs (OFCCP)

Executive Order 11246, as amended

EEOC-P/E-1 – Equal Employment Opportunity is the Law Poster

United States Department of Labor, Wage and Hour Division (WHD)

WH 1321 – Employee Rights under the Davis-Bacon Act Poster

END OF ITEM C-105

Item C-110 Method of Estimating Percentage of Material Within Specification Limits (PWL)

110-1 General. When the specifications provide for acceptance of material based on the method of estimating percentage of material within specification limits (PWL), the PWL will be determined in accordance with this section. All test results for a lot will be analyzed statistically to determine the total estimated percent of the lot that is within specification limits. The PWL is computed using the sample average (X) and sample standard deviation (S_n) of the specified number (n) of sublots for the lot and the specification tolerance limits, L for lower and U for upper, for the particular acceptance parameter. From these values, the respective Quality index, Q_L for Lower Quality Index and/or Q_U for Upper Quality Index, is computed and the PWL for the lot for the specified n is determined from Table 1. All specification limits specified in the technical sections shall be absolute values. Test results used in the calculations shall be to the significant figure given in the test procedure.

There is some degree of uncertainty (risk) in the measurement for acceptance because only a small fraction of production material (the population) is sampled and tested. This uncertainty exists because all portions of the production material have the same probability to be randomly sampled. The Contractor's risk is the probability that material produced at the acceptable quality level is rejected or subjected to a pay adjustment. The Owner's risk is the probability that material produced at the rejectable quality level is accepted.

It is the intent of this section to inform the Contractor that, in order to consistently offset the Contractor's risk for material evaluated, production quality (using population average and population standard deviation) must be maintained at the acceptable quality specified or higher. In all cases, it is the responsibility of the Contractor to produce at quality levels that will meet the specified acceptance criteria when sampled and tested at the frequencies specified.

110-2 Method for computing PWL. The computational sequence for computing PWL is as follows:

a. Divide the lot into n sublots in accordance with the acceptance requirements of the specification.

b. Locate the random sampling position within the sublot in accordance with the requirements of the specification.

c. Make a measurement at each location, or take a test portion and make the measurement on the test portion in accordance with the testing requirements of the specification.

d. Find the sample average (X) for all sublot test values within the lot by using the following formula:

$$\mathbf{X = (x_1 + x_2 + x_3 + \ldots x_n) / n}$$

Where: X = Sample average of all sublot test values within a lot

$x_1, x_2, \ldots x_n$ = Individual sublot test values

n = Number of sublot test values

e. Find the sample standard deviation (S_n) by use of the following formula:

$$S_n = [(d_1^2 + d_2^2 + d_3^2 + \ldots d_n^2)/(n-1)]^{1/2}$$

Where: S_n = Sample standard deviation of the number of sublot test values in the set

$d_1, d_2, \ldots d_n$ = Deviations of the individual sublot test values $x_1, x_2, \ldots$ from the average value X

that is: $d_1 = (x_1 - X)$, $d_2 = (x_2 - X) \ldots d_n = (x_n - X)$

n = Number of sublot test values

f. For single sided specification limits (i.e., L only), compute the Lower Quality Index Q_L by use of the following formula:

$$Q_L = (X - L) / S_n$$

Where: L = specification lower tolerance limit

Estimate the percentage of material within limits (PWL) by entering Table 1 with Q_L, using the column appropriate to the total number (n) of measurements. If the value of Q_L falls between values shown on the table, use the next higher value of PWL.

g. For double-sided specification limits (i.e., L and U), compute the Quality Indexes Q_L and Q_U by use of the following formulas:

$$Q_L = (X - L) / S_n$$
and
$$Q_U = (U - X) / S_n$$

Where: L and U = specification lower and upper tolerance limits

Estimate the percentage of material between the lower (L) and upper (U) tolerance limits (PWL) by entering Table 1 separately with Q_L and Q_U, using the column appropriate to the total number (n) of measurements, and determining the percent of material above P_L and percent of material below P_U for each tolerance limit. If the values of Q_L fall between values shown on the table, use the next higher value of P_L or P_U. Determine the PWL by use of the following formula:

$$PWL = (P_U + P_L) - 100$$

Where: P_L = percent within lower specification limit

P_U = percent within upper specification limit

EXAMPLE OF PWL CALCULATION

Project: Example Project

Test Item: Item P-401, Lot A.

A. PWL Determination for Mat Density.

1. Density of four random cores taken from Lot A.

A-1 = 96.60
A-2 = 97.55
A-3 = 99.30
A-4 = 98.35
n = 4

2. Calculate average density for the lot.

$X = (x_1 + x_2 + x_3 + . . . x_n) / n$
$X = (96.60 + 97.55 + 99.30 + 98.35) / 4$
$X = 97.95\%$ density

3. Calculate the standard deviation for the lot.

$S_n = \mathbf{[}((96.60 - 97.95)^2 + (97.55 - 97.95)^2 + (99.30 - 97.95)^2 + (98.35 - 97.95)^2)) / (4 - 1)\mathbf{]}^{1/2}$
$S_n = \mathbf{[}(1.82 + 0.16 + 1.82 + 0.16) / 3\mathbf{]}^{1/2}$
$S_n = 1.15$

4. Calculate the Lower Quality Index Q_L for the lot. (L=96.3)

$Q_L = (X - L) / S_n$
$Q_L = (97.95 - 96.30) / 1.15$
$Q_L = 1.4348$

5. Determine PWL by entering Table 1 with $Q_L = 1.44$ and n= 4.

PWL = 98

B. PWL Determination for Air Voids.

1. Air Voids of four random samples taken from Lot A.

A-1 = 5.00
A-2 = 3.74
A-3 = 2.30
A-4 = 3.25

2. Calculate the average air voids for the lot.

$X = (x_1 + x_2 + x_3 . . . n) / n$
$X = (5.00 + 3.74 + 2.30 + 3.25) / 4$
$X = 3.57\%$

3. Calculate the standard deviation S_n for the lot.

$S_n = \mathbf{[}((3.57 - 5.00)^2 + (3.57 - 3.74)^2 + (3.57 - 2.30)^2 + (3.57 - 3.25)^2) / (4 - 1)\mathbf{]}^{1/2}$

$S_n = [(2.04 + 0.03 + 1.62 + 0.10) / 3]^{1/2}$

$S_n = 1.12$

4. Calculate the Lower Quality Index Q_L for the lot. (L= 2.0)

$Q_L = (X - L) / S_n$

$Q_L = (3.57 - 2.00) / 1.12$

$Q_L = 1.3992$

5. Determine P_L by entering Table 1 with $Q_L = 1.41$ and n = 4.

$P_L = 97$

6. Calculate the Upper Quality Index Q_U for the lot. (U= 5.0)

$Q_U = (U - X) / S_n$

$Q_U = (5.00 - 3.57) / 1.12$

$Q_U = 1.2702$

7. Determine P_U by entering Table 1 with $Q_U = 1.29$ and n = 4.

$P_U = 93$

8. Calculate Air Voids PWL

$PWL = (P_L + P_U) - 100$

$PWL = (97 + 93) - 100 = 90$

EXAMPLE OF OUTLIER CALCULATION (REFERENCE ASTM E178)

Project: Example Project

Test Item: Item P-401, Lot A.

A. Outlier Determination for Mat Density.

1. Density of four random cores taken from Lot A arranged in descending order.

A-3 = 99.30

A-4 = 98.35

A-2 = 97.55

A-1 = 96.60

2. From ASTM E178, Table 1, for n=4 an upper 5% significance level, the critical value for test criterion = 1.463.

3. Use average density, standard deviation, and test criterion value to evaluate density measurements.

a. For measurements greater than the average:

If (measurement - average)/(standard deviation) is less than test criterion, then the measurement is not considered an outlier.

For A-3, check if (99.30 - 97.95) / 1.15 is greater than 1.463.

Since 1.174 is less than 1.463, the value is not an outlier.

b. For measurements less than the average:

If (average - measurement)/(standard deviation) is less than test criterion, then the measurement is not considered an outlier.

For A-1, check if (97.95 - 96.60) / 1.15 is greater than 1.463.

Since 1.435 is less than 1.463, the value is not an outlier.

Note: In this example, a measurement would be considered an outlier if the density were:

Greater than (97.95 + 1.463 × 1.15) = 99.63%

OR

less than (97.95 - 1.463 × 1.15) = 96.27%.

Table 1. Table for Estimating Percent of Lot Within Limits (PWL)

Percent Within Limits (P_L and P_U)	Positive Values of Q (Q_L and Q_U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
99	1.1541	1.4700	1.6714	1.8008	1.8888	1.9520	1.9994	2.0362
98	1.1524	1.4400	1.6016	1.6982	1.7612	1.8053	1.8379	1.8630
97	1.1496	1.4100	1.5427	1.6181	1.6661	1.6993	1.7235	1.7420
96	1.1456	1.3800	1.4897	1.5497	1.5871	1.6127	1.6313	1.6454
95	1.1405	1.3500	1.4407	1.4887	1.5181	1.5381	1.5525	1.5635
94	1.1342	1.3200	1.3946	1.4329	1.4561	1.4717	1.4829	1.4914
93	1.1269	1.2900	1.3508	1.3810	1.3991	1.4112	1.4199	1.4265
92	1.1184	1.2600	1.3088	1.3323	1.3461	1.3554	1.3620	1.3670
91	1.1089	1.2300	1.2683	1.2860	1.2964	1.3032	1.3081	1.3118
90	1.0982	1.2000	1.2290	1.2419	1.2492	1.2541	1.2576	1.2602
89	1.0864	1.1700	1.1909	1.1995	1.2043	1.2075	1.2098	1.2115
88	1.0736	1.1400	1.1537	1.1587	1.1613	1.1630	1.1643	1.1653
87	1.0597	1.1100	1.1173	1.1192	1.1199	1.1204	1.1208	1.1212
86	1.0448	1.0800	1.0817	1.0808	1.0800	1.0794	1.0791	1.0789
85	1.0288	1.0500	1.0467	1.0435	1.0413	1.0399	1.0389	1.0382
84	1.0119	1.0200	1.0124	1.0071	1.0037	1.0015	1.0000	0.9990
83	0.9939	0.9900	0.9785	0.9715	0.9671	0.9643	0.9624	0.9610
82	0.9749	0.9600	0.9452	0.9367	0.9315	0.9281	0.9258	0.9241
81	0.9550	0.9300	0.9123	0.9025	0.8966	0.8928	0.8901	0.8882
80	0.9342	0.9000	0.8799	0.8690	0.8625	0.8583	0.8554	0.8533
79	0.9124	0.8700	0.8478	0.8360	0.8291	0.8245	0.8214	0.8192
78	0.8897	0.8400	0.8160	0.8036	0.7962	0.7915	0.7882	0.7858
77	0.8662	0.8100	0.7846	0.7716	0.7640	0.7590	0.7556	0.7531
76	0.8417	0.7800	0.7535	0.7401	0.7322	0.7271	0.7236	0.7211
75	0.8165	0.7500	0.7226	0.7089	0.7009	0.6958	0.6922	0.6896
74	0.7904	0.7200	0.6921	0.6781	0.6701	0.6649	0.6613	0.6587
73	0.7636	0.6900	0.6617	0.6477	0.6396	0.6344	0.6308	0.6282
72	0.7360	0.6600	0.6316	0.6176	0.6095	0.6044	0.6008	0.5982
71	0.7077	0.6300	0.6016	0.5878	0.5798	0.5747	0.5712	0.5686
70	0.6787	0.6000	0.5719	0.5582	0.5504	0.5454	0.5419	0.5394
69	0.6490	0.5700	0.5423	0.5290	0.5213	0.5164	0.5130	0.5105
68	0.6187	0.5400	0.5129	0.4999	0.4924	0.4877	0.4844	0.4820
67	0.5878	0.5100	0.4836	0.4710	0.4638	0.4592	0.4560	0.4537
66	0.5563	0.4800	0.4545	0.4424	0.4355	0.4310	0.4280	0.4257
65	0.5242	0.4500	0.4255	0.4139	0.4073	0.4030	0.4001	0.3980
64	0.4916	0.4200	0.3967	0.3856	0.3793	0.3753	0.3725	0.3705
63	0.4586	0.3900	0.3679	0.3575	0.3515	0.3477	0.3451	0.3432
62	0.4251	0.3600	0.3392	0.3295	0.3239	0.3203	0.3179	0.3161
61	0.3911	0.3300	0.3107	0.3016	0.2964	0.2931	0.2908	0.2892
60	0.3568	0.3000	0.2822	0.2738	0.2691	0.2660	0.2639	0.2624
59	0.3222	0.2700	0.2537	0.2461	0.2418	0.2391	0.2372	0.2358
58	0.2872	0.2400	0.2254	0.2186	0.2147	0.2122	0.2105	0.2093
57	0.2519	0.2100	0.1971	0.1911	0.1877	0.1855	0.1840	0.1829
56	0.2164	0.1800	0.1688	0.1636	0.1607	0.1588	0.1575	0.1566
55	0.1806	0.1500	0.1406	0.1363	0.1338	0.1322	0.1312	0.1304
54	0.1447	0.1200	0.1125	0.1090	0.1070	0.1057	0.1049	0.1042
53	0.1087	0.0900	0.0843	0.0817	0.0802	0.0793	0.0786	0.0781
52	0.0725	0.0600	0.0562	0.0544	0.0534	0.0528	0.0524	0.0521
51	0.0363	0.0300	0.0281	0.0272	0.0267	0.0264	0.0262	0.0260
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Percent Within Limits (P_L and P_U)	Negative Values of Q (Q_L and Q_U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
49	-0.0363	-0.0300	-0.0281	-0.0272	-0.0267	-0.0264	-0.0262	-0.0260
48	-0.0725	-0.0600	-0.0562	-0.0544	-0.0534	-0.0528	-0.0524	-0.0521
47	-0.1087	-0.0900	-0.0843	-0.0817	-0.0802	-0.0793	-0.0786	-0.0781
46	-0.1447	-0.1200	-0.1125	-0.1090	-0.1070	-0.1057	-0.1049	-0.1042
45	-0.1806	-0.1500	-0.1406	-0.1363	-0.1338	-0.1322	-0.1312	-0.1304
44	-0.2164	-0.1800	-0.1688	-0.1636	-0.1607	-0.1588	-0.1575	-0.1566
43	-0.2519	-0.2100	-0.1971	-0.1911	-0.1877	-0.1855	-0.1840	-0.1829
42	-0.2872	-0.2400	-0.2254	-0.2186	-0.2147	-0.2122	-0.2105	-0.2093
41	-0.3222	-0.2700	-0.2537	-0.2461	-0.2418	-0.2391	-0.2372	-0.2358
40	-0.3568	-0.3000	-0.2822	-0.2738	-0.2691	-0.2660	-0.2639	-0.2624
39	-0.3911	-0.3300	-0.3107	-0.3016	-0.2964	-0.2931	-0.2908	-0.2892
38	-0.4251	-0.3600	-0.3392	-0.3295	-0.3239	-0.3203	-0.3179	-0.3161
37	-0.4586	-0.3900	-0.3679	-0.3575	-0.3515	-0.3477	-0.3451	-0.3432
36	-0.4916	-0.4200	-0.3967	-0.3856	-0.3793	-0.3753	-0.3725	-0.3705
35	-0.5242	-0.4500	-0.4255	-0.4139	-0.4073	-0.4030	-0.4001	-0.3980
34	-0.5563	-0.4800	-0.4545	-0.4424	-0.4355	-0.4310	-0.4280	-0.4257
33	-0.5878	-0.5100	-0.4836	-0.4710	-0.4638	-0.4592	-0.4560	-0.4537
32	-0.6187	-0.5400	-0.5129	-0.4999	-0.4924	-0.4877	-0.4844	-0.4820
31	-0.6490	-0.5700	-0.5423	-0.5290	-0.5213	-0.5164	-0.5130	-0.5105
30	-0.6787	-0.6000	-0.5719	-0.5582	-0.5504	-0.5454	-0.5419	-0.5394
29	-0.7077	-0.6300	-0.6016	-0.5878	-0.5798	-0.5747	-0.5712	-0.5686
28	-0.7360	-0.6600	-0.6316	-0.6176	-0.6095	-0.6044	-0.6008	-0.5982
27	-0.7636	-0.6900	-0.6617	-0.6477	-0.6396	-0.6344	-0.6308	-0.6282
26	-0.7904	-0.7200	-0.6921	-0.6781	-0.6701	-0.6649	-0.6613	-0.6587
25	-0.8165	-0.7500	-0.7226	-0.7089	-0.7009	-0.6958	-0.6922	-0.6896
24	-0.8417	-0.7800	-0.7535	-0.7401	-0.7322	-0.7271	-0.7236	-0.7211
23	-0.8662	-0.8100	-0.7846	-0.7716	-0.7640	-0.7590	-0.7556	-0.7531
22	-0.8897	-0.8400	-0.8160	-0.8036	-0.7962	-0.7915	-0.7882	-0.7858
21	-0.9124	-0.8700	-0.8478	-0.8360	-0.8291	-0.8245	-0.8214	-0.8192
20	-0.9342	-0.9000	-0.8799	-0.8690	-0.8625	-0.8583	-0.8554	-0.8533
19	-0.9550	-0.9300	-0.9123	-0.9025	-0.8966	-0.8928	-0.8901	-0.8882
18	-0.9749	-0.9600	-0.9452	-0.9367	-0.9315	-0.9281	-0.9258	-0.9241
17	-0.9939	-0.9900	-0.9785	-0.9715	-0.9671	-0.9643	-0.9624	-0.9610
16	-1.0119	-1.0200	-1.0124	-1.0071	-1.0037	-1.0015	-1.0000	-0.9990
15	-1.0288	-1.0500	-1.0467	-1.0435	-1.0413	-1.0399	-1.0389	-1.0382
14	-1.0448	-1.0800	-1.0817	-1.0808	-1.0800	-1.0794	-1.0791	-1.0789
13	-1.0597	-1.1100	-1.1173	-1.1192	-1.1199	-1.1204	-1.1208	-1.1212
12	-1.0736	-1.1400	-1.1537	-1.1587	-1.1613	-1.1630	-1.1643	-1.1653
11	-1.0864	-1.1700	-1.1909	-1.1995	-1.2043	-1.2075	-1.2098	-1.2115
10	-1.0982	-1.2000	-1.2290	-1.2419	-1.2492	-1.2541	-1.2576	-1.2602
9	-1.1089	-1.2300	-1.2683	-1.2860	-1.2964	-1.3032	-1.3081	-1.3118
8	-1.1184	-1.2600	-1.3088	-1.3323	-1.3461	-1.3554	-1.3620	-1.3670
7	-1.1269	-1.2900	-1.3508	-1.3810	-1.3991	-1.4112	-1.4199	-1.4265
6	-1.1342	-1.3200	-1.3946	-1.4329	-1.4561	-1.4717	-1.4829	-1.4914
5	-1.1405	-1.3500	-1.4407	-1.4887	-1.5181	-1.5381	-1.5525	-1.5635
4	-1.1456	-1.3800	-1.4897	-1.5497	-1.5871	-1.6127	-1.6313	-1.6454
3	-1.1496	-1.4100	-1.5427	-1.6181	-1.6661	-1.6993	-1.7235	-1.7420
2	-1.1524	-1.4400	-1.6016	-1.6982	-1.7612	-1.8053	-1.8379	-1.8630
1	-1.1541	-1.4700	-1.6714	-1.8008	-1.8888	-1.9520	-1.9994	-2.0362

REFERENCES

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

ASTM International (ASTM)

ASTM E178 Standard Practice for Dealing with Outlying Observations

END OF ITEM C-110

Item P-101 Preparation/Removal of Existing Pavements

DESCRIPTION

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

EQUIPMENT AND MATERIALS

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

Pavement saw cutting shall be completed by a device capable of making a neat, straight, and smooth vertical cut without damaging adjacent pavement that is not to be removed. The RPR's decision as to the acceptability of the cutting device and manner of operation will be final. Pavement saw cutting shall be required at match lines to existing pavement that is to remain.

CONSTRUCTION

101-3.1 Removal of existing pavement.

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

a. Concrete pavement removal. Full depth saw cuts shall be made perpendicular to the slab surface. The Contractor shall saw through the full depth of the slab including any dowels at the joint, removing the pavement and installing new dowels as shown on the plans and per the specifications. Where the perimeter of the removal limits is not located on the joint and there are no dowels present, the perimeter shall be saw cut the full depth of the pavement. The pavement inside the saw cut shall be removed by methods which will not cause distress in the pavement which is to remain in place. If the material is to be wasted on the airport site, it shall be reduced to a maximum size of 2 inches. Concrete slabs that are damaged by under breaking shall be repaired or removed and replaced as directed by the RPR.

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

b. Asphalt pavement removal. Asphalt pavement to be removed shall be cut to the full depth of the asphalt pavement around the perimeter of the area to be removed.

c. Repair or removal of Base, Subbase, and/or Subgrade. All failed material including surface, base course, subbase course, and subgrade shall be removed and repaired as shown

on the plans or as directed by the RPR. Materials and methods of construction shall comply with the applicable sections of these specifications. Any damage caused by Contractor's removal process shall be repaired at the Contractor's expense.

101-3.2 Preparation of joints and cracks. Remove all vegetation and debris from cracks to a minimum depth of 1 inch (25 mm). If extensive vegetation exists, treat the specific area with a concentrated solution of a water-based herbicide approved by the RPR. Fill all cracks greater than 1/4 inch (6 mm) wide) with a crack sealant per ASTM D6690. The crack sealant, preparation, and application shall be compatible with the surface treatment/overlay to be used. To minimize contamination of the asphalt with the crack sealant, underfill the crack sealant a minimum of 1/8 inch (3 mm), not to exceed ¼ inch (6 mm). Any excess joint or crack sealer shall be removed from the pavement surface.

Wider cracks (over 1-1/2 inch wide (38 mm)), along with soft or sunken spots, indicate that the pavement or the pavement base should be repaired or replaced as stated below.

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

Gradation

Sieve Size	Percent Passing
No. 4 (4.75 mm)	100
No. 8 (2.36 mm)	90-100
No. 16 (1.18 mm)	65-90
No. 30 (600 µm)	40-60
No. 50 (300 µm)	25-42
No. 100 (150 µm)	15-30
No. 200 (75 µm)	10-20

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

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

101-3.3 Removal of Foreign Substances/contaminates prior to overlay, seal-coat, or remarking. Removal of foreign substances/contaminates from existing pavement that will affect the bond of the new treatment shall consist of removal of rubber, fuel spills, oil, crack sealer, at least 90% of paint, and other foreign substances from the surface of the pavement. Areas that

require removal are designated on the plans and as directed by the RPR in the field during construction.

High-pressure water may be used. If chemicals are used, they shall comply with the state's environmental protection regulations. Removal methods used shall not cause major damage to the pavement, or to any structure or utility within or adjacent to the work area. Major damage is defined as changing the properties of the pavement, removal of asphalt causing the aggregate to ravel, or removing pavement over 1/8 inch (3 mm) deep. If it is deemed by the RPR that damage to the existing pavement is caused by operational error, such as permitting the application method to dwell in one location for too long, the Contractor shall repair the damaged area without compensation and as directed by the RPR.

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

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

a. Repair of concrete spalls in areas to be overlaid with asphalt. The Contractor shall repair all spalled concrete as shown on the plans or as directed by the RPR. The perimeter of the repair shall be saw cut a minimum of 2 inches (50 mm) outside the affected area and 2 inches (50 mm) deep. The deteriorated material shall be removed to a depth where the existing material is firm or cannot be easily removed with a geologist pick. The removed area shall be filled with asphalt mixture with aggregate sized appropriately for the depth of the patch. The material shall be compacted with equipment approved by the RPR until the material is dense and no movement or marks are visible. The material shall not be placed in lifts over 4 inches (100 mm) in depth. This method of repair applies only to pavement to be overlaid.

b. Asphalt pavement repair. The Contractor shall repair all spalled concrete as shown on the plans or as directed by the RPR. The failed areas shall be removed as specified in paragraph 101-3.1b. All failed material including surface, base course, subbase course, and subgrade shall be removed. Materials and methods of construction shall comply with the applicable sections of these specifications.

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

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

b. Profiling, grade correction, or surface correction. The milling machine shall have a minimum width of 7 feet (2 m) and it shall be equipped with electronic grade control devices that will cut the surface to the grade specified. The tolerances shall be maintained within +0 inch and

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

c. Clean-up. The Contractor shall sweep the milled surface daily and immediately after the milling until all residual materials are removed from the pavement surface. Prior to paving, the Contractor shall wet down the milled pavement and thoroughly sweep and/or blow the surface to remove loose residual material. Waste materials shall be collected and removed from the pavement surface and adjacent areas by sweeping or vacuuming. Waste materials shall be removed and disposed off Airport property.

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

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

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

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

d. Clean pavement surface immediately prior to placing the surface treatment so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film.

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

101-3.8 Preparation of Joints in Rigid Pavement prior to resealing. Prior to application of sealant material, clean and dry the joints of all scale, dirt, dust, old sealant, curing compound, moisture and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method used cleans the joint and does not damage the joint.

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

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

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

101-3.9 Preparation of Cracks in Flexible Pavement prior to sealing. Prior to application of sealant material, clean and dry the joints of all scale, dirt, dust, old sealant, curing compound,

moisture and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method used cleans the cracks and does not damage the pavement.

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

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

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

101-3.9.4 Removal of Pipe and other Buried Structures.

a. Removal of Existing Pipe Material. Remove the types of pipe as indicated on the plans. The pipe material shall be legally disposed of off-site in a timely manner following removal. Trenches shall be backfilled with material equal to or better in quality than adjacent embankment. Trenches under paved areas must be compacted to 95% of ASTM D1557.

b. Removal of Inlets/Manholes. Where indicated on the plans or as directed by the RPR, inlets and/or manholes shall be removed and legally disposed of off-site in a timely fashion after removal. Excavations after removal shall be backfilled with material equal or better in quality than adjacent embankment. When under paved areas must be compacted to 95% of ASTM D1557, when outside of paved areas must be compacted to 95% of ASTM D698.

METHOD OF MEASUREMENT

101-4.1 Pavement removal. The unit of measurement for pavement removal shall be the number of square yards (square meters) removed by the Contractor. Any pavement removed outside the limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment. No direct measurement or payment shall be made for saw cutting. Saw cutting shall be incidental to pavement removal. Dowel bar installation shall be incidental to pavement removal.

101-4.2 Joint and crack repair. The unit of measurement for joint and crack repair shall be the linear foot of joint.

101-4.3 Removal of Foreign Substances/contaminates. The unit of measurement for foreign Substances/contaminates removal shall be the square foot.

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

101-4.5 Concrete Spall Repair. The unit of measure for concrete spall repair shall be the number of square feet. The location and average depth of the patch shall be determined and agreed upon by the RPR and the Contractor.

101-4.6 Cold milling. The unit of measure for cold milling shall be 9.5 inches of milling per square yard. The location and average depth of the cold milling shall be as shown on the plans. If the initial cut does not correct the condition, the Contractor shall re-mill the area and will be paid for the total depth of milling.

101-4.7 Removal of Pipe and other Buried Structures. The unit of measurement for removal of pipe shall be the linear feet of pipe. The unit of measurement for removal of other buried

structures will be made at the contract unit price for each completed and accepted item. This price shall be full compensation for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with paragraph 101-3.9.4.

BASIS OF PAYMENT

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

Payment will be made under:

Item P 101-5.1a	Remove Asphalt Concrete Pavement Full Depth - per square yard

REFERENCES

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

Advisory Circulars (AC)

AC 150/5380-6	Guidelines and Procedures for Maintenance of Airport Pavements.

ASTM International (ASTM)

ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

END OF ITEM P-101

Item P-151 Clearing and Grubbing

DESCRIPTION

151-1.1 This item shall consist of 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 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.

Clearing and grubbing does not include removal of items specifically included under Technical Special Provision Specifications.

CONSTRUCTION METHODS

151-2.1 General. The areas denoted on the plans to be cleared and grubbed shall be staked on the ground by the 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 outside the Airport's limits at the Contractor's responsibility, except when otherwise directed by the RPR.

Waste concrete and masonry shall not be placed on slopes of embankments or channels. Any broken concrete or masonry 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.

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.

In areas designated to be cleared and grubbed, all stumps, roots, buried logs, brush, grass, and other unsatisfactory materials shall be removed.

METHOD OF MEASUREMENT

151-3.1 The quantities of clearing and grubbing as shown by the limits on the plans shall be per lump sum of land specifically cleared and grubbed.

BASIS OF PAYMENT

151-4.1 Payment shall be made at the contract unit price 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.

Payment will be made under:

Item P-151-4.1 Clearing and grubbing – per lump sum

END OF ITEM P-151

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.

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, to loosen and pulverize the soil. Stones or rock fragments larger than 4 inches in their greatest dimension will not be permitted in the top 6 inches 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.

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.

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 of the stated elevations for ground surfaces, or within 0.04 foot 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.

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.

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 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 off the airport. The cost is incidental to this item. This excavated material shall be paid for at the contract unit price per cubic yard (per cubic meter) for unclassified excavation. The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary backfill will constitute a part of the embankment. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained in accordance with the details shown on the plans. Undercutting will be paid as unclassified excavation.

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 or by the Contractor as indicated on the plans. All existing foundations shall be excavated at least 2 feet 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.

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 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 D1557. 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.

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 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 and compacted as specified for the adjacent fill.

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

152-2.7 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 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 nor more than 12 inches 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 ±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 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 D 1557. A new Proctor shall be developed for each soil type based on visual classification.

Density tests will be taken by the 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 sieve, follow AASHTO T-180 Annex Correction of maximum dry density and optimum moisture for oversized particles.

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 D1557. Under all areas to be paved, the embankments shall be compacted to a depth of 12” and to a density of not less than 95% percent of the maximum density as determined by ASTM D698. 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.

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

The in-place field density shall be determined in accordance with ASTM D1556 or 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 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 in their greatest dimensions will not be allowed in the top 12 inches 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 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 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.

152-2.9 Proof rolling. The purpose of proof rolling the subgrade is to identify any weak areas in the subgrade and not for compaction of the subgrade. After compaction is completed, the subgrade area shall be proof rolled with a 20 ton Tandem axle Dual Wheel Dump Truck loaded to the legal limit with tires inflated to 80/100/150 psi in the presence of the RPR. Apply a minimum of 100% 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 or show permanent deformation greater than 1 inch 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.

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

The material to be compacted shall be within ±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 ¾ inch sieve, follow the methods in ASTM D1557. Tests for moisture content and compaction will be taken at a minimum of 1000 S.Y. of subgrade. All quality assurance testing shall be done by 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 in-place field density shall be determined in accordance with ASTM D1556 or ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938 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, 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 when tested with a 12-foot 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 straightedge for the full length of each line on a 50-foot grid.

b. **Grade.** The grade and crown shall be measured on a 50-foot grid and shall be within +/- 0.05 feet of the specified grade.

On safety areas, turfed areas and other designated areas within the grading limits where no subbase or base is to placed, grade shall not vary more than 0.10 feet 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. Not used.

METHOD OF MEASUREMENT

152-3.1 Measurement for payment specified by the cubic yard shall be computed by 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.

152-3.1 The quantity of unclassified excavation to be paid for shall be the number of cubic yards 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.

BASIS OF PAYMENT

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

Payment will be made under:

Item P-152-4.1	Unclassified Excavation - per cubic yard

REFERENCES

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

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO T-180	Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

ASTM International (ASTM)

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 D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

Advisory Circulars (AC)

AC 150/5370-2	Operational Safety on Airports During Construction Software

Software

FAARFIELD – FAA Rigid and Flexible Iterative Elastic Layered Design

U.S. Department of Transportation

FAA RD-76-66	Design and Construction of Airport Pavements on Expansive Soils

END OF ITEM P-152

Item P-153 Controlled Low-Strength Material (CLSM)

DESCRIPTION

153-1.1 This item shall consist of furnishing, transporting, and placing a controlled low-strength material (CLSM) as flowable backfill in trenches or at other locations shown on the plans or as directed by the Resident Project Representative (RPR).

MATERIALS

153-2.1 Materials.

a. Cement. Cement shall conform to the requirements of ASTM C150 Type I, II, or V.

b. Fly ash. Fly ash shall conform to ASTM C618, Class C or F.

c. Fine aggregate (sand). Fine aggregate shall conform to the requirements of ASTM C33 except for aggregate gradation. Any aggregate gradation which produces the specified performance characteristics of the CLSM and meets the following requirements, will be accepted.

Sieve Size	Percent Passing by weight
3/4 inch (19.0 mm)	100
No. 200 (75 µm)	0 - 12

d. Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

MIX DESIGN

153-3.1 Proportions. The Contractor shall submit, to the RPR, a mix design including the proportions and source of aggregate, fly ash, cement, water, and approved admixtures. No CLSM mixture shall be produced for payment until the RPR has given written approval of the proportions. The proportions shall be prepared by a laboratory and shall remain in effect for the duration of the project. The proportions shall establish a single percentage or weight for aggregate, fly ash, cement, water, and any admixtures proposed. Laboratory costs are incidental to this item.

a. Compressive strength. CLSM shall be designed to achieve a 28-day compressive strength of 100 to 200 psi when tested in accordance with ASTM D4832, with no significant strength gain after 28 days.

b. Consistency. Design CLSM to achieve a consistency that will produce an approximate 8-inch (200 mm) diameter circular-type spread without segregation. CLSM consistency shall be determined per ASTM D6103.

CONSTRUCTION METHODS

153-4.1 Placement.

a. Placement. CLSM may be placed by any reasonable means from the mixing unit into the space to be filled. Agitation is required during transportation and waiting time. Placement shall be performed so structures or pipes are not displaced from their final position and intrusion of CLSM into unwanted areas is avoided. The material shall be brought up uniformly to the fill line shown on the plans or as directed by the RPR. Each placement of CLSM shall be as continuous an operation as possible. If CLSM is placed in more than one lift, the base lift shall be free of surface water and loose foreign material prior to placement of the next lift.

b. Contractor Quality Control. The Contractor shall collect all batch tickets to verify the CLSM delivered to the project conforms to the mix design. The Contractor shall verify daily that the CLSM is consistent with 153-3.1a and 153-3.1b. Adjustments shall be made as necessary to the proportions and materials as needed. The Contractor shall provide all batch tickets to the RPR.

c. Limitations of placement. CLSM shall not be placed on frozen ground. Mixing and placing may begin when the air or ground temperature is at least 35°F and rising. Mixing and placement shall stop when the air temperature is 40°F and falling or when the anticipated air or ground temperature will be 35°F or less in the 24-hour period following proposed placement. At the time of placement, CLSM shall have a temperature of at least 40°F.

153-4.2 Curing and protection

a. Curing. The air in contact with the CLSM shall be maintained at temperatures above freezing for a minimum of 72 hours. If the CLSM is subjected to temperatures below 32°F, the material may be rejected by the RPR if damage to the material is observed.

b. Protection. The CLSM shall not be subject to loads and shall remain undisturbed by construction activities for a period of 48 hours or until a compressive strength of 15 psi is obtained. The Contractor shall be responsible for providing evidence to the RPR that the material has reached the desired strength. Acceptable evidence shall be based upon compressive tests made in accordance with paragraph 153-3.1a.

153-4.3 Quality Assurance (QA) Acceptance. CLSM QA acceptance shall be based upon batch tickets provided by the Contractor to the RPR to confirm that the delivered material conforms to the mix design.

METHOD OF MEASUREMENT

153-5.1 Measurement.

No separate measurement for payment shall be made for controlled low strength material (CLSM). CLSM shall be considered necessary and incidental to the work of this Contract.

BASIS OF PAYMENT

153-6.1 Payment.

No payment will be made separately or directly for controlled low strength material (CLSM). CLSM shall be considered necessary and incidental to the work of this Contract.

REFERENCES

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

ASTM International (ASTM)

ASTM C33	Standard Specification for Concrete Aggregates
ASTM C150	Standard Specification for Portland Cement
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D4832	Standard Test Method for Preparation and Testing of Controlled Low-Strength Material (CLSM) Test Cylinders
ASTM D6103	Flow Consistency of Controlled Low Strength Material (CLSM)

END OF ITEM P-153

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Item P-155 Lime-Treated Subgrade

DESCRIPTION

155-1.1 This item shall be used for soil modification that require strength gain to a specific level. This item shall consist of constructing one or more courses of a mixture of soil, lime, and water in accordance with this specification, and in conformity with the lines, grades, thicknesses, and typical cross-sections shown on the plans.

MATERIALS

155-2.1 Lime. Quicklime, hydrated lime, and either high-calcium dolomitic, or magnesium lime, as defined by ASTM C51, shall conform to the requirements of ASTM C977. Lime not produced from calcining limestone is not permitted.

155-2.2 Commercial lime slurry. Commercial lime slurry shall be a pumpable suspension of solids in water. The water or liquid portion of the slurry shall not contain dissolved material injurious or objectionable for the intended purpose. The solids portion of the mixture, when considered on the basis of "solids content," shall consist principally of hydrated lime of a quality and fineness sufficient to meet the following chemical composition and residue requirements.

a. **Chemical Composition.** The "solids content" of the lime slurry shall consist of a minimum of 70%, by weight, of calcium and magnesium oxides.

b. **Residue.** The percent by weight of residue retained in the "solids content" of lime slurry shall conform to the following requirements:

   Residue retained on a No. 6 sieve = maximum 0.0%

   Residue retained on a No. 10 sieve = maximum 1.0%

   Residue retained on a No. 30 sieve = maximum 2.5%

c. **Grade.** Commercial lime slurry shall conform to one of the following two grades:

   Grade 1. The "dry solids content" shall be at least 31%, by weight, of the slurry.

   Grade 2. The "dry solids content" shall be at least 35%, by weight, of the slurry.

155-2.3 Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

155-2.4 Soil. The soil for this work shall consist of on-site materials free of roots, sod, weeds, and stones larger than 2-1/2 inches and have a sulfate content of less than 0.3%.

COMPOSITION

155-3.1 Lime. Lime shall be applied at 5.0% dry unit weight of soil for the depth of the subgrade treatment as shown on the plans.

155-3.2 Tolerances. At final compaction, the lime and water content for each course of subgrade treatment shall conform to the following tolerances:

Material	Tolerance
Lime	+ 0.5%
Water	+ 2%, -0%

WEATHER LIMITATIONS

155-4.1 Weather limitation. Subgrade shall not be constructed when weather conditions detrimentally affect the quality of the materials. Lime shall not be applied unless the air temperature is at least 40°F and rising. Lime shall not be applied to soils that are frozen or contain frost. Protect completed lime-treated areas by approved methods against the detrimental effects of freezing if the air temperature falls below 35°F. Remove and replace any damaged portion of the completed soil-lime treated area with new soil-lime material in accordance with this specification.

EQUIPMENT

155-5.1 Equipment. All equipment necessary to grade, scarify, spread, mix and compact the material shall be provided. The Resident Project Representative (RPR) must approve the Contractor's proposed equipment prior to the start of the treatment.

CONSTRUCTION METHODS

155-6.1 General. This specification is to construct a subgrade consisting of a uniform lime mixture which shall be free from loose or segregated areas. The subgrade shall be of uniform density and moisture content, well mixed for its full depth, and have a smooth surface suitable for placing subsequent lifts. The Contractor shall be responsible to meet the above requirements.

Prior to any treatment, the subgrade shall be constructed as specified in Item P-152, Excavation, Subgrade and Embankment, and shaped to conform to the typical sections, lines, and grades as shown on the plans.

The mixing equipment must give visible indication at all times that it is cutting, pulverizing and mixing the material uniformly to the proper depth over the full width of the cut.

155-6.2 Application. Lime shall be uniformly spread only over an area where the initial mixing operations can be completed during the same work day. Lime shall not be applied when wind conditions are detrimental to proper application. A motor grader shall not be used to spread the lime. Adequate moisture shall be added to the cement/soil mixture to maintain the proper moisture content. Materials shall be handled, stored, and applied in accordance with all federal, state, and local requirements.

155-6.3 Mixing. The mixing procedure shall be as described below:

a. Preliminary mixing. The full depth of the treated subgrade shall be mixed with an approved mixing machine. Lime shall not be left exposed for more than six (6) hours. The mixing machine shall make two coverages. Water shall be added to the subgrade during mixing to provide a moisture content approximately 3% to 5% above the optimum moisture of the

material and to ensure chemical reaction of the lime and subgrade. After mixing, the subgrade shall be lightly rolled to seal the surface and help prevent evaporation of moisture. The water content of the subgrade mixture shall be maintained at a moisture content above the optimum moisture content for a minimum of 4 to 24 hours or until the material becomes friable. During the mellowing period, the material shall be sprinkled as directed by the RPR.

b. Final mixing. After the required mellowing time, the material shall be uniformly mixed by approved methods. Any clods shall be reduced in size by blading, discing, harrowing, scarifying, or by the use of other approved pulverization methods. After curing, pulverize lime treated material until 100% of soil particles pass a one-inch sieve and 60% pass the No. 4 sieve when tested dry by laboratory sieves. If resultant mixture contains clods, reduce their size by scarifying, remixing, or pulverization to meet specified gradation.

155-6.4 Control strip. The first half-day of construction shall be considered the control strip. The Contractor shall demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of the specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. Control strips that do not meet specification requirements shall be reworked, re-compacted, or removed and replaced at the Contractor's expense. Full operations shall not continue until the control strip has been accepted by the RPR. Upon acceptance of the control strip 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.

155-6.5 Treatment application and depth checks. The depth and amount of stabilization shall be measured by the Contractor with no less than 2 tests per day of material placed; test shall be witnessed by the RPR. Measurements shall be made in test holes excavated to show the full depth of mixing and the pH checked by spraying the side of the test hole with a pH indicator such as phenolphthalein. Phenolphthalein changes from clear to red between pH 8.3 and 10. The color change indicates the location of the bottom of the mixing zone. pH indicators other than phenolphthalein can be used to measure pH levels. If the pH is not at least 8.3 and/or if the depth of the treated subgrade is more than 1/2-inch deficient, additional lime treatment shall be added and the material remixed. The Contractor shall correct all such areas in a manner satisfactory to the RPR.

155-6.6 Compaction. Compaction of the mixture shall immediately follow the final mixing operation with the mixture compacted within 1 to 4 hours after final mixing. The material shall be at the moisture content specified in paragraph 155-3.2 during compaction. The field density of the compacted mixture shall be at least 95% of the maximum density as specified in paragraph 155-6.10. Perform in-place density test to determine degree of compaction between 24 and 72 hours after final compaction and the 24-hour moist cure period. If the material fails to meet the density requirements, it shall be reworked to meet the density requirements. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

155-6.7 Finishing and curing. After the final lift or course of lime-treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. The completed section shall then be finished by rolling, as directed by the RPR, with a pneumatic or other suitable roller sufficiently light to prevent hairline cracking. The finished surface shall not vary more than 1/2-inch when tested with a 12-foot straightedge applied parallel with and at right angles to the pavement centerline. Any variations in excess of this

tolerance shall be corrected by the Contractor at the Contractor's expense in a manner satisfactory to the RPR.

The completed section shall be moist-cured for a minimum of seven (7) days before further courses are added or any traffic is permitted, unless otherwise directed by the RPR. The final lift should not be exposed for more than 14 days without protection or the placement of a base course material.

155-6.8 Maintenance. The Contractor shall protect and maintain the lime-treated subgrade from yielding until the lime-treated subgrade is covered by placement of the next lift. When material has been exposed to excessive rain, snow, or freeze-thaw conditions, prior to placement of additional material, the Contractor shall verify that materials still meets all specification requirements. The maintenance cost shall be incidental to this item.

155-6.9 Surface tolerance. 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, 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 +/- 1/2-inch when tested with a 12-foot 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 straightedge for the full length of each line on a 50-foot grid.

b. Grade. The grade and crown shall be measured on a 50-foot grid and shall be within +/- 0.05 feet of the specified grade.

155-6.10 Acceptance sampling and testing. The lime treated subgrade shall be accepted for density and thickness on an area basis. Testing frequency shall be a minimum of one compaction and thickness test per 1000 square yards of lime treated subgrade, but not less than four (4) tests per day of production. Sampling locations will be determined on a random basis per ASTM D3665.

a. Density. All testing shall be done by 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 field density of the compacted mixture shall be at least 95% of the maximum density of laboratory specimens prepared from samples taken from the material in place. The specimens shall be compacted and tested in accordance with ASTM D698 to determine maximum density and optimum moisture content. The in-place field density shall be determined in accordance with ASTM D1556. If the material fails to meet the density requirements, the area represented by the failed test shall be reworked to meet the density requirements. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

b. Thickness. The thickness of the course shall be within +0 and -1/2 inch of the specified thickness as determined by depth tests taken by the Contractor in the presence of the RPR for each area. Where the thickness is deficient by more than 1/2-inch, the Contractor shall correct such areas at no additional cost The Contractor shall replace, at his expense, material where depth tests have been taken.

155-6.11 Handling and safety. The Contractor shall obtain and enforce the lime supplier's instructions for proper safety and handling of the lime to prevent physical eye or skin contact with lime during transport or application.

METHOD OF MEASUREMENT

155-7.1 Lime-treated subgrade shall be paid for by the square yard in the completed and accepted work.

155-7.2. Measurement of lime will not be made. The costs for this work shall be in the amount of lime-treated subgrade for which direct payment is made.

BASIS OF PAYMENT

155-8.1 Payment shall be made at the contract unit price per square yard for the lime-treated subgrade of the thickness specified. The price shall be full compensation for furnishing all material, including the lime, and for all preparation, delivering, placing and mixing these materials, and all labor, equipment, tools and incidentals necessary to complete this item.

Payment will be made under:

Item P-155-8.1 Lime-treated subgrade (12", 5.5% Lime) – per square yard

REFERENCES

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

ASTM International (ASTM)

ASTM C51 Standard Terminology Relating to Lime and Limestone (as used by the Industry)

ASTM C977 Standard Specification for Quicklime and Hydrated Lime for Soil Stabilization

ASTM C1602 Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete

ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3) (600 kN-m/m3)

ASTM D1556 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

ASTM D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

Software

FAARFIELD – FAA Rigid and Flexible Iterative Elastic Layered Design

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Item P-209 Crushed Aggregate Base Course

DESCRIPTION

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

MATERIALS

209-2.1 Crushed aggregate base. Crushed aggregate shall consist of clean, sound, durable particles of crushed stone, crushed gravel, and shall be free from coatings of clay, silt, organic material, clay lumps or balls or other deleterious materials or coatings. The method used to produce the crushed gravel shall result in the fractured particles in the finished product as consistent and uniform as practicable. Fine aggregate portion, defined as the portion passing the No. 4 (4.75 mm) sieve shall consist of fines from the coarse aggregate crushing operation. The fine aggregate shall be produced by crushing stone, gravel, that meet the coarse aggregate requirements for wear and soundness. Aggregate base material requirements are listed in the following table.

Crushed Aggregate Base Material Requirements

Material Test	Requirement	Standard
Coarse Aggregate		
Resistance to Degradation	Loss: 45% maximum	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate **or** Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Percentage of Fractured Particles	Minimum 90% by weight of particles with at least two fractured faces and 98% with at least one fractured face[1]	ASTM D5821
Flat Particles, Elongated Particles, or Flat and Elongated Particles	10% maximum, by weight, of flat, elongated, or flat and elongated particles [2]	ASTM D4791
Fine Aggregate		
Liquid limit	Less than or equal to 25	ASTM D4318
Plasticity Index	Not more than five (5)	ASTM D4318

[1] The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

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

209-2.2 Gradation requirements. The gradation of the aggregate base material shall meet the requirements of the gradation given in the following table when tested per ASTM C117 and ASTM C136. The gradation shall be well graded from coarse to fine and shall not vary from the lower limit on one sieve to the high limit on an adjacent sieve or vice versa.

Gradation of Aggregate Base

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

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

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

209-2.3 Sampling and Testing.

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

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

209-2.4 Separation Geotextile. Not used.

CONSTRUCTION METHODS

209-3.1 Control strip. The first half-day of construction shall be considered the control strip. The Contractor shall demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of the specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches (300 mm) upon

the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The RPR must witness this demonstration and approve the lift thickness prior to full production.

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

209-3.2 Preparing underlying subgrade and/or subbase. The underlying subgrade and/or subbase shall be checked and accepted by the RPR before base course placing and spreading operations begin. Re-proof rolling of the subgrade or proof rolling of the subbase in accordance with Item P-152, at the Contractor's expense, may be required by the RPR if the Contractor fails to ensure proper drainage or protect the subgrade and/or subbase. Any ruts or soft, yielding areas due to improper drainage conditions, hauling, or any other cause, shall be corrected before the base course is placed. To ensure proper drainage, the spreading of the base shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one-way slope.

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

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

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

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

209-3.5 Compaction. Immediately after completion of the spreading operations, compact each layer of the base course, as specified, with approved compaction equipment. The number, type, and weight of rollers shall be sufficient to compact the material to the required density within the same day that the aggregate is placed on the subgrade.

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

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

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

209-3.8 Surface tolerances. After the course has been compacted, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches, reshaped and recompacted to grade until the required smoothness and accuracy are obtained and approved by the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense. The smoothness and accuracy requirements specified here apply only to the top layer when base course is constructed in more than one layer.

a. Smoothness. The finished surface shall not vary more than 3/8-inch when tested with a 12-foot 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 straightedge for the full length of each line on a 50-foot grid.

b. Grade. The grade and crown shall be measured on a 50-foot grid and shall be within +0 and -1/2 inch of the specified grade.

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

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

Each area shall be accepted for density when the field density is at least 100% of the maximum density of laboratory specimens compacted and tested per ASTM D1557. The in-place field density shall be determined per ASTM D1556 or ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. If the specified density is not attained, the area represented by the failed test must be reworked and/or recompacted and two additional random tests made. This procedure shall be followed until the specified density is reached. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

b. Thickness. Depth tests shall be made by test holes at least 3 inches in diameter that extend through the base. The thickness of the base course shall be within +0 and -1/2 inch of the specified thickness as determined by depth tests taken by the Contractor in the presence of the RPR for each area. Where the thickness is deficient by more than 1/2-inch, the Contractor shall correct such areas at no additional cost by scarifying to a depth of at least 3 inches, adding new material of proper gradation, and the material shall be blended and recompacted to grade. The Contractor shall replace, at his expense, base material where depth tests have been taken.

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT

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

Payment will be made under:

Item P-209-5.1	Crushed Aggregate Base Course (6”) - per square yard

REFERENCES

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

ASTM International (ASTM)

ASTM C29	Standard Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75-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 C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2700 kN-m/m^3))
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method

ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4491	Standard Test Methods for Water Permeability of Geotextiles by Permittivity
ASTM D4643	Standard Test Method for Determination of Water Content of Soil and Rock by Microwave Oven Heating
ASTM D4751	Standard Test Methods for Determining Apparent Opening Size of a Geotextile
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)
ASTM D7928	Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis

American Association of State Highway and Transportation Officials (AASHTO)

M288	Standard Specification for Geosynthetic Specification for Highway Applications

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Item P-401 Asphalt Mix Pavement

DESCRIPTION

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

MATERIALS

401-2.1 Aggregate. Aggregates shall consist of crushed stone, crushed gravel, crushed slag, screenings, natural sand, and mineral filler, as required. The aggregates should have no known history of detrimental pavement staining due to ferrous sulfides, such as pyrite. Coarse aggregate is the material retained on the No. 4 sieve. Fine aggregate is the material passing the No. 4 sieve.

a. Coarse aggregate. Coarse aggregate shall consist of sound, tough, durable particles, free from films of matter that would prevent thorough coating and bonding with the asphalt material and free from organic matter and other deleterious substances. Coarse aggregate material requirements are given in the table below.

Coarse Aggregate Material Requirements

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

[1] The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

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

[3] Only required if slag is specified.

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

Fine Aggregate Material Requirements

Material Test	Requirement	Standard
Liquid limit	25 maximum	ASTM D4318
Plasticity Index	4 maximum	ASTM D4318
Soundness of Aggregates by Use of Sodium Sulfate **or** Magnesium Sulfate	Loss after 5 cycles: 10% maximum using Sodium sulfate - or - 15% maximum using magnesium sulfate	ASTM C88
Clay lumps and friable particles	0.3% maximum	ASTM C142
Sand equivalent	45 minimum	ASTM D2419
Natural Sand	0% to 15% maximum by weight of total aggregate	ASTM D1073

c. Sampling. ASTM D75 shall be used in sampling coarse and fine aggregate.

401-2.2 Mineral filler. Mineral filler (baghouse fines) may be added in addition to material naturally present in the aggregate. Mineral filler shall meet the requirements of ASTM D242.

Mineral Filler Requirements

Material Test	Requirement	Standard
Plasticity Index	4 maximum	ASTM D4318

401-2.3 Asphalt binder. Asphalt binder shall conform to ASTM D6373 Performance Grade (PG) 76-22.

Asphalt Binder PG Plus Test Requirements

Material Test	Requirement	Standard
Elastic Recovery	75% minimum	ASTM D6084

401-2.4 Anti-stripping agent. Any anti-stripping agent or additive (anti-strip) shall be heat stable and shall not change the asphalt binder grade beyond specifications. Anti-strip shall be an approved material of the Department of Transportation of the State in which the project is located.

COMPOSITION

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

401-3.2 Job mix formula (JMF) laboratory. The laboratory used to develop the JMF shall possess a current certificate of accreditation, listing D3666 from a national accrediting authority and all test methods required for developing the JMF; and be listed on the accrediting authority's website. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Resident Project Representative (RPR) prior to start of construction.

401-3.3 Job mix formula (JMF). No asphalt mixture shall be placed until an acceptable mix design has been submitted to the RPR for review and accepted in writing. The RPR's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

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

The JMF shall be prepared by an accredited laboratory that meets the requirements of paragraph 401-3.2. The asphalt mixture shall be designed using procedures contained in Asphalt Institute MS-2 Mix Design Manual, 7th Edition**.** Samples shall be prepared and compacted using a Marshall compactor in accordance with ASTM D6926.

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

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

The JMF shall be submitted in writing by the Contractor at least 10 days prior to the start of paving operations. The JMF shall be developed within the same construction season using aggregates proposed for project use.

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

- Manufacturer's Certificate of Analysis (COA) for the asphalt binder used in the JMF in accordance with paragraph 401-2.3. Certificate of asphalt performance grade is with modifier already added, if used and must indicate compliance with ASTM D6373. For plant modified asphalt binder, certified test report indicating grade certification of modified asphalt binder.
- Manufacturer's Certificate of Analysis (COA) for the anti-stripping agent if used in the JMF in accordance with paragraph 401-2.4.
- Certified material test reports for the course and fine aggregate and mineral filler in accordance with paragraphs 401-2.1.
- Percent passing each sieve size for individual gradation of each aggregate cold feed and/or hot bin; percent by weight of each cold feed and/or hot bin used; and the total combined gradation in the JMF.
- Specific Gravity and absorption of each coarse and fine aggregate.
- Percent natural sand.
- Percent fractured faces.

- Percent by weight of flat particles, elongated particles, and flat and elongated particles (and criteria).
- Percent of asphalt.
- Number of blows or gyrations
- Laboratory mixing and compaction temperatures.
- Supplier-recommended field mixing and compaction temperatures.
- Plot of the combined gradation on a 0.45 power gradation curve.
- Graphical plots of air voids, voids in the mineral aggregate (VMA), and unit weight versus asphalt content. To achieve minimum VMA during production, the mix design needs to account for material breakdown during production.
- Tensile Strength Ratio (TSR).
- Type and amount of Anti-strip agent when used.
- Asphalt Pavement Analyzer (APA) results.
- Date the JMF was developed. Mix designs that are not dated or which are from a prior construction season shall not be accepted.

Table 1. Asphalt Design Criteria

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

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

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

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

The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the gradation or gradations specified in Table 2 when tested in accordance with ASTM C136 and ASTM C117.

The gradations in Table 2 represent the limits that shall determine the suitability of aggregate for use from the sources of supply; be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa.

Table 2. Aggregate - Asphalt Pavements

Sieve Size	Percentage by Weight Passing Sieve
1 inch (25.0 mm)	100
3/4 inch (19.0 mm)	90-100
1/2 inch (12.5 mm)	68-88
3/8 inch (9.5 mm)	60-82
No. 4 (4.75 mm)	45-67
No. 8 (2.36 mm)	32-54
No. 16 (1.18 mm)	22-44
No. 30 (600 µm)	15-35
No. 50 (300 µm)	9-25
No. 100 (150 µm)	6-19
No. 200 (75 µm)	3-6
Minimum Voids in Mineral Aggregate (VMA)[1]	14.0
Asphalt Percent:	
Stone or gravel	4.5-7.0
Slag	5.0-7.5
Recommended Minimum Construction Lift Thickness	3 inch

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

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

401-3.4 Reclaimed asphalt pavement (RAP). RAP shall not be used.

401-3.5 Control Strip. Full production shall not begin until an acceptable control strip has been constructed and accepted in writing by the RPR**.** The Contractor shall prepare and place a quantity of asphalt according to the JMF. The underlying grade or pavement structure upon which the control strip is to be constructed shall be the same as the remainder of the course represented by the control strip.

The Contractor will not be allowed to place the control strip until the Contractor quality control program (CQCP), showing conformance with the requirements of paragraph 401-5.1, has been accepted, in writing, by the RPR.

The control strip will consist of at least 250 tons or 1/2 sublot, whichever is greater. The control strip shall be placed in two lanes of the same width and depth to be used in production with a longitudinal cold joint. The cold joint must be cut back in accordance with paragraph 401-4.14 using the same procedure that will be used during production. The cold joint for the control strip will be an exposed construction joint at least four (4) hours old or when the mat has cooled to less than 160°F. The equipment used in construction of the control strip shall be the same type, configuration and weight to be used on the project.

The control strip will be considered acceptable by the RPR if the gradation, asphalt content, and VMA are within the action limits specified in paragraph 401-5.5a; and Mat density greater than or equal to 94.5%, air voids 3.5% +/- 1%, and joint density greater than or equal to 92.5%.

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

The control strip will be considered one lot for payment based upon the average of a minimum of 3 samples (no sublots required for control strip). Payment will only be made for an acceptable control strip in accordance with paragraph 401-8.1 using a lot pay factor equal to 100.

CONSTRUCTION METHODS

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

Table 4. Surface Temperature Limitations of Underlying Course

Mat Thickness	Base Temperature (Minimum)	
	°F	°C
3 inches (7.5 cm) or greater	40 [1]	4
Greater than 2 inches (50 mm) but less than 3 inches (7.5 cm)	45	7

401-4.2 Asphalt plant. Plants used for the preparation of asphalt shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M156 including the following items.

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

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

401-4.3 Aggregate stockpile management. Aggregate stockpiles shall be constructed in a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the asphalt batch plant. Aggregates that have become segregated or mixed with earth or foreign material shall not be used.

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

401-4.4 Hauling equipment. Trucks used for hauling asphalt shall have tight, clean, and smooth metal beds. To prevent the asphalt from sticking to the truck beds, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other material approved by the RPR. Petroleum products shall not be used for coating truck beds. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers shall be securely fastened.

401-4.4.1 Material transfer vehicle (MTV). Material transfer vehicles are not required.

401-4.5 Asphalt pavers. Asphalt pavers shall be self-propelled with an activated heated screed, capable of spreading and finishing courses of asphalt that will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface. The asphalt paver shall be equipped with a control system capable of automatically maintaining the specified screed grade and elevation.

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

The paver shall be capable of paving to a minimum width specified in paragraph 401-4.12.

401-4.6 Rollers. The number, type, and weight of rollers shall be sufficient to compact the asphalt to the required density while it is still in a workable condition without crushing of the aggregate, depressions or other damage to the pavement surface. Rollers shall be in good condition, clean, and capable of operating at slow speeds to avoid displacement of the asphalt. All rollers shall be specifically designed and suitable for compacting asphalt concrete and shall be properly used. Rollers that impair the stability of any layer of a pavement structure or underlying soils shall not be used.

401-4.7 Density device. The Contractor shall have on site a density gauge during all paving operations in order to assist in the determination of the optimum rolling pattern, type of roller and frequencies, as well as to monitor the effect of the rolling operations during production paving. The Contractor shall supply a qualified technician during all paving operations to calibrate the gauge and obtain accurate density readings for all new asphalt. These densities shall be supplied to the RPR upon request at any time during construction. No separate payment will be made for supplying the density gauge and technician.

401-4.8 Preparation of asphalt binder. The asphalt binder shall be heated in a manner that will avoid local overheating and provide a continuous supply of the asphalt binder to the mixer at a uniform temperature. The temperature of unmodified asphalt binder delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles, but shall not exceed 325°F when added to the aggregate. The temperature of modified asphalt binder shall be no more than 350°F when added to the aggregate.

401-4.9 Preparation of mineral aggregate. The aggregate for the asphalt shall be heated and dried. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates. The temperature of the aggregate and mineral filler shall not exceed 350°F when the asphalt binder is added. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by overheating. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

401-4.10 Preparation of Asphalt mixture. The aggregates and the asphalt binder shall be weighed or metered and mixed in the amount specified by the JMF. The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but not less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor, based on the procedure for determining the percentage of coated particles described in ASTM D2489, for each individual plant and for each type of aggregate used. The wet mixing time will be set to achieve 95% of coated particles. For continuous mix plants, the minimum mixing time shall be determined by dividing the weight of its contents at operating level by the weight of the mixture delivered per second by the mixer. The moisture content of all asphalt upon discharge shall not exceed 0.5%.

401-4.11 Application of Prime and Tack Coat. Immediately before placing the asphalt mixture, the underlying course shall be cleaned of all dust and debris.

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

401-4.12 Laydown plan, transporting, placing, and finishing. Prior to the placement of the asphalt, the Contractor shall prepare a laydown plan with the sequence of paving lanes and width to minimize the number of cold joints; the location of any temporary ramps; laydown temperature; and estimated time of completion for each portion of the work (milling, paving, rolling, cooling, etc.). The laydown plan and any modifications shall be approved by the RPR.

Deliveries shall be scheduled so that placing and compacting of asphalt is uniform with minimum stopping and starting of the paver. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to approximately ambient temperature. The Contractor, at their expense, shall be responsible for repair of any damage to the pavement caused by hauling operations.

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

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

The speed of the paver shall be regulated to eliminate pulling and tearing of the asphalt mat. Placement of the asphalt mix shall begin along the centerline of a crowned section or on the high side of areas with a one way slope unless shown otherwise on the laydown plan as accepted by the RPR. The asphalt mix shall be placed in consecutive adjacent lanes having a minimum width of 10 feet (m) except where edge lanes require less width to complete the area. Additional screed sections attached to widen the paver to meet the minimum lane width requirements must include additional auger sections to move the asphalt mixture uniformly along the screed extension.

The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least one foot; however, the joint in the surface top course shall be at the centerline of crowned pavements. Transverse joints in one course shall be offset by at least 10 feet from transverse joints in the previous course. Transverse joints in adjacent lanes shall be offset a minimum of 10 feet. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the asphalt may be spread and luted by hand tools.

The RPR may at any time, reject any batch of asphalt, on the truck or placed in the mat, which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or overheated asphalt mixture. Such rejection may be based on only visual inspection or temperature measurements. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the RPR, and if it can be demonstrated in the laboratory, in the presence of the RPR, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

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

401-4.13 Compaction of asphalt mixture. After placing, the asphalt mixture shall be thoroughly and uniformly compacted by self-propelled rollers. The surface shall be compacted as soon as possible when the asphalt has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any surface defects and/or displacement occurring as a result of the roller, or from any other cause, shall be corrected at the Contractor's expense.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross-section, and the required field density is obtained. To prevent adhesion of the asphalt to the roller, the wheels shall be equipped with a scraper and kept moistened with water as necessary.

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

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

401-4.14 Joints. The formation of all joints shall be made to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

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

Longitudinal joints which have been left exposed for more than four (4) hours; the surface temperature has cooled to less than 175°F; or are irregular, damaged, uncompacted or otherwise defective shall be cut back with a cutting wheel or pavement saw a maximum of 3 inches (75 mm) to expose a clean, sound, uniform vertical surface for the full depth of the course. All cutback material and any laitance produced from cutting joints shall be removed from the project. Asphalt tack coat in accordance with P-603 shall be applied to the clean, dry joint prior to placing any additional fresh asphalt against the joint. The cost of this work shall be considered incidental to the cost of the asphalt.

401-4.15 Saw-cut grooving. Saw-cut grooving is not required.

401-4.16 Diamond grinding. Diamond grinding shall be completed prior to pavement grooving. Diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive.

Diamond grinding shall be performed with a machine designed specifically for diamond grinding capable of cutting a path at least 3 feet (0.9 m) wide. The saw blades shall be 1/8-inch wide with a sufficient number of blades to create grooves between 0.090 and 0.130 inches wide; and peaks and ridges approximately 1/32 inch higher than the bottom of the grinding cut. The actual number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Equipment or grinding procedures that cause ravels, aggregate fractures, spalls or disturbance to the pavement will not be permitted. 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. The Contractor shall apply a surface treatment per P-608 to all areas that have been subject to grinding.

401-4.17 Nighttime paving requirements. The Contractor shall provide adequate lighting during any nighttime construction. A lighting plan shall be submitted by the Contractor and approved by the RPR prior to the start of any nighttime work. All work shall be in accordance with the approved CSPP and lighting plan.

CONTRACTOR QUALITY CONTROL (CQC)

401-5.1 General. The Contractor shall develop a Contractor Quality Control Program (CQCP) in accordance with Item C-100. No partial payment will be made for materials without an approved CQCP.

401-5.2 Contractor quality control (QC) facilities. The Contractor shall provide or contract for testing facilities in accordance with Item C-100. The RPR shall be permitted unrestricted access to inspect the Contractor’s QC facilities and witness QC activities. The RPR will advise the Contractor in writing of any noted deficiencies concerning the QC facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

401-5.3 Contractor QC testing. The Contractor shall perform all QC tests necessary to control the production and construction processes applicable to these specifications and as set forth in the approved CQCP. The testing program shall include, but not necessarily be limited to, tests

for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, field compaction, and surface smoothness. A QC Testing Plan shall be developed as part of the CQCP.

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

b. Gradation. Aggregate gradations shall be determined a minimum of twice per day from mechanical analysis of extracted aggregate in accordance with ASTM D5444, ASTM C136, and ASTM C117.

c. Moisture content of aggregate. The moisture content of aggregate used for production shall be determined a minimum of once per day in accordance with ASTM C566.

d. Moisture content of asphalt. The moisture content shall be determined once per day in accordance with AASHTO T329 or ASTM D1461.

e. Temperatures. Temperatures shall be checked, at least four times per day, at necessary locations to determine the temperatures of the dryer, the asphalt binder in the storage tank, the asphalt at the plant, and the asphalt at the job site.

f. In-place density monitoring. The Contractor shall conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the pavement density in accordance with ASTM D2950.

g. Smoothness for Contractor Quality Control.

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

The Contractor may use a 12-foot “straightedge, a rolling inclinometer meeting the requirements of ASTM E2133 or rolling external reference device that can simulate a 12-foot 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 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.

(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 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; and at the third points of paving lanes when widths of paving lanes are 20 ft 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 shall be corrected with diamond grinding per paragraph 401-4.16 or by removing and replacing the surface course to full depth. Grinding shall be tapered in all directions to provide smooth transitions to areas not requiring grinding. All areas in which diamond grinding has been performed shall be subject to the final pavement thickness tolerances specified in paragraph 401-6.1d(3). Areas that have been ground shall be sealed with a surface treatment in accordance with Item P-608. To avoid the surface treatment creating any conflict with runway or taxiway markings, it may be necessary to seal a larger area.

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

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

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

Areas with humps or depressions that exceed grade or smoothness criteria and that retain water on the surface must be ground off provided the course thickness after grinding is not more than 1/2 inch less than the thickness specified on the plans. Grinding shall be in accordance with paragraph 401-4.16.

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

401-5.4 Sampling. When directed by the RPR, the Contractor shall sample and test any material that appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

401-5.5 Control charts. The Contractor shall maintain linear control charts for both individual measurements and range (i.e. difference between highest and lowest measurements) for aggregate gradation, asphalt content, and VMA. The VMA for each day will be calculated and monitored by the QC laboratory.

Control charts shall be posted in a location satisfactory to the RPR and kept current. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part

of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a problem and the Contractor is not taking satisfactory corrective action, the RPR may suspend production or acceptance of the material.

a. Individual measurements. Control charts for individual measurements shall be established to maintain process control within tolerance for aggregate gradation, asphalt content, and VMA. The control charts shall use the job mix formula target values as indicators of central tendency for the following test parameters with associated Action and Suspension Limits:

Control Chart Limits for Individual Measurements

Sieve	Action Limit	Suspension Limit
3/4 inch (19.0 mm)	±6%	±9%
1/2 inch (12.5 mm)	±6%	±9%
3/8 inch (9.5 mm)	±6%	±9%
No. 4 (4.75 mm)	±6%	±9%
No. 16 (1.18 mm)	±5%	±7.5%
No. 50 (300 µm)	±3%	±4.5%
No. 200 (75 µm)	±2%	±3%
Asphalt Content	±0.45%	±0.70%
Minimum VMA	-0.5%	-1.0%

b. Range. Control charts shall be established to control gradation process variability. The range shall be plotted as the difference between the two test results for each control parameter. The Suspension Limits specified below are based on a sample size of n = 2. Should the Contractor elect to perform more than two tests per lot, the Suspension Limits shall be adjusted by multiplying the Suspension Limit by 1.18 for n = 3 and by 1.27 for n = 4.

Control Chart Limits Based on Range

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

c. Corrective Action. The CQCP shall indicate that appropriate action shall be taken when the process is believed to be out of tolerance. The Plan shall contain rules to gauge when a process is out of control and detail what action will be taken to bring the process into control. As

a minimum, a process shall be deemed out of control and production stopped and corrective action taken, if:

(1) One point falls outside the Suspension Limit line for individual measurements or range; or

(2) Two points in a row fall outside the Action Limit line for individual measurements.

401-5.6 QC reports. The Contractor shall maintain records and shall submit reports of QC activities daily, in accordance with Item C-100.

MATERIAL ACCEPTANCE

401-6.1 Acceptance sampling and testing. Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the RPR at no cost to the Contractor except that coring as required in this section shall be completed and paid for by the Contractor.

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

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

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

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

(1) Sampling. Material from each sublot shall be sampled in accordance with ASTM D3665. Samples shall be taken from material deposited into trucks at the plant or at the job site in accordance with ASTM D979. The sample of asphalt may be put in a covered metal tin and placed in an oven for not less than 30 minutes nor more than 60 minutes, or not less than 60 minutes nor more than 90 minutes when absorptive aggregates are used, to maintain the material at or above the compaction temperature as specified in the JMF.

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

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

(1) Sampling. The Contractor will cut minimum 5 inch diameter samples in accordance with ASTM D5361. The Contractor shall furnish all tools, labor, and materials for cleaning, and filling the cored pavement. Laitance produced by the coring operation shall be removed immediately after coring, and core holes shall be filled within one day after sampling in a manner acceptable to the RPR.

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

(3) Thickness. Thickness of each lift of surface course will be evaluated by the RPR for compliance to the requirements shown on the plans after any necessary corrections for grade. Measurements of thickness will be made using the cores extracted for each sublot for density measurement. The maximum allowable deficiency at any point will not be more than 1/4 inch less than the thickness indicated for the lift. Average thickness of lift, or combined lifts, will not be less than the indicated thickness. Where the thickness tolerances are not met, the lot or sublot shall be corrected by the Contractor at his expense by removing the deficient area and replacing with new pavement. The Contractor, at his expense, may take additional cores as approved by the RPR to circumscribe the deficient area.

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

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

401-6.2 Acceptance criteria.

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

b. Air Voids and Mat density. Acceptance of each lot of plant produced material for mat density and air voids will be based on the percentage of material within specification limits (PWL). If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment will be determined in accordance with paragraph 401-8.1.

c. Joint density. Acceptance of each lot of plant produced asphalt for joint density will be based on the PWL. If the PWL of the lot is equal to or exceeds 90%, the lot will be considered acceptable. If the PWL is less than 90%, the Contractor shall evaluate the reason and act accordingly. If the PWL is less than 80%, the Contractor shall cease operations and until the reason for poor compaction has been determined. If the PWL is less than 71%, the pay factor for the lot used to complete the joint will be reduced by five (5) percentage points. This lot pay factor reduction will be incorporated and evaluated in accordance with paragraph 401-8.1.

d. Grade. The final finished surface of the pavement shall be surveyed to verify that the grade elevations and cross-sections shown on the plans do not deviate more than 1/2 inch vertically or 0.1 feet laterally.

Cross-sections of the pavement shall be taken at a minimum 50-foot longitudinal spacing, at all longitudinal grade breaks, and at start and end of each lane placed. Minimum cross-section grade points shall include grade at centerline, ± 10 feet of centerline, and edge of taxiway pavement.

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

e. 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 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 hours 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 blanking band. The bump template must span one inch with an offset of 0.4 inches. 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 equals 25 feet and a vertical scale of one inch equals one inch. Profilograph shall be performed one foot right and left of project centerline and 15 feet right and left of project centerline. Any areas that indicate “must grind” shall be corrected with diamond grinding per paragraph 401-4.16 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.

401-6.3 Percentage of material within specification limits (PWL). The PWL will be determined in accordance with procedures specified in Item C-110. The specification tolerance limits (L) for lower and (U) for upper are contained in Table 5.

Table 5. Acceptance Limits for Air Voids and Density

Test Property	Pavements Specification Tolerance Limits	
	L	U
Air Voids Total Mix (%)	2.0	5.0
Surface Course Mat Density (%)	92.8	-
Base Course Mat Density (%)	92.0	-
Joint density (%)	90.5	--

a. Outliers. All individual tests for mat density and air voids will be checked for outliers (test criterion) in accordance with ASTM E178, at a significance level of 5%. Outliers will be discarded, and the PWL will be determined using the remaining test values. The criteria in Table 5 is based on production processes which have a variability with the following standard deviations: Surface Course Mat Density (%), 1.30; Base Course Mat Density (%), 1.55; Joint Density (%), 1.55.

The Contractor should note that (1) 90 PWL is achieved when consistently producing a surface course with an average mat density of at least 94.5% with 1.30% or less variability, (2) 90 PWL is achieved when consistently producing a base course with an average mat density of at least 94.0% with 1.55% or less variability, and (3) 90 PWL is achieved when consistently producing joints with an average joint density of at least 92.5% with 1.55% or less variability.

401-6.4 Resampling pavement for mat density.

a. General. Resampling of a lot of pavement will only be allowed for mat density, and then, only if the Contractor requests same, in writing, within 48 hours after receiving the written test results from the RPR. A retest will consist of all the sampling and testing procedures contained in paragraphs 401-6.1d and 401-6.2b. Only one resampling per lot will be permitted.

(1) A redefined PWL will be calculated for the resampled lot. The number of tests used to calculate the redefined PWL will include the initial tests made for that lot plus the retests.

(2) The cost for resampling and retesting shall be borne by the Contractor.

b. Payment for resampled lots. The redefined PWL for a resampled lot will be used to calculate the payment for that lot in accordance with Table 6.

c. Outliers. Check for outliers in accordance with ASTM E178, at a significance level of 5%.

METHOD OF MEASUREMENT

401-7.1 Measurement. Asphalt shall be measured by the number of tons of asphalt used in the accepted work. Batch weights or truck scale weights will be used to determine the basis for the tonnage.

BASIS OF PAYMENT

401-8.1 Payment. Payment for a lot of asphalt meeting all acceptance criteria as specified in paragraph 401-6.2 shall be made based on results of tests for mat density and air voids. Payment for acceptable lots shall be adjusted according to paragraph 401-8.1c for mat density and air voids; and paragraph 401-6.2c for joint density, subject to the limitation that:

a. The total project payment for plant mix asphalt pavement shall not exceed 100 percent of the product of the contract unit price and the total number of tons (kg) of asphalt used in the accepted work.

b. The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

c. Basis of adjusted payment. The pay factor for each individual lot shall be calculated in accordance with Table 6. A pay factor shall be calculated for both mat density and air voids. The lot pay factor shall be the higher of the two values when calculations for both mat density and air voids are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either mat density or air voids is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both mat density and air voids are less than 100%. If PWL for joint density is less than 71% then the lot pay factor shall be reduced by 5% but be no higher than 95%.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 401-8.1a. Payment in excess of 100% for accepted lots of asphalt shall be used to offset payment for accepted lots of asphalt pavement that achieve a lot pay factor less than 100%.

Payment for sublots which do not meet grade in accordance with paragraph 401-6.2d after correction for over 25% of the sublot shall be reduced by 5%.

Table 6. Price adjustment schedule[1]

Percentage of material within specification limits (PWL)	Lot pay factor (percent of contract unit price)
96 – 100	106
90 – 95	PWL + 10
75 – 89	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 above 100% shall be subject to the total project payment limitation specified in paragraph 401-8.1a.

[2] The lot shall be removed and replaced. However, the RPR may decide to allow the rejected lot to remain. In that case, if the RPR and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50% of the contract unit price and the total project payment shall be reduced by the amount withheld for the rejected lot.

d. Profilograph Roughness. The Contractor will receive full payment when the profilograph average profile index is in accordance with paragraph 401-6.2e. 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.

401-8.1 Payment.

Payment will be made under:

Item P-401-8.1 Asphalt Surface Course - per ton

REFERENCES

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

ASTM International (ASTM)

ASTM C29	Standard Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C127	Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D242	Standard Specification for Mineral Filler for Bituminous Paving Mixtures
ASTM D946	Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D979	Standard Practice for Sampling Asphalt Paving Mixtures
ASTM D1073	Standard Specification for Fine Aggregate for Asphalt Paving Mixtures
ASTM D1188	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
ASTM D2172	Standard Test Method for Quantitative Extraction of Bitumen from Asphalt Paving Mixtures
ASTM D1461	Standard Test Method for Moisture or Volatile Distillates in Asphalt Paving Mixtures
ASTM D2041	Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D2489	Standard Practice for Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D2726	Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D2950	Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods
ASTM D3203	Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D3381	Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D3666	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4552	Standard Practice for Classifying Hot-Mix Recycling Agents

ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D4867	Standard Test Method for Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D5361	Standard Practice for Sampling Compacted Asphalt Mixtures for Laboratory Testing
ASTM D5444	Standard Test Method for Mechanical Size Analysis of Extracted Aggregate
ASTM D5821	Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
ASTM D6084	Standard Test Method for Elastic Recovery of Bituminous Materials by Ductilometer
ASTM D6307	Standard Test Method for Asphalt Content of Hot Mix Asphalt by Ignition Method
ASTM D6373	Standard Specification for Performance Graded Asphalt Binder
ASTM D6752	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method
ASTM D6925	Standard Test Method for Preparation and Determination of the Relative Density of Hot Mix Asphalt (HMA) Specimens by Means of the SuperPave Gyratory Compactor.
ASTM D6926	Standard Practice for Preparation of Bituminous Specimens Using Marshall Apparatus
ASTM D6927	Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures
ASTM D6995	Standard Test Method for Determining Field VMA based on the Maximum Specific Gravity of the Mix (Gmm)
ASTM E11	Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
ASTM E178	Standard Practice for Dealing with Outlying Observations
ASTM E1274	Standard Test Method for Measuring Pavement Roughness Using a Profilograph
ASTM E950	Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference
ASTM E2133	Standard Test Method for Using a Rolling Inclinometer to Measure Longitudinal and Transverse Profiles of a Traveled Surface

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M156	Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

AASHTO T329	Standard Method of Test for Moisture Content of Hot Mix Asphalt (HMA) by Oven Method
AASHTO T324	Standard Method of Test for Hamburg Wheel-Track Testing of Compacted Asphalt Mixtures
AASHTO T 340	Standard Method of Test for Determining the Rutting Susceptibility of Hot Mix Asphalt (APA) Using the Asphalt Pavement Analyzer (APA)

Asphalt Institute (AI)

Asphalt Institute Handbook MS-26, Asphalt Binder

Asphalt Institute MS-2Mix Design Manual, 7th Edition

AI State Binder Specification Database

Federal Highway Administration (FHWA)

Long Term Pavement Performance Binder Program

Advisory Circulars (AC)

AC 150/5320-6	Airport Pavement Design and Evaluation

FAA Orders

5300.1	Modifications to Agency Airport Design, Construction, and Equipment Standards

Software

FAARFIELD

END OF ITEM P-401

Item P-603 Emulsified Asphalt Tack Coat

DESCRIPTION

603-1.1 This item shall consist of preparing and treating an asphalt or concrete surface with asphalt material in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

MATERIALS

603-2.1 Asphalt materials. The asphalt material shall be an emulsified asphalt as specified in ASTM D3628 as an asphalt application for tack coat appropriate to local conditions. The emulsified asphalt shall not be diluted. The Contractor shall provide a copy of the manufacturer's Certificate of Analysis (COA) for the asphalt material to the Resident Project Representative (RPR) before the asphalt material is applied for review and acceptance. The furnishing of COA for the asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer's COA may be subject to verification by testing the material delivered for use on the project.

CONSTRUCTION METHODS

603-3.1 Weather limitations. The tack coat shall be applied only when the existing surface is dry and the atmospheric temperature is 50°F or above; the temperature has not been below 35°F for the 12 hours prior to application; and when the weather is not foggy or rainy. The temperature requirements may be waived when directed by the RPR.

603-3.2 Equipment. The Contractor shall provide equipment for heating and applying the emulsified asphalt material. The emulsion shall be applied with a manufacturer-approved computer rate-controlled asphalt distributor. The equipment shall be in good working order and contain no contaminants or diluents in the tank. Spray bar tips must be clean, free of burrs, and of a size to maintain an even distribution of the emulsion. Any type of tip or pressure source is suitable that will maintain predetermined flow rates and constant pressure during the application process with application speeds under eight (8) miles per hour or seven (700) feet per minute.

The equipment will be tested under pressure for leaks and to ensure proper set-up before use to verify truck set-up (via a test-shot area), including but not limited to, nozzle tip size appropriate for application, spray-bar height and pressure and pump speed, evidence of triple-overlap spray pattern, lack of leaks, and any other factors relevant to ensure the truck is in good working order before use.

The distributor truck shall be equipped with a minimum 12-foot spreader spray bar with individual nozzle control with computer-controlled application rates. The distributor truck shall have an easily accessible thermometer that constantly monitors the temperature of the emulsion, and have an operable mechanical tank gauge that can be used to cross-check the computer accuracy. If the distributor is not equipped with an operable quick shutoff valve, the prime operations shall be started and stopped on building paper.

The distributor truck shall be equipped to effectively heat and mix the material to the required temperature prior to application as required. Heating and mixing shall be done in accordance with the manufacturer's recommendations. Do not overheat or over mix the material.

The distributor shall be equipped with a hand sprayer.

Asphalt distributors must be calibrated annually in accordance with ASTM D2995. The Contractor must furnish a current calibration certification for the asphalt distributor truck from any State or other agency as approved by the RPR.

A power broom and/or power blower suitable for cleaning the surfaces to which the asphalt tack coat is to be applied shall be provided.

603-3.3 Application of emulsified asphalt material. The emulsified asphalt shall not be diluted. Immediately before applying the emulsified asphalt tack coat, the full width of surface to be treated shall be swept with a power broom and/or power blower to remove all loose dirt and other objectionable material.

The emulsified asphalt material shall be uniformly applied with an asphalt distributor at the rates appropriate for the conditions and surface specified in the table below. The type of asphalt material and application rate shall be approved by the RPR prior to application.

Emulsified Asphalt

Surface Type	Residual Rate, gal/SY	Emulsion Application Bar Rate, gal/SY
New asphalt	0.02-0.05	0.03-0.07
Existing asphalt	0.04-0.07	0.06-0.11
Milled Surface	0.04-0.08	.0.06-0.12
Concrete	0.03-0.05	0.05-0.08

After application of the tack coat, the surface shall be allowed to cure without being disturbed for the period of time necessary to permit drying and setting of the tack coat. This period shall be determined by the RPR. The Contractor shall protect the tack coat and maintain the surface until the next course has been placed. When the tack coat has been disturbed by the Contractor, tack coat shall be reapplied at the Contractor's expense.

603-3.4 Freight and waybills The Contractor shall submit waybills and delivery tickets, during progress of the work. Before the final statement is allowed, file with the RPR certified waybills and certified delivery tickets for all emulsified asphalt materials used in the construction of the pavement covered by the contract. Do not remove emulsified asphalt material from storage until the initial outage and temperature measurements have been taken. The delivery or storage units will not be released until the final outage has been taken.

METHOD OF MEASUREMENT

603-4.1 The emulsified asphalt material for tack coat shall be measured by the ton. Volume shall be corrected to the volume at 60°F (16°C) in accordance with ASTM D1250. The emulsified asphalt material paid for will be the measured quantities used in the accepted work, provided that the measured quantities are not 10% over the specified application rate. Any amount of emulsified asphalt material more than 10% over the specified application rate for

each application will be deducted from the measured quantities, except for irregular areas where hand spraying of the emulsified asphalt material is necessary. Water added to emulsified asphalt will not be measured for payment.

BASIS OF PAYMENT

603.5-1 Payment shall be made at the contract unit price per ton of emulsified asphalt material. This price shall be full compensation for furnishing all materials, for all preparation, delivery, and application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-603-5.1	Emulsified Asphalt Tack Coat - per ton

REFERENCES

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

ASTM International (ASTM)

ASTM D1250	Standard Guide for Use of the Petroleum Measurement Tables
ASTM D2995	Standard Practice for Estimating Application Rate and Residual Application Rate of Bituminous Distributors
ASTM D3628	Standard Practice for Selection and Use of Emulsified Asphalts

END ITEM P-603

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Item P-605 Joint Sealants for Pavements

DESCRIPTION

605-1.1 This item shall consist of providing and installing a resilient and adhesive joint sealing material capable of effectively sealing joints in pavement; joints between different types of pavements; and cracks in existing pavement.

MATERIALS

605-2.1 Joint sealants. Joint sealant materials shall meet the requirements of ASTM D5893 or ASTM D6690.

Each lot or batch of sealant shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, the safe heating temperature, and shall be accompanied by the manufacturer's certification stating that the sealant meets the requirements of this specification.

605-2.2 Backer rod. The material furnished shall be a compressible, non-shrinking, non-staining, non-absorbing material that is non-reactive with the joint sealant in accordance with ASTM D5249. The backer-rod material shall be 25% ± 5 % larger in diameter than the nominal width of the joint.

605-2.3 Bond breaking tapes. Provide a bond breaking tape or separating material that is a flexible, non-shrinkable, non-absorbing, non-staining, and non-reacting adhesive-backed tape. The material shall have a melting point at least 5°F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The bond breaker tape shall be approximately 1/8 inch wider than the nominal width of the joint and shall not bond to the joint sealant.

CONSTRUCTION METHODS

605-3.1 Time of application. Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be 50°F and rising at the time of application of the poured joint sealing material. Do not apply sealant if moisture is observed in the joint.

605-3.2 Equipment. Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, 7 days prior to use on the project.

a. Tractor-mounted routing tool. Provide a routing tool, used for removing old sealant from the joints, of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing

devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.

b. Concrete saw. Provide a self-propelled power saw, with water-cooled diamond or abrasive saw blades, for cutting joints to the depths and widths specified.

c. Sandblasting equipment. Sandblasting is not allowed.

d. Waterblasting equipment. The Contractor must demonstrate waterblasting equipment including the pumps, hose, guide and nozzle size, under job conditions, before approval in accordance with paragraph 605-3.3. The Contractor shall demonstrate, in the presence of the RPR, that the method cleans the joint and does not damage the joint.

e. Hand tools. Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces. Hand tools should be carefully evaluated for potential spalling effects prior to approval for use.

f. Hot-poured sealing equipment. The unit applicators used for heating and installing ASTM D6690 joint sealant materials shall be mobile and shall be equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the joint to be filled; positive temperature devices for controlling the temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. The applicator unit shall be designed so that the sealant will circulate through the delivery hose and return to the inner kettle when not in use.

g. Cold-applied, single-component sealing equipment. The equipment for installing ASTM D5893 single component joint sealants shall consist of an extrusion pump, air compressor, following plate, hoses, and nozzle for transferring the sealant from the storage container into the joint opening. The dimension of the nozzle shall be such that the tip of the nozzle will extend into the joint to allow sealing from the bottom of the joint to the top. Maintain the initially approved equipment in good working condition, serviced in accordance with the supplier's instructions, and unaltered in any way without obtaining prior approval. Small hand-held air-powered equipment (i.e., caulking guns) may be used for small applications.

605-3.3 Preparation of joints. Pavement joints for application of material in this specification must be dry, clean of all scale, dirt, dust, curing compound, and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method cleans the joint and does not damage the joint.

a. Sawing. All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.

b. Sealing. Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, filler, protrusions of hardened concrete, old sealant and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished by tractor-mounted routing equipment, concrete saw, or waterblaster as specified in paragraph 605-3.2. The newly exposed concrete joint faces and the pavement surface extending a minimum of 1/2 inch from the joint edge shall be sandblasted clean. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches from it. After final cleaning and immediately prior to sealing, blow out the joints with compressed air and

leave them completely free of debris and water. The joint faces shall be surface dry when the seal is applied.

c. Backer Rod. When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a backer rod in accordance with paragraph 605-2.2 to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backer rod is placed at the specified depth and is not stretched or twisted during installation.

d. Bond-breaking tape. Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond-separating tape breaker in accordance with paragraph 605-2.3 to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Securely bond the tape to the bottom of the joint opening so it will not float up into the new sealant.

605-3.4 Installation of sealants. Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the RPR before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Immediately preceding, but not more than 50 feet ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/4 inch ±1/16 inch below the top of pavement surface; or bottom of groove for grooved pavement. Remove and discard excess or spilled sealant from the pavement by approved methods. Install the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the RPR. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

605-3.5 Inspection. The Contractor shall inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified at no additional cost to the airport.

605-3.6 Clean-up. Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

METHOD OF MEASUREMENT

605-4.1 No separate measurement shall be made for joint sealants for pavements. This work shall be incidental to other items and shall include the furnishing all materials, for all preparation, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item..

BASIS OF PAYMENT

605-5.1 No separate payment shall be made for joint sealants for pavements. This work shall be incidental to other items and shall include the furnishing all materials, for all preparation, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

REFERENCES

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

ASTM International (ASTM)

ASTM D789	Standard Test Method for Determination of Relative Viscosity of Polyamide (PA)
ASTM D5249	Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints
ASTM D5893	Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt
ASTM D7116	Standard Specification for Joint Sealants, Hot Applied, Jet Fuel Resistant Types for Portland Cement Concrete Pavements

Advisory Circulars (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids

END ITEM P-605

Item P-610 Concrete for Miscellaneous Structures

DESCRIPTION

610-1.1 This item shall consist of concrete and reinforcement, as shown on the plans, prepared and constructed in accordance with these specifications. This specification shall be used for all concrete other than airfield pavement which are cast-in-place.

MATERIALS

610-2.1 General. Only approved materials, conforming to the requirements of these specifications, shall be used in the work. Materials may be subject to inspection and tests at any time during their preparation or use. The source of all materials shall be approved by the Resident Project Representative (RPR) before delivery or use in the work. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be stored and handled to ensure preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed in them.

The use of pit-run aggregates shall not be permitted unless the pit-run aggregate has been screened and washed, and all fine and coarse aggregates stored separately and kept clean. The mixing of different aggregates from different sources in one storage stockpile or alternating batches of different aggregates shall not be permitted.

a. Reactivity. Fine aggregate and coarse aggregates to be used in all concrete shall have been tested separately within six months of the project in accordance with ASTM C1260. Test results shall be submitted to the RPR. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.08% at 14 days (16 days from casting). If the expansion either or both test specimen is greater than 0.08% at 14 days, but less than 0.20%, a minimum of 25% of Type F fly ash, or between 40% and 55% of slag cement shall be used in the concrete mix.

If the expansion is greater than 0.20%, the aggregates shall not be used, and test results for other aggregates must be submitted for evaluation; or aggregates that meet P-501 reactivity test requirements may be utilized.

610-2.2 Coarse aggregate. The coarse aggregate for concrete shall meet the requirements of ASTM C33 and the requirements of Table 4, Class Designation 5S; and the grading requirements shown below, as required for the project.

Coarse Aggregate Grading Requirements

Maximum Aggregate Size	ASTM C33, Table 3 Grading Requirements (Size No.)
1 1/2 inch	467 or 4 and 67
1 inch	57
¾ inch	67
½ inch	7

610-2.3 Fine aggregate. The fine aggregate for concrete shall meet all fine aggregate requirements of ASTM C33.

610-2.4 Cement. Cement shall conform to the requirements of ASTM C150, Type I, IA, II, IIA, III, IIIA, V.

610-2.5 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 13% and a total available alkali content less than 3% per ASTM C311. Fly ash produced in furnace operations using liming materials or soda ash (sodium carbonate) as an additive shall not be acceptable. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the 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 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.

610-2.6 Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

610-2.7 Admixtures. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the RPR may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the RPR from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

c. Other chemical admixtures. The use of set retarding, and set-accelerating admixtures shall be approved by the RPR. Retarding shall meet the requirements of ASTM C494, Type A,

B, or D and set-accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

610-2.8 Premolded joint material. Premolded joint material for expansion joints shall meet the requirements of ASTM D1751.

610-2.9 Joint filler. The filler for joints shall meet the requirements of Item P-605, unless otherwise specified.

610-2.10 Steel reinforcement. Reinforcing shall consist of reinforcing steel conforming to the requirements of ASTM A615**.**

610-2.11 Materials for curing concrete. Curing materials shall conform to ASTM C309, for White-pigmented Liquid Membrane-Forming Compound, Type 2, Class B.

CONSTRUCTION METHODS

610-3.1 General. The Contractor shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified here. All machinery and equipment used by the Contractor on the work, shall be of sufficient size to meet the requirements of the work. All work shall be subject to the inspection and approval of the RPR.

610-3.2 Concrete Mixture. The concrete shall develop a compressive strength of 4000 psi in 28 days as determined by test cylinders made in accordance with ASTM C31 and tested in accordance with ASTM C39. The concrete shall contain not less than 470 pounds of cementitious material per cubic yard (280 kg per cubic meter). The water cementitious ratio shall not exceed 0.45 by weight. The air content of the concrete shall be 5% +/- 1.2% as determined by ASTM C231 and shall have a slump of not more than 4 inches as determined by ASTM C143.

610-3.3 Mixing. Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of ASTM C94 or ASTM C685.

The concrete shall be mixed only in quantities required for immediate use. Concrete shall not be mixed while the air temperature is below 40°F without the RPRs approval. If approval is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature not less than 50°F nor more than 100°F. The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his expense.

Retempering of concrete by adding water or any other material is not permitted.

The rate of delivery of concrete to the job shall be sufficient to allow uninterrupted placement of the concrete.

610-3.4 Forms. Concrete shall not be placed until all the forms and reinforcements have been inspected and approved by the RPR. Forms shall be of suitable material and shall be of the type, size, shape, quality, and strength to build the structure as shown on the plans. The forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes. The Contractor shall be responsible for their adequacy.

The internal form ties shall be arranged so no metal will show in the concrete surface or discolor the surface when exposed to weathering when the forms are removed. All forms shall be wetted with water or with a non-staining mineral oil, which shall be applied immediately before the concrete is placed. Forms shall be constructed so they can be removed without injuring the concrete or concrete surface.

610-3.5 Placing reinforcement. All reinforcement shall be accurately placed, as shown on the plans, and shall be firmly held in position during concrete placement. Bars shall be fastened together at intersections. The reinforcement shall be supported by approved metal chairs. Shop drawings, lists, and bending details shall be supplied by the Contractor when required.

610-3.6 Embedded items. Before placing concrete, all embedded items shall be firmly and securely fastened in place as indicated. All embedded items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The concrete shall be spaded and consolidated around and against embedded items. The embedding of wood shall not be allowed.

610-3.7 Concrete Consistency. The Contractor shall monitor the consistency of the concrete delivered to the project site; collect each batch ticket; check temperature; and perform slump tests on each truck at the project site in accordance with ASTM C143.

610-3.8 Placing concrete. All concrete shall be placed during daylight hours, unless otherwise approved. The concrete shall not be placed until the depth and condition of foundations, the adequacy of forms and falsework, and the placing of the steel reinforcing have been approved by the RPR. Concrete shall be placed as soon as practical after mixing, but in no case later than one (1) hour after water has been added to the mix. The method and manner of placing shall avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. The concrete shall not be dropped from a height of more than 5 feet. Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation. Concrete shall be placed on clean, damp surfaces, free from running water, or on a properly consolidated soil foundation.

610-3.9 Vibration. Vibration shall follow the guidelines in American Concrete Institute (ACI) Committee 309R, Guide for Consolidation of Concrete.

610-3.10 Joints. Joints shall be constructed as indicated on the plans.

610-3.11 Finishing. All exposed concrete surfaces shall be true, smooth, and free from open or rough areas, depressions, or projections. All concrete horizontal plane surfaces shall be brought flush to the proper elevation with the finished top surface struck-off with a straightedge and floated.

610-3.12 Curing and protection. All concrete shall be properly cured in accordance with the recommendations in American Concrete Institute (ACI) 308R, Guide to External Curing of Concrete. The concrete shall be protected from damage until project acceptance.

610-3.13 Cold weather placing. When concrete is placed at temperatures below 40°F, follow the cold weather concreting recommendations found in ACI 306R, Cold Weather Concreting.

610-3.14 Hot weather placing. When concrete is placed in hot weather greater than 85ºF, follow the hot weather concreting recommendations found in ACI 305R, Hot Weather Concreting.

QUALITY ASSURANCE (QA)

610-4.1 Quality Assurance sampling and testing. Concrete for each day's placement will be accepted on the basis of the compressive strength specified in paragraph 610-3.2. The RPR will sample the concrete in accordance with ASTM C172; test the slump in accordance with ASTM C143; test air content in accordance with ASTM C231; make and cure compressive strength specimens in accordance with ASTM C31; and test in accordance with ASTM C39. The QA testing agency will meet the requirements of ASTM C1077.

The Contractor shall provide adequate facilities for the initial curing of cylinders.

610-4.2 Defective work. Any defective work that cannot be satisfactorily repaired as determined by the RPR, shall be removed and replaced at the Contractor's expense. Defective work includes, but is not limited to, uneven dimensions, honeycombing and other voids on the surface or edges of the concrete.

METHOD OF MEASUREMENT

610-5.1 Concrete shall be considered incidental and no separate measurement shall be made of concrete complete in place and accepted.

BASIS OF PAYMENT

610-6.1 Concrete shall be considered incidental and no separate payment shall be made.

REFERENCES

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

ASTM International (ASTM)

ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats 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 A884	Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
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 C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C685	Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1157	Standard Performance Specification for Hydraulic Cement

ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1365	Standard Test Method for Determination of the Proportion of Phases in Portland Cement and Portland-Cement Clinker Using X-Ray Powder Diffraction Analysis
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction

American Concrete Institute (ACI)

ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 308R	Guide to External Curing of Concrete
ACI 309R	Guide for Consolidation of Concrete

END OF ITEM P-610

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Item P-620 Runway and Taxiway Marking

DESCRIPTION

620-1.1 This item shall consist of the preparation and painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Resident Project Representative (RPR). The terms “paint” and “marking material” as well as “painting” and “application of markings” are interchangeable throughout this specification.

MATERIALS

620-2.1 Materials acceptance. The Contractor shall furnish manufacturer’s certified test reports, for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. This certification along with a copy of the paint manufacturer’s surface preparation; marking materials, including adhesion, flow promoting and/or floatation additive; and application requirements must be submitted and approved by the Resident Project Representative (RPR) prior to the initial application of markings. The reports can be used for material acceptance or the RPR may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the RPR upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers that are easily quantifiable for inspection by the RPR.

620-2.2 Marking materials.

Table 1. Marking Materials

Paint[1]				Glass Beads[2]	
Type	**Color**	**Fed Std. 595 Number**	**Application Rate Maximum**	**Type**	**Application Rate Minimum**
Waterborne Type II	Yellow	33538	115 ft^2/gal	III	10 lb/gal
Waterborne Type II	White	37925	115 ft^2/gal	III	10 lb/gal
Waterborne Type II	Red	31136	115 ft^2/gal	I, Gradation A	5 lb/gal
Waterborne Type II	Black	37038	115 ft^2/gal	None	None

[1] See paragraph 620-2.2a

[2] See paragraph 620-2.2b

a. Paint. Paint shall be waterborne in accordance with the requirements of this paragraph. Paint colors shall comply with Federal Standard No. 595.

Waterborne. Paint shall meet the requirements of Federal Specification TT-P-1952F, Type II. The non-volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis.

b. Reflective media. Glass beads for white and yellow paint shall meet the requirements for Federal Specification TT-B-1325D Type III.

Glass beads for red paint shall meet the requirements for Type I, Gradation A.

Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

Glass beads shall not be used in black paint.

Type III glass beads shall not be used in red and pink paint.

CONSTRUCTION METHODS

620-3.1 Weather limitations. Painting shall only be performed when the surface is dry, and the ambient temperature and the pavement surface temperature meet the manufacturer's recommendations in accordance with paragraph 620-2.1. Painting operations shall be discontinued when the ambient or surface temperatures does not meet the manufacturer's recommendations. Markings shall not be applied when the wind speed exceeds 10 mph unless windscreens are used to shroud the material guns. Markings shall not be applied when weather conditions are forecasts to not be within the manufacturers' recommendations for application and dry time.

620-3.2 Equipment. Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless type marking machine with automatic glass bead dispensers suitable for application of traffic paint. It shall produce an even and uniform film thickness and appearance of both paint and glass beads at the required coverage and shall apply markings of uniform cross-sections and clear-cut edges without running or spattering and without over spray. The marking equipment for both paint and beads shall be calibrated daily.

620-3.3 Preparation of surfaces. Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other contaminates that would reduce the bond between the paint and the pavement. Use of any chemicals or impact abrasives during surface preparation shall be approved in advance by the RPR. After the cleaning operations, sweeping, blowing, or rinsing with pressurized water shall be performed to ensure the surface is clean and free of grit or other debris left from the cleaning process.

a. Preparation of new pavement surfaces. The area to be painted shall be cleaned by broom, blower, water blasting, or by other methods approved by the RPR to remove all contaminants, including PCC curing compounds, minimizing damage to the pavement surface.

b. Preparation of pavement to remove existing markings. Existing pavement markings shall be removed by rotary grinding, water blasting, or by other methods approved by the RPR minimizing damage to the pavement surface. The removal area may need to be larger than the area of the markings to eliminate ghost markings. After removal of markings on asphalt pavements, apply a fog seal or seal coat to 'block out' the removal area to eliminate 'ghost' markings.

c. Preparation of pavement markings prior to remarking. Prior to remarking existing markings, existing markings must be removed minimizing damage to the pavement surface, with a method approved by the RPR. After removal, the surface shall be cleaned of all residue or debris.

Prior to the application of markings, the Contractor shall certify in writing that the surface is dry and free from dirt, grease, oil, laitance, or other foreign material that would prevent the bond of the paint to the pavement or existing markings. This certification along with a copy of the paint manufactures application and surface preparation requirements must be submitted to the RPR prior to the initial application of markings.

620-3.4 Layout of markings. The proposed markings shall be laid out in advance of the paint application. The locations of markings to receive glass beads shall be shown on the plans.

620-3.5 Application. A period of 30 days shall elapse between placement of surface course or seal coat and application of the permanent paint markings. Paint shall be applied at the locations and to the dimensions and spacing shown on the plans. Paint shall not be applied until the layout and condition of the surface has been approved by the RPR.

The edges of the markings shall not vary from a straight line more than 1/2 inch (12 mm) in 50 feet (15 m), and marking dimensions and spacing shall be within the following tolerances:

Marking Dimensions and Spacing Tolerance

Dimension and Spacing	Tolerance
36 inch or less	±1/2 inch
greater than 36 inch to 6 feet	±1 inch
greater than 6 feet to 60 feet	±2 inch
greater than 60 feet	±3 inch

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate shown in Table 1. The addition of thinner will not be permitted.

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate shown in Table 1. Glass beads shall not be applied to black paint or green paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment and distribution should be performed.

620-3.6 Application – preformed thermoplastic airport pavement markings.

Preformed thermoplastic pavement markings not used.

620-3.7 Control strip. Prior to the full application of airfield markings, the Contractor shall prepare a control strip in the presence of the RPR. The Contractor shall demonstrate the surface preparation method and all striping equipment to be used on the project. The marking equipment must achieve the prescribed application rate of paint and population of glass beads (per Table 1) that are properly embedded and evenly distributed across the full width of the marking. Prior to acceptance of the control strip, markings must be evaluated during darkness to ensure a uniform appearance.

620-3.8 Retro-reflectance. Reflectance shall be measured with a portable retro-reflectometer meeting ASTM E1710 (or equivalent). A total of 6 reading shall be taken over a 6 square foot area with 3 readings taken from each direction. The average shall be equal to or above the minimum levels of all readings which are within 30% of each other.

Minimum Retro-Reflectance Values

Material	Retro-reflectance mcd/m^2/lux		
	White	Yellow	Red
Initial Type I	300	175	35
Initial Type III	600	300	35
Initial Thermoplastic	225	100	35
All materials, remark when less than[1]	100	75	10

[1] Prior to remarking determine if removal of contaminants on markings will restore retro-reflectance.

620-3.9 Protection and cleanup. After application of the markings, all markings shall be protected from damage until dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings. The Contractor shall remove from the work area all debris, waste, loose reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the RPR. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and federal environmental statutes and regulations.

METHOD OF MEASUREMENT

620-4.1a The quantity of surface preparation shall be measured by the number of square feet (square meters) for each type of surface preparation specified in paragraph 620-3.3.

620-4.1b The quantity of markings shall be measured by the number of square feet of painting.

620-4.1c The quantity of reflective media shall be paid for by lump sum of reflective media.

620-4.1d The quantity of temporary markings to be paid for shall be lump sum price performed in accordance with the specifications and accepted by the RPR. Temporary marking includes surface preparation, application and complete removal of the temporary marking.

BASIS OF PAYMENT

620-5.1 This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item complete in place and accepted by the RPR in accordance with these specifications.

620-5.1a Payment for surface preparation shall be made at the contract price for the number of square feet for each type of surface preparation specified in paragraph 620-3.3.

620-5.2b Payment for markings shall be made at the contract price for the number of square feet of painting.

620-5.3c Payment for reflective media shall be made at the contract unit price for lump sum.

620-5.4d Payment for temporary markings shall be made at the contract price for lump sum price. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-620-5.1a	Surface Preparation of Pavement to Remove Existing Markings – per square foot
Item P-620-5.2b.1	Yellow Pavement Marking – per square foot
Item P-620-5.2b.2	White Pavement Marking – per square foot
Item P-620-5.2b.3	Red Pavement Marking – per square foot
Item P-620-5.2b.4	Black Pavement Marking – per square foot
Item P-620-5.3c	Reflective Media – per lump sum
Item P-620-5.4d	Temporary Markings – per lump sum

REFERENCES

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

ASTM International (ASTM)

ASTM D476	Standard Classification for Dry Pigmentary Titanium Dioxide Products
ASTM D968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1652	Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D2074	Standard Test Method for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D2240	Standard Test Method for Rubber Property - Durometer Hardness
ASTM D7585	Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments
ASTM E303	Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester
ASTM E1710	Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer

ASTM E2302	Standard Test Method for Measurement of the Luminance Coefficient Under Diffuse Illumination of Pavement Marking Materials Using a Portable Reflectometer
ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

Code of Federal Regulations (CFR)

40 CFR Part 60, Appendix A-7, Method 24	Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings
29 CFR Part 1910.1200	Hazard Communication

Federal Specifications (FED SPEC)

FED SPEC TT-B-1325D	Beads (Glass Spheres) Retro-Reflective
FED SPEC TT-P-1952F	Paint, Traffic and Airfield Marking, Waterborne
FED STD 595	Colors used in Government Procurement

Commercial Item Description

A-A-2886B	Paint, Traffic, Solvent Based

Advisory Circulars (AC)

AC 150/5340-1	Standards for Airport Markings
AC 150/5320-12	Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces

END OF ITEM P-620

Item D-701 Pipe for Storm Drains and Culverts

DESCRIPTION

701-1.1 This item shall consist of the construction of pipe culverts and storm drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

MATERIALS

701-2.1 Materials shall meet the requirements shown on the plans and specified below. Underground piping and components used in drainage systems for terminal and aircraft fueling ramp drainage shall be noncombustible and inert to fuel in accordance with National Fire Protection Association (NFPA) 415.

701-2.2 Pipe. The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements:

ASTM C76 Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

701-2.3 Concrete. Concrete for pipe collars shall have a minimum compressive strength of 2500 psi at 28 days and conform to the requirements of ASTM C94.

701-2.4 Rubber Gaskets. Rubber gaskets for rigid pipe shall conform to the requirements of ASTM C443. Rubber gaskets for PVC pipe, polyethylene, and polypropylene pipe shall conform to the requirements of ASTM F477.

701-2.5 Joint Mortar. Pipe joint mortar shall consist of one part Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type II. The sand to be used in mortar shall be thoroughly and uniformly washed and shall be entirely free from oil and deleterious substances and shall conform to the requirements of ASTM C144.

701-2.6 Joint Fillers. Poured filler for joints shall conform to the requirements of ASTM D6690.

701-2.7 Plastic Gaskets. Plastic gaskets shall conform to the requirements of ASTM C990.

701-2.8 Controlled Low-Strength Material (CLSM). Controlled low-strength material shall conform to the requirements of Item P-153. When CLSM is used, all joints shall have gaskets.

701-2.9 Precast Box Culverts. Manufactured in accordance with and conforming to ASTM C1433.

701-2.10 Precast Concrete Pipe. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or American Concrete Pipe Association QCast Plant Certification program.

CONSTRUCTION METHODS

701-3.1 Excavation. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but it shall not be less than the external diameter of the pipe plus 12 inches on each side. The trench walls shall be approximately vertical.

The Contractor shall comply with all current federal, state and local rules and regulations governing the safety of men and materials during the excavation, installation and backfilling operations. Specifically, the Contractor shall observe that all requirements of the Occupational Safety and Health Administration (OSHA) relating to excavations, trenching and shoring are strictly adhered to. The width of the trench shall be sufficient to permit satisfactorily jointing of the pipe and thorough compaction of the bedding material under the pipe and backfill material around the pipe, but it shall not be greater than the widths shown on the plans trench detail.

Where rock, hardpan, or other unyielding material is encountered, the Contractor shall remove it from below the foundation grade for a depth of at least 8 inch or 1/2 inch for each foot of fill over the top of the pipe (whichever is greater) but for no more than three-quarters of the nominal diameter of the pipe. The excavation below grade should be filled with granular material to form a uniform foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The RPR shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

The excavation for pipes placed in embankment fill shall not be made until the embankment has been completed to a height above the top of the pipe as shown on the plans.

701-3.2 Bedding. The bedding surface for the pipe shall provide a foundation of uniform density to support the pipe throughout its entire length.

a. Rigid pipe. The pipe bedding shall be constructed uniformly for the full length of the pipe barrel, as required on the plans. The maximum aggregate size shall be 1 in when the bedding thickness is less than 6 inches, and 1-1/2 in when the bedding thickness is greater than 6 inches. Bedding shall be loosely placed uncompacted material under the middle third of the pipe prior to placement of the pipe.

b. Flexible pipe. For flexible pipe, the bed shall be roughly shaped to fit the pipe, and a bedding blanket of sand or fine granular material shall be provided as follows:

Pipe Corrugation Depth	Minimum Bedding Depth
inch	inch
1/2	1
1	2
2	3
2-1/2	3-1/2

c. Other pipe materials. For PVC, polyethylene, polypropylene, or fiberglass pipe, the bedding material shall consist of coarse sands and gravels with a maximum particle size of 3/4 inches. For pipes installed under paved areas, no more than 12% of the material shall pass the No. 200 sieve. For all other areas, no more than 50% of the material shall pass the No. 200 sieve. The bedding shall have a thickness of at least 6 inches below the bottom of the pipe and extend up around the pipe for a depth of not less than 50% of the pipe's vertical outside diameter.

701-3.3 Laying Pipe. The pipe laying shall begin at the lowest point of the trench and proceed upgrade. The lower segment of the pipe shall be in contact with the bedding throughout its full length. Bell or groove ends of rigid pipes and outside circumferential laps of flexible pipes shall be placed facing upgrade.

Paved or partially lined pipe shall be placed so that the longitudinal center line of the paved segment coincides with the flow line.

Elliptical and elliptically reinforced concrete pipes shall be placed with the manufacturer's reference lines designating the top of the pipe within five degrees of a vertical plane through the longitudinal axis of the pipe.

701-3.4 Joining Pipe. Joints shall be made with (1) cement mortar, (2) cement grout, (3) rubber gaskets, (4) plastic gaskets, (5) coupling bands.

Mortar joints shall be made with an excess of mortar to form a continuous bead around the outside of the pipe and shall be finished smooth on the inside. Molds or runners shall be used for grouted joints to retain the poured grout. Rubber ring gaskets shall be installed to form a flexible watertight seal.

a. Concrete pipe. Concrete pipe may be either bell and spigot or tongue and groove. Pipe sections at joints shall be fully seated and the inner surfaces flush and even. Concrete pipe joints shall be sealed with rubber gaskets meeting ASTM C443. Joints shall be thoroughly wetted before applying mortar or grout.

b. Metal pipe. Metal pipe shall be firmly joined by form-fitting bands conforming to the requirements of ASTM A760 for steel pipe and AASHTO M196 for aluminum pipe.

c. PVC, Polyethylene, or Polypropylene pipe. Joints for PVC, Polyethylene, or Polypropylene pipe shall conform to the requirements of ASTM D3212 when leak resistant joints are required. Joints for PVC and Polyethylene pipe shall conform to the requirements of AASHTO M304 when soil tight joints are required. Fittings for polyethylene pipe shall

conform to the requirements of AASHTO M252 or ASTM M294. Fittings for polypropylene pipe shall conform to ASTM F2881, ASTM F2736, or ASTM F2764.

d. Fiberglass pipe. Joints and fittings shall be as detailed on the plans and in accordance with the manufacturer's recommendations. Joints shall meet the requirements of ASTM D4161 for flexible elastomeric seals.

701-3.5 Embedment and Overfill. Pipes shall be inspected before any fill material is placed; any pipes found to be out of alignment, unduly settled, or damaged shall be removed and re-laid or replaced at the Contractor's expense.

701-3.5-1 Embedment Material Requirements

a. Concrete Pipe. Embedment material and compaction requirements shall be in accordance with the applicable Type of Standard Installation (Types 1, 2, 3, or 4) per ASTM C1479. If a concrete cradle or CLSM embedment material is used, it shall conform to the plan details.

b. Plastic and fiberglass Pipe. Embedment material shall meet the requirements of ASTM D3282, A-1, A-2-4, A-2-5, or A-3. Embedment material shall be free of organic material, stones larger than 1.5 inches in the greatest dimension, or frozen lumps. Embedment material shall extend to 12 inches above the top of the pipe.

c. Metal Pipe. Embedment material shall be granular as specified in the contract document and specifications, and shall be free of organic material, rock fragments larger than 1.5 inches in the greatest dimension and frozen lumps. As a minimum, backfill materials shall meet the requirements of ASTM D3282, A-1, A-2, or A-3. Embedment material shall extend to 12 inches above the top of the pipe.

701-3.5-2 Placement of Embedment Material. The embedment material shall be compacted in layers not exceeding 6 inches on each side of the pipe and shall be brought up one (1) foot above the top of the pipe or to natural ground level, whichever is greater. Thoroughly compact the embedment material under the haunches of the pipe without displacing the pipe. Material shall be brought up evenly on each side of the pipe for the full length of the pipe.

When the top of the pipe is above the top of the trench, the embedment material shall be compacted in layers not exceeding 6 inches and shall be brought up evenly on each side of the pipe to one (1) foot above the top of the pipe. All embedment material shall be compacted to a density required under Item P-152.

Concrete cradles and flowable fills, such as controlled low strength material (CLSM) or controlled density fill (CDF), may be used for embedment provided adequate flotation resistance can be achieved by restraints, weighing, or placement technique.

It shall be the Contractor's responsibility to protect installed pipes and culverts from damage due to construction equipment operations. The Contractor shall be responsible for installation of any extra strutting or backfill required to protect pipes from the construction equipment.

701-3.6 Overfill. Pipes shall be inspected before any overfill is in place. Any pipes found to be out of alignment, unduly settled, or damaged shall be removed and relaid or replaced at the Contractor's expense. Evaluation of any damage to RCP shall be evaluated based on AASHTO

R73.

Overfill material shall be place and compacted in layers as required to achieve compaction to at least 95 percent standard proctor per ASTM D698. The soil shall contain no debris, organic matter, frozen material, or stones with a diameter greater than one half the thickness of the compacted layers being placed.

701-3.7 Inspection Requirements. An initial post installation inspection shall be performed by the RPR no sooner than 30 days after completion of installation and final backfill. Clean or flush all lines prior to inspection.

a. Video Inspection. The Contractor shall provide the RPR with an annotated video inspection record (either VHS or DVD format) of the new mainline storm drain pipeline. The video shall clearly show all joints, seals, connecting pipes, and manholes. This video shall be provided to the RPR, and reviewed and approved by the RPR prior to the Contractor being allowed to place the final pavement over the storm drain line.

b. Deflection Test for HDPE and PVC Pipe. In addition to the tests prescribed above, the Contractor shall perform a deflection test on the system as directed by the RPR. Any part of the installation which shows deflection in excess of 5% of the nominal inside diameter for HDPE pipe or in excess of 5% of the average inside diameter per ASTM D3034 for PVC pipe, shall be evaluated and appropriate remedy, if any, shall be performed.

After acceptance but prior to the termination of the warranty period, the Contracting Agency may test the long term deflection of the storm drain. If the Contracting Agency determines that the deflection has exceeded 7.5% of the average inside diameter, that portion of the installation shall be corrected by the Contractor at no cost to the Contracting Agency.

METHOD OF MEASUREMENT

701-4.1 Measurement. The length of pipe shall be measured in linear feet of pipe in place, completed, and accepted. It shall be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. Each size of Class V RGRCP shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipe being measured.

BASIS OF PAYMENT

701-5.0 Payment. These prices shall fully compensate the Contractor for furnishing all materials and for all preparation, excavation, and installation of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

701-5.1 Payment will be made at the contract unit price per linear foot for each size of Class V RGRCP.

Payment will be made under:

Item D-701-5.1a 24 inch RGRCP, Class V – per linear foot

REFERENCES

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

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M167	Standard Specification for Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M190	Standard Specification for Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M196	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M219	Standard Specification for Corrugated Aluminum Alloy Structural Plate for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M243	Standard Specification for Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe-Arches, and Arches
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter
AASHTO M304	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
AASHTO MP20	Standard Specification for Steel Reinforced Polyethylene (PE) Ribbed Pipe, 300- to 900-mm (12- to 36-in.) Diameter

ASTM International (ASTM)

ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains
ASTM A761	Standard Specification for Corrugated Steel Structural Plate, Zinc Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
ASTM A762	Standard Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM A849	Standard Specification for Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
ASTM B745	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains

ASTM C14	Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe
ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C94	Standard Specification for Ready Mixed Concrete
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C506	Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C507	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe
ASTM C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe
ASTM C990	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
ASTM D1056	Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber
ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3262	Standard Specification for "Fiberglass" (Glass-Fiber Reinforced Thermosetting Resin) Sewer Pipe
ASTM D3282	Standard Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
ASTM D4161	Standard Specification for "Fiberglass" (Glass-Fiber Reinforced Thermosetting Resin) Pipe Joints Using Flexible Elastomeric Seals

ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F667	Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (DR PR) Based on Outside Diameter
ASTM F794	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe & Fittings Based on Controlled Inside Diameter
ASTM F894	Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
ASTM F949	Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
ASTM F2435	Standard Specification for Steel Reinforced Polyethylene (PE) Corrugated Pipe
ASTM F2562	Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage
ASTM F2736	Standard Specification for 6 to 30 in. (152 to 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe
ASTM F2764	Standard Specification for 30 to 60 in. (750 to 1500 mm) Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications
ASTM F2881	Standard Specification for 12 to 60 in. (300 to 1500 mm) Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications

National Fire Protection Association (NFPA)

NFPA 415	Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways

END OF ITEM D-701

ITEM D-705 PIPE UNDERDRAINS FOR AIRPORTS

DESCRIPTION

705-1.1 This item shall consist of the construction of pipe drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

MATERIALS

705-2.1 GENERAL. Materials shall meet the requirements shown on the plans and specified below.

705-2.2 PIPE. The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements:

ASTM F794 Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe & Fittings Based on Controlled Inside Diameter

705-2.3 JOINT MORTAR. Pipe joint mortar shall consist of one part by volume of Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

705-2.4 ELASTOMERIC SEALS. Elastomeric seals shall conform to the requirements of ASTM F477.

705-2.5 POROUS BACKFILL. Porous backfill shall be free of clay, humus, or other objectionable matter, and shall conform to the gradation in Table 1 when tested in accordance with ASTM C136.

Table 1. Gradation of Porous Backfill

Sieve Designation (square openings)	Percentage by Weight Passing Sieves
	Porous Material No. 2
1-1/2 inch	100
1 inch	90-100
3/8 inch	25-60
No. 4	5-40
No. 8	0-20
No. 16	
No. 50	
No. 100	

When two courses of porous backfill are specified in the plans, the finer of the materials shall conform to particle size tabulated herein for porous material No. 1. The coarser granular material shall meet the gradation given in the tabulation for porous material No. 2.

705-2.6 GRANULAR MATERIAL. Granular material used for backfilling shall conform to the requirements of ASTM D2321 for Class IA, IB, or II materials.

705-2.7 FILTER FABRIC. The filter fabric shall conform to the requirements of AASHTO M288 Class 2 or equivalent.

Table 2. Fabric Properties

Fabric Properties	Test Method	Test Requirement
Grab Tensile Strength, lbs	ASTM D4632	125 min
Grab Tensile Elongation %	ASTM D4632	50 min
Burst Strength, psi	ASTM D3785	125 min
Trapezoid Tear Strength, lbs	ASTM D4533	55 min
Puncture Strength, lbs	ASTM D4833	40 min
Abrasion, lbs	ASTM D4886	15 max loss
Equivalent Opening Size	ASTM D4751	70-100
Permittivity sec^{-1}	ASTM D4491	0.80
Accelerated Weathering (UV Stability) (Strength Retained - %)	ASTM D4355 *(500 hrs exposure)	70

705-2.8 CONTROLLED LOW-STRENGTH MATERIAL (CLSM). CLSM is not used.

CONSTRUCTION METHODS

705-3.1 EQUIPMENT. All equipment required for the construction of pipe underdrains shall be on the project, in good working condition, and approved by the RPR before construction is permitted to start.

705-3.2 EXCAVATION. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but shall not be less than the external diameter of the pipe plus 6 inches on each side of the pipe. The trench walls shall be approximately vertical.

Where rock, hardpan, or other unyielding material is encountered, it shall be removed below the foundation grade for a depth of at least 4 inches. The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 6 inches in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The RPR shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

Excavated material not required or acceptable for backfill shall be disposed of by the Contractor as directed by the RPR. The excavation shall not be carried below the required depth; if this occurs, the trench shall be backfilled at the Contractor's expense with material approved by the RPR and compacted to the density of the surrounding material.

The pipe bedding shall be constructed uniformly over the full length of the pipe barrel, as required on the plans. The maximum aggregate size shall be 1 inch when the bedding thickness is less than 6 inches, and 1-1/2 inch when the bedding thickness is greater than 6 inches. Bedding shall

be loosely placed, uncompacted material under the middle third of the pipe prior to placement of the pipe.

The Contractor shall do trench bracing, sheathing, or shoring necessary to perform and protect the excavation as required for safety and conformance to federal, state and local laws. Unless otherwise provided, the bracing, sheathing, or shoring shall be removed by the Contractor after the backfill has reached at least 12 inches over the top of the pipe. The sheathing or shoring shall be pulled as the granular backfill is placed and compacted to avoid any unfilled spaces between the trench wall and the backfill material. The cost of bracing, sheathing, or shoring, and the removal of same, shall be included in the unit price bid per foot for the pipe.

705-3.3 LAYING AND INSTALLING PIPE.

a. **Concrete pipe.** Not used.

b. **Metal pipe.** Not used..

c. **PVC, fiberglass, or polyethylene pipe.** PVC or polyethylene pipe shall be installed in accordance with the requirements of ASTM D2321. Perforations shall meet the requirements of AASHTO M252 or AASHTO M294 Class 2, unless otherwise indicated on the plans. The pipe shall be laid accurately to line and grade. Fiberglass per ASTM D3839 Standard Guide for Underground Installation of "Fiberglass" (Glass-Fiber Reinforced Thermosetting-Resin) Pipe.

d. **All types of pipe.** The upgrade end of pipelines, not terminating in a structure, shall be plugged or capped as approved by the RPR.

   Unless otherwise shown on the plans, a 4-inch (100 mm) bed of granular backfill material shall be spread in the bottom of the trench throughout the entire length under all perforated pipe underdrains.

   Pipe outlets for the underdrains shall be constructed when required or shown on the plans. The pipe shall be laid with tight-fitting joints. Porous backfill is not required around or over pipe outlets for underdrains. All connections to other drainage pipes or structures shall be made as required and in a satisfactory manner. If connections are not made to other pipes or structures, the outlets shall be protected and constructed as shown on the plans.

e. **Filter fabric.** The filter fabric shall be installed in accordance with the manufacturer’s recommendations, or in accordance with the AASHTO M288 Appendix, unless otherwise shown on the plans.

705-3.4 MORTAR. The mortar shall be of the desired consistency for caulking and filling the joints of the pipe and for making connections to other pipes or to structures. Mortar that is not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted.

705-3.5 JOINTS IN CONCRETE PIPE. When open or partly open joints are required or specified, they shall be constructed as indicated on the plans. The pipe shall be laid with the ends fitted together as designed. If bell and spigot pipe is used, mortar shall be placed along the inside

bottom quarter of the bell to center the following section of pipe.

The open or partly open joints shall be surrounded with granular material meeting requirements of porous backfill No. 2 in Table 1 or as indicated on the plans. This backfill shall be placed so its thickness will be not less than 3 inches nor more than 6 inches, unless otherwise shown on the plans.

When the original material excavated from the trench is impervious, commercial concrete sand or granular material meeting requirements of porous backfill No. 1 shall surround porous backfill No. 2 (Table 1), as shown on the plans or as directed by the RPR.

When the original material excavated from the trench is pervious and suitable, it may be used as backfill in lieu of porous backfill No. 1, when indicated on the plans or as directed by the RPR.

705-3.6 EMBEDMENT AND BACKFILL

a. Earth. All trenches and excavations shall be backfilled soon after the pipes are installed, unless additional protection of the pipe is directed. The embedment material shall be select material from excavation or borrow and shall be approved by the RPR. The select material shall be placed on each side of the pipe out to a distance of the nominal pipe diameter and one foot over the top of the pipe and shall be readily compacted. It shall not contain stones 3 inches or larger in size, frozen lumps, chunks of highly plastic clay, or any other material that is objectionable to the RPR. The material shall be moistened or dried, as required to aid compaction. Placement of the embedment material shall not cause displacement of the pipe. Thorough compaction under the haunches and along the sides to the top of the pipe shall be obtained.

The embedment material shall be placed in loose layers not exceeding 6 inches in depth under and around the pipe. Backfill material over the pipe shall be placed in lifts not exceeding 8 inches. Successive layers shall be added and thoroughly compacted by hand and pneumatic tampers, approved by the RPR, until the trench is completely filled and brought to the planned elevation. Embedment and backfilling shall be done to avoid damaging top or side of the pipe.

In embankments and other unpaved areas, the backfill shall be compacted per Item P-152 to the density required for embankments in unpaved areas. Under paved areas, the subgrade and any backfill shall be compacted per Item P-152 to the density required for embankments for paved areas.

b. Granular backfill. When granular backfill is required, placement in the trench and about the pipe shall be as shown on the plans. The granular backfill shall not contain an excessive amount of foreign matter, nor shall soil from the sides of the trench or from the soil excavated from the trench be allowed to filter into the granular backfill. When required by the RPR, a template shall be used to properly place and separate the two sizes of backfill. The backfill shall be placed in loose layers not exceeding 6 inches in depth. The granular backfill shall be compacted by hand and pneumatic tampers to the requirements as given for embankment. Backfilling shall be done to avoid damaging top or side pressure on the pipe. The granular backfill shall extend to the elevation of the trench or as shown on the plans.

When perforated pipe is specified, granular backfill material shall be placed along the full length of the pipe. The position of the granular material shall be as shown on the plans. If the original material excavated from the trench is pervious and suitable, it shall be used in lieu of porous backfill No. 1.

If porous backfill is placed in paved or adjacent to paved areas before grading or subgrade operations is completed, the backfill material shall be placed immediately after laying the pipe. The depth of the granular backfill shall be not less than 12 inches, measured from the top of the underdrain. During subsequent construction operations, a minimum depth of 12 inches of backfill shall be maintained over the underdrains. When the underdrains are to be completed, any unsuitable material shall be removed exposing the porous backfill. Porous backfill containing objectionable material shall be removed and replaced with suitable material. The cost of removing and replacing any unsuitable material shall be at the Contractor's expense.

If a granular subbase blanket course is used which extends several feet beyond the edge of paving to the outside edge of the underdrain trench, the granular backfill material over the underdrains shall be placed in the trench up to an elevation of 2 inches above the bottom surface of the granular subbase blanket course. Immediately prior to the placing of the granular subbase blanket course, the Contractor shall blade this excess trench backfill from the top of the trench onto the adjacent subgrade where it can be incorporated into the granular subbase blanket course. Any unsuitable material that remains over the underdrain trench shall be removed and replaced. The subbase material shall be placed to provide clean contact between the subbase material and the underdrain granular backfill material for the full width of the underdrain trench.

c. **Controlled low-strength material (CLSM).** CLSM is not used.

705-3.7 FLEXIBLE PIPE RING DEFLECTION. Not used.

705-3.8 CONNECTIONS. When the plans call for connections to existing or proposed pipe or structures, these connections shall be watertight and made to obtain a smooth uniform flow line throughout the drainage system.

705-3.9 CLEANING AND RESTORATION OF SITE. After the backfill is completed, the Contractor shall dispose of all surplus material, soil, and rubbish from the site. Surplus soil may be deposited in embankments, shoulders, or as directed by the RPR. Except for paved areas of the airport, the Contractor shall restore all disturbed areas to their original condition.

METHOD OF MEASUREMENT

705-4.1 The length of pipe shall be the number of linear feet of pipe underdrains in place, completed, and approved; measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. The several classes, types, and sizes shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipeline being measured.

705-4.2 Not used.

705-4.3 Not used.

705-4.4 The quantity of pipe underdrains shall be made at the contract unit price per linear foot complete, including porous backfill and filter fabric.

BASIS OF PAYMENT

705-5.1 Payment will be made at the contract unit price per linear foot (meter) for pipe underdrains of the type, class, and size designated.

705-5.2 Not used.

705-5.3 Not used.

705-5.4 Pipe underdrains, Complete. Pipe underdrains, complete (including porous backfill and filter fabric) shall be made at the contract unit price per linear foot complete (including porous backfill and filter fabric).

These prices shall be full compensation for furnishing all materials and for all preparation, excavation, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item D-705-5.4	4 inch HDPE Underdrain Pipe Complete (including porous backfill and filter fabric) – per linear foot

REFERENCES

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

ASTM International (ASTM)

ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains
ASTM A762	Standard Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C444	Standard Specification for Perforated Concrete Pipe
ASTM C654	Standard Specification for Porous Concrete Pipe

ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D3262	Standard Specification for "Fiberglass" (Glass-Fiber Reinforced Thermosetting Resin) Sewer Pipe
ASTM D4161	Standard Specification for "Fiberglass" (Glass-Fiber Reinforced Thermosetting Resin) Pipe Joints Using Flexible Elastomeric Seals
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F758	Standard Specification for Smooth Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage
ASTM F794	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe & Fittings Based on Controlled Inside Diameter
ASTM F949	Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
ASTM F2562	Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M190	Standard Specification for Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M196	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M288	Standard Specification for Geotextile Specification for Highway Applications
AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500- mm (12- to 60-in.) Diameter
AASHTO M304	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
AASHTO MP20	Standard Specification for Steel-Reinforced Polyethylene (PE) Ribbed Pipe, 300- to 900-mm (12- to 36-in.) diameter
AASHTO	Standard Specifications for Highway Bridges

END OF ITEM D-705

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Item D-751 Manholes, Catch Basins, Inlets

DESCRIPTION

751-1.1 This item shall consist of construction of manholes, catch basins, inlets, and inspection holes, in accordance with these specifications, at the specified locations and conforming to the lines, grades, and dimensions shown on the plans or required by the RPR.

MATERIALS

751-2.1 Brick. The brick shall conform to the requirements of ASTM C32, Grade MS.

751-2.2 Mortar. Mortar shall consist of one part Portland cement and two parts sand. The cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

751-2.3 Concrete. Plain and reinforced concrete used in structures, connections of pipes with structures, and the support of structures or frames shall conform to the requirements of MAG Section 725, Class A. Reinforcing steel shall conform to the requirements of P-610.

751-2.4 Precast Concrete Pipe Manhole Rings. Precast concrete pipe manhole rings shall conform to the requirements of ASTM C478. Unless otherwise specified, the risers and offset cone sections shall have an inside diameter of not less than 36 inches nor more than 48 inches. There shall be a gasket between individual sections and sections cemented together with mortar on the inside of the manhole. Gaskets shall conform to the requirements of ASTM C443.

751-2.5 Corrugated Metal. Corrugated metal shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M36.

751-2.6 Frames, Covers, And Grates. The castings shall conform to one of the following requirements:

a. ASTM A48, Class 35B: Gray iron castings

b. ASTM A47: Malleable iron casting.

c. ASTM A27: Steel castings

d. ASTM A283, Grade D: Structural steel for grates and frames

e. ASTM A536, Grade 65-45-12: Ductile iron castings

f. ASTM A897: Austempered ductile iron castings

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings, aircraft gear configuration and/or direct loading, specified.

Each frame and cover or grate unit shall be provided with fastening members to prevent it from

being dislodged by traffic but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

751-2.7 Steps. Manhole steps shall not be used.

751-2.8 Precast Inlet Structures. Manufactured in accordance with and conforming to ASTM C913.

CONSTRUCTION METHODS

751-3.1 Unclassified Excavation.

a. The Contractor shall excavate for structures and footings to the lines and grades or elevations, shown on the plans, or as staked by the RPR. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown. The elevations of the bottoms of footings, as shown on the plans, shall be considered as approximately only; and the RPR may direct, in writing, changes in dimensions or elevations of footings necessary for a satisfactory foundation.

b. Boulders, logs, or any other objectionable material encountered in excavation shall be removed. All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped, or serrated, as directed by the RPR. All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and thin strata shall be removed. Where concrete will rest on a surface other than rock, the bottom of the excavation shall not be disturbed and excavation to final grade shall not be made until immediately before the concrete or reinforcing is placed.

c. The Contractor shall do all bracing, sheathing, or shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheathing, or shoring shall be included in the unit price bid for the structure.

d. All bracing, sheathing, or shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall not disturb or damage finished masonry. The cost of removal shall be included in the unit price bid for the structure.

e. After excavation is completed for each structure, the Contractor shall notify the RPR. No concrete or reinforcing steel shall be placed until the RPR has approved the depth of the excavation and the character of the foundation material.

751-3.2 Brick Structures. Brick structures are not used. Bricks may be used lieu of or in combination with concrete adjusting rings in manholes with approval of the RPR.

751-3.3 Concrete Structures. Concrete structures which are to be cast-in-place within the project boundaries shall be built on prepared foundations, conforming to the dimensions and shape indicated on the plans. The construction shall conform to the requirements specified in MAG Section 505. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the RPR before the concrete is placed.

All invert channels shall be constructed and shaped accurately to be smooth, uniform, and

cause minimum resistance to flowing water. The interior bottom shall be sloped to the outlet.

751-3.4 Precast Concrete Structures. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another RPR approved third party certification program.

Precast concrete structures shall conform to ASTM C478. Precast concrete structures shall be constructed on prepared or previously placed slab foundations conforming to the dimensions and locations shown on the plans. All precast concrete sections necessary to build a completed structure shall be furnished. The different sections shall fit together readily. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall: (1) be smoothed to a uniform surface on both interior and exterior of the structure or (2) utilize a rubber gasket per ASTM C443. The top of the upper precast concrete section shall be suitably formed and dimensioned to receive the metal frame and cover or grate, or other cap, as required. Provision shall be made for any connections for lateral pipe, including drops and leads that may be installed in the structure. The flow lines shall be smooth, uniform, and cause minimum resistance to flow. The metal or metal encapsulated steps that are embedded or built into the side walls shall be aligned and placed in accordance to ASTM C478. When a metal ladder replaces the steps, it shall be securely fastened into position.

751-3.5 Corrugated Metal Structures. Not used.

751-3.6 Inlet and Outlet Pipes. Inlet and outlet pipes shall extend through the walls of the structures a sufficient distance beyond the outside surface to allow for connections. They shall be cut off flush with the wall on the inside surface of the structure, unless otherwise directed. For concrete or brick structures, mortar shall be placed around these pipes to form a tight, neat connection.

751-3.7 Placement and Treatment of Castings, Frames, And Fittings. All castings, frames, and fittings shall be placed in the positions indicated on the plans or as directed by the RPR, and shall be set true to line and elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

When frames or fittings are placed on previously constructed masonry, the bearing surface of the masonry shall be brought true to line and grade and shall present an even bearing surface so the entire face or back of the unit will come in contact with the masonry. The unit shall be set in mortar beds and anchored to the masonry as indicated on the plans or as directed by the RPR. All units shall set firm and secure.

After the frames or fittings have been set in final position, the concrete or mortar shall be allowed to harden for seven (7) days before the grates or covers are placed and fastened down.

751-3.8 Installation of Steps. Steps shall not be used.

751-3.9 Backfilling.

a. After a structure has been completed, the area around it shall be backfilled with approved material, in horizontal layers not to exceed 8 inches in loose depth, and compacted to the density required in Item P-152. Each layer shall be deposited evenly around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the

plans or as directed by the RPR.

b. Backfill shall not be placed against any structure until approved by the RPR. For concrete structures, approval shall not be given until the concrete has been in place seven (7) days, or until tests establish that the concrete has attained sufficient strength to withstand any pressure created by the backfill and placing methods.

c. Backfill shall not be measured for direct payment. Performance of this work shall be considered an obligation of the Contractor covered under the contract unit price for the structure involved.

751-3.10 Cleaning and Restoration Of Site. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in embankments, shoulders, or as approved by the RPR. The Contractor shall restore all disturbed areas to their original condition. The Contractor shall remove all tools and equipment, leaving the entire site free, clear, and in good condition.

METHOD OF MEASUREMENT

751-4.1 Measurement. Manholes, catch basins, inlets, and inspection holes shall be measured by the unit.

BASIS OF PAYMENT

751-5.1 Payment. The accepted quantities of manholes, catch basins, inlets, and inspection holes will be paid for at the contract unit price per each in place when completed. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials; furnishing and installation of such specials and connections to pipes and other structures as may be required to complete the item as shown on the plans; and for all labor equipment, tools and incidentals necessary to complete the structure.

Payment will be made under:

Item D-751-5.1	Construct Triple Catch Basin per Plans, with Concrete Apron per ADOT Detail C-15.80 – per each
Item D-751-5.2	Construct Storm Drain Manhole per Plans – per each

REFERENCES

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

ASTM International (ASTM)

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings

ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C32	Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
ASTM C478	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C913	Standard Specification for Precast Concrete Water and Wastewater Structures Applications

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M36	Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains

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SECTION III-C

ELECTRICAL TECHNICAL SPECIFICATIONS

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ITEM L-100 ELECTRICAL GENERAL REQUIREMENTS

DESCRIPTION

100-1.1 General. This Item includes furnishing and installing all material, equipment and apparatus, and all labor, tools, services, and equipment required for the demolition/removal of portions of the existing airfield lighting systems as shown on the drawings and as follows:

a. The removal portions of runway and taxiway edge lighting system including conduit, cable, lighting, and light bases.

b. The removal of existing runway and taxiway lighting fixtures, cable, and conduit within areas of construction for replacement and reconnection to maintain operation of circuit.

c. Temporary Airfield lighting power systems, including temporary cable jumpers.

Installation shall be in accordance with Specifications FAA-C-1217 and FAA-C-1391, or as noted on the plans. Perform all work not included in the FAA Specifications in accordance with the National Electrical Code, applicable local and Deer Valley Airport standards and regulations.

100-1.2 Demolition and salvage.

a. Removal and salvage of airfield electrical elements is included under this Item and shall include the intent, but not limited to the specific elements, of the following:

(1) Remove existing elevated runway and taxiway edge lights and isolation transformers. Return to Airport or store safely until reinstallation.
(2) Remove and salvage existing guidance signage.
(3) All power cables removed shall be removed from site.

b. Any fixtures damaged that are to remain in-place or identified as remove and salvage to Airport on the plans, shall be replaced at Contractor's expense.

c. Demolition (removal and non-return to Owner or for re-installation) of other airfield electrical system elements shall include the intent, but not limited to the specific elements, of the following:

(1) Concrete encased transformer housings / light base cans.
(2) Conduits and fittings.
(3) Concrete hand holes and pull boxes

d. Demolition (removal and non-return) of other elements associated with the airfield electrical system may also be included under other Items of this project. Elements covered within this specification shall include the intent, but not be limited to the specific elements, of the following:

(1) Underground conduits and duct banks, both concrete encased and direct earth buried.
(2) Grading and backfill associated with removal of the foregoing elements shall be covered under P-152, “Excavation and Embankment”.

100-1.3 New construction grading and backfill.

a. Grading and backfill associated with the construction of the new ducts and conduits shall be installed in accordance with P-152, “Excavation and Embankment” P-153, “Controlled Low-Strength Material (CLSM)” and P-610 “Concrete”, there will be no separate measurement or payment for any backfill, compaction, or materials for slurry or concrete encased duct banks but shall be considered incidental to the associated item being installed.

100-1.4 Related documents. The General Provisions of the Contract, including General and Special Conditions, apply to work specified in this item.

a. Conflicts between Drawing and Specifications (Contract Documents) and between Contract Documents and references within the Contract Documents: Drawings and Specifications are complementary. Work called for by one is binding as if called for by both. Prospective Contractors shall, as part of their proposals, enumerate, identify and list conflicts they find to exist within the Contract Documents, and between these Documents and the rules, regulations, standards and codes of the authority having jurisdiction (Airport Authority, City County, etc.) local Utility companies and local County or State governing bodies. No Allowance shall subsequently be made to the Contractor by reason of his/her failure to have brought said discrepancies to the attention of the Consultant during the bidding period or by reason of any error on the Contractor’s part.

b. Execution of Contract is evidence that Contractor has examined all existing conditions, drawings and specifications related to work, and is informed to extent and character of work. Claims made during construction for labor and materials required due to difficulties encountered as a result of Contractor’s inattention to this issue, which could have been clarified prior to bid had examination been made, will be denied.

100-1.5 Temporary lighting and circuits.

a. Contractor shall coordinate with Airport Maintenance before the end of each daylight work shift to verify that all airfield lighting circuits are operational. Contractor shall provide all labor and material for this work, non-pay item (NPI).

b. Contractor shall provide and maintain on site sufficient equipment required to provide temporary lighting and circuit extensions. Existing Runway 7R/25L threshold / end lights are required to be temporarily mounted for operation of runway during non-construction hours, in accordance with the Plans. Light fixtures, transformers and temp cable may have to be moved from within the pavement reconstruction area and will have to be replaced and tested before end of each working shift.

c. Temporary cable installation shall be protected. Temporary cable (jumpers) and its installation through the existing conduit system or through temporary conduit, shall all be

furnished, installed, and removed by the Contractor at no additional compensation beyond the payment for each demolition item. No separate payment will be made for counterpoise, ground rods, grounding connectors, conduit, trench and backfill, or other protection for the temporary jumper cable. Temporary cable shall not be used in the permanent installation. ***Temporary cable shall not be direct buried.*** Other methods may be used for short term or emergency situations only if approved by the Airport and Engineer. Where cable in conduit is approved for temporary placement on the surface, the conduit shall be held in place in a manner approved by the Construction Manager, and the Contractor shall provide temporary traffic protection for the cable and/or conduit. Temporary cable locations shall be marked sufficiently to prevent damage from construction equipment.

d. Re-cabling associated with active runways shall be performed during coordinated runway closures in segments, reconnected to remaining existing circuit segments and tested for operation prior to the end of each shift before re-opening runway to prevent the need for excessive temporary cabling.

100-1.6 Specifications and standards. As a supplement to the installation requirements of this item, the following standard specifications, and regulations of the issues in effect on the date of this solicitation are incorporated herein by reference and are made a part hereof for electrical work and installation and splicing of underground cables.

NEC National Electrical Code

FAA-STD-019f Lightning Protection, Grounding, Bonding and Shielding Requirements for Facilities

FAA-C-1391e Installation and Splicing of Underground Cables

Local Governing Bodies' Public Works Department, City of Mesa

Codes and Regulations Maricopa Association of Governments (MAG)

SRP Electric Service Requirements

American Association of State Highway and Transportation Officials (AASHTO)

(1) AASHTO LTS-5 (2009: Errata 2009: Amendment 2010) Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals.

ASTM International (ASTM)

(1) ASTM A123/A123M (2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

(2) ASTM A153/A153M (2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

(3) ASTM A575 (1996; R 2007) Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades

(4) ASTM A576 (1900b; R 2006) Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality

Illuminating Engineering Society of North America (IESNA)

(1) IESNA HB-9 (2000: Errata 2004: Errata 2005: Errata 2006) IES Lighting Handbook.

Institute of Electrical and Electronics Engineers (IEEE)

(1) IEEE 81 (1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

(2) IEEE C135.1 (1999) Standard for Zinc-Coated Steel Bolts and Nuts for Overhead Line Construction.

(3) IEEE C2 (2007; Errata 06-1; TIA 07-1: TIA 07-3, Errata 07-2; TIA 08-4; TIA 08-6; TIA 08-7; TIA 08-8; TIA 08-9; TIA 08-10; TIA 08-11; TIA 09-12; TIA 09-13; TIA 09-14; Errata 09-3; TIA 09-15; TIA 09-16; TIA 10-17) National Electrical Safety Code

(4) IEEE Stds Dictionary (2009) IEEE Standards Dictionary: Glossary of Terms & Definitions

National Electrical Manufacturers Association (NEMA)

(1) ANSI C136.3 (2005; R 2009) American National Standard for Roadway and Area Lighting Equipment Luminaire Attachments

National Fire Protection Association (NFPA)

(1) NFPA 70 (2011; TIA 11-1; Errata 2011) National Electrical Code

ASHRAE/IESNA 90.1, 2004

American Welding Society (AWS)

Factory Mutual Institute Association (FM)

Lightning Protection Institute 175 Standard for Design, Installation, and Inspection of Lightning Protection Systems

International Electrical Testing Association

Underwriters Laboratories (UL)

(1) UL 467(2007) Grounding and Bonding Equipment

When required by law or regulations, the government agency having jurisdiction for inspections shall be given reasonable notice and opportunity to inspect the work. Any work that is enclosed or covered up before such inspection and test shall be uncovered at the Contractor's expense: after it has been inspected, the Contractor shall restore the work to its original condition at his own expense.

100-1.7 Shop drawings and material lists. Prior to the installation of any material and equipment and within thirty (30) days of contract award, the Contractor shall submit to the Owner for approval electronic PDF copies of manufacturers' brochures containing complete dimensional and performance characteristics, wiring diagrams, installation, and operation instructions, etc., for the equipment listed in the individual L-Series specification Items.

A materials list shall be submitted listing each specification paragraph number and stating whether the materials proposed are as specified or are substitutions. If the item is a substitute item, a complete submittal as described in the above paragraph shall be provided for that item.

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 pertinent products or models applicable to this product. 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 boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Engineer reserves the right to reject any and all equipment, materials, or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

EQUIPMENT AND MATERIALS

100-2.1 Equipment. Conduits, conduit fittings, conductors, connectors, boxes, and wiring devices shall meet requirements of Specification FAA-C-1217 and Item L-110.

100-2.2 Conduit, underground. Conduits run underground are specified in Item L-110 of these specifications. Existing conduit will remain for reuse and installation of new cables as indicated in plans.

100-2.3 Conduit fittings. Each conduit and nipple entrance to duct and other such electrical enclosures shall be fitted with double locknuts (one each side of metal penetrated) and insulating bushing. Bushings on 1-1/4 inch and larger conduits shall be insulated metallic, type OZ/Gedney Cat. No. IBC Series, or equal; bushings for 3/4 inch and 1 inch shall be plastic insulated T&B rated for 150 C, or equal. All insulated bonding and grounding bushings of conduits for 2400 volts or higher voltages, for conduit going underground, and for conduits going into concrete slabs shall be OZ/Gedney Cat. No. IBC-XXL (fitted with grounding lug), or equal. The bushings shall be connected to the grounding system within the terminating enclosure and not on the underground end. The buried end of each conduit shall be fitted with a thermosetting, plastic-insulated, metallic bushing. All openings where conduits enter junction boxes, other enclosures and shelters shall be sealed weather tight. The conduit shall be capped, if left empty, or sealed with Duc Seal, or equal, around the conductors for exterior conduits.

100-2.4 Concrete-encased duct. Concrete-encased PVC duct shall be as specified in Item L-110.

100-2.5 Concrete duct markers. Markers shall be as specified in Item L-110 and as detailed on drawings.

100-2.6 Concrete handholes. Handholes shall be as specified in Item L-115 and as detailed on drawings.

100-2.7 Conduit, exterior. Conduits in concrete slabs, in block walls or exterior exposed shall be rigid galvanized steel (RGS). Conduits run on the exterior of the building above or below the grade for the earth grounding system shall be rigid zinc-coated steel. Radius of bends in RGS shall be minimum 12 nominal pipe diameters. Rigid galvanized steel conduit run in concrete or below slab on grade, or in the ground, shall be field wrapped or shall have factory-applied coating as required in Specification FAA-C-1217. Field-made joints, fittings, abrasions, and holidays shall be coated or wrapped with material equal to the original coating or wrapping.

100-2.8 600 Volt wire. All wire shall have copper conductors. Size shall be American Wire Gauge (AWG) with size for power circuit as shown on the project drawings. Size for all control circuits shall be per the manufacturer's recommendation. All power wire and all control wire shall be stranded. Insulation shall be Type XHHW rated 90º C and shall be continuous and color coded as follows:

		120/240V/208V	**277/480V**
Line 1 or	Phase "A"	Black	Brown
Line 2 or	Phase "B"	Red	Orange
	Phase "C"	Blue	Yellow
	Neutral	White	Grey
	Ground	See Item 100-3.6	
	Control	Black with numbered adhesive markers on both ends.	

All wire shall be continuous; no splices will be permitted. All wire shall be drawn into conduit with adequate lubricating compound to prevent damage to insulation. Pull tension shall not exceed manufacturer's recommendation.

CONSTRUCTION METHODS

100-3.1 Existing utilities. Prior to any excavation or trenching, Contractor shall provide utility locator or contact Blue Stake to locate any existing cables and utilities, which will be crossed by the trench. Where existing underground utilities are shown on plans to conflict with existing conduit removal and / or new conduit installation, Contractor shall pothole to verify the location and depth. Ensure these utilities are permanently disconnected if they are going to be demolished. The existing service lines shall be exposed by hand digging in those areas that will be crossed and shall be protected from any possible damage. If any damage occurs, it shall be the Contractor's responsibility to immediately repair such damage with materials and methods approved by the Owner and in compliance with applicable codes and standards, at Contractor's

expense. Existing utilities to be abandoned shall be removed at the point of crossing as shown on the drawings.

100-3.2 Demolition.

a. Removal of existing conductors associated with runway(s) and taxiway(s) that are required to remain active during daytime operations (or as required by Airport) shall be performed after isolating circuit segments affected by construction and temporary jumper installation to maintain operation of lighting during hours when construction is not occurring.

b. Removal of cables associated with lighting or signage that is to remain operational during construction shall be coordinated with Airport. Existing cables may be removed from underground conduits and sleeved with PVC conduit, secured with sandbags to provide temporary power during construction as required for facilitating removal of existing and construction of new bases, foundations, and hand holes / junction cans.

c. Removal of existing runway lighting fixtures, isolation transformers and base cans associated with runway that is to remain operational during non-construction hours will require coordination with Airport for temporary circuit jumper placement.

d. Existing L-867 bases for lighting that are to remain for reinstallation of new or existing fixtures with new hardware will likely require penetrating oil application for removal of existing mounting bolt hardware. Contractor shall be prepared for task of removing existing hardware and broken bolts for installation of new hardware and fixtures during construction.

(1) Coordinate with Airport / Operations for NOTAMs and Lockout / Tag-out of all circuits affected by construction.

(2) Remove indicated conduits, ducts and conductors from site and dispose of according to local regulations.

(3) Material and equipment not designated for re-installation, including signs, power cables, light fixtures, and isolation transformers, shall be safely stored to protect from damage during construction then offered for salvage to the appropriate Airport personnel at the end of completion. Non-re-usable material, including conduit, concrete hand holes / pull boxes, foundations, base cans, shall become the property of the Contractor and shall be removed from the site and disposed of according to Local Ordinances, at Contractor's expense.

e. Existing signage that is required to remain operational shall remain in place on existing foundation until installation of new sign is ready to be performed. Removal of existing mounting anchors for replacement with new shall also be included in demolition efforts.

f. Replacement of existing signage on existing foundation that also require re-connection to new circuit may remain in place until installation of new sign is ready to be performed. Existing cable may be removed from underground conduit and sleeved above grade in PVC, secured with sandbags, for temporarily feeding during construction to reconnect conduit and install new cable for connection to new circuit. Removal of temporary feed cables and conduit shall be completed after installation of new sign is completed.

g. Replacement of existing signage requiring removal of existing concrete foundations for reconstruction or relocation shall include the removal of existing sign and isolation transformer for temporarily mounting on steel strut in the same general area, secured with sandbags. Sign shall be temporarily fed as required during construction of new sign base. After construction of new base and installation of new sign, Contractor shall remove temporary sign and feeder. Both new and existing sign shall not be installed in same location without covers installed over new sign until ready for operation.

100-3.3 Conductors. Installation of underground 5 kV conductors is specified in Item L-108 of these specifications. Utilization of a pulley system is Owner preferred method on installation. Airfield lighting cable terminations shall be "penciled" using a Ripley Utility tool #WS49-27700 or approved equal. All cable connections shall be installed with Burndy MR4C crimping toll or approved equal.

100-3.4 Grounding. All metal support structures and metal enclosures shall be grounded in accordance with the requirements of the latest edition of Specifications FAA-C-1217, FAA-C-1391, and FAA-STD-019, and as indicated in Item L-108 and as detailed on the drawings.

100-3.5 Ground rods. Grounding rods shall be 3/4-inch diameter by 10 feet long copper-jacketed steel. Grounding connections to ground rods where buried or encased shall be by the exothermic weld process, Cadweld or equal. Extruded, drawn or stamped-type ground clamps will not be acceptable. The resistance to ground shall not exceed 25 ohms.

100-3.6 Ground conductors. Equipment grounding conductors shall be insulated copper, except where shown on the project drawings to be bare and sized as shown on the project drawings; and all grounds will be shown in accordance with Article 250 of the National Electrical Code and with FAA-STD-019 and Item L-108. Attachment of wire to supports, boxes, etc., shall be accomplished using approved ground lug attached with a separate stainless-steel screw, and load distribution washer. Screws used for support of the electrical enclosure shall not be used for connection of the ground wire. Pipe straps shall not be used for ground purposes.

COLOR CODING OF GROUND CONDUCTORS

TYPE OF GROUND CONDUCTOR	COLOR OF INSULATION
Grounding Electrode Conductor	Bare - No Insulation
Counterpoise Conductor	Bare – No Insulation
External Sign and Transformer Housing Ground Conductor	Bare – No Insulation
Equipment Grounding Conductor	Green (safety)
*Multipoint Ground (Frame)	Green with bright orange tracer
*Signal Ground	Green with bright yellow tracer

*Where these cables are concealed and not color coded, an exposed portion of the cable and each end of the cable for a minimum length of 2 feet shall be color coded with green tape overlaid with a bright orange or yellow to form a tracer. Where routed through raceways or wire ways, the color-coding shall be such that by removing or opening any one cover, the coding will be visible. Where conductors are routed through cable trays, color-coding shall be accomplished at intervals not exceeding 3 feet.

The multi-ground system supplements but does not replace the equipment-grounding conductor required by the National Electrical Code.

Each of these separate ground conductors is insulated in order to keep it distinct and not allow contact with any other conductor.

Electrical continuity of cable armor or shield shall be maintained. Grounding of the cable armor or shield shall be required at all terminations and shall be accomplished by connecting a #6 AWG solid bare copper wire to the cable armor or shield by means of a compression-type ground clamp installed within the terminating enclosure. Armor or shield ground wire shall be connected to the ground electrode conductor using split bolt connector, Burndy or equal. Grounding of direct earth burial (DEB) armored power and shielding control cable shall be at each end in accordance with FAA-C-1391.

100-3.7 Identification. Conductors shall be identified as per FAA-C-1217, Section 4.6.5.2.2. Cable tagging and markers shall be identified as per FAA-C-1391, Sections 5.11.1 and 5.11.2. Circuit identification tape is required on all new cables in all structures. Circuit identification tape shall be Scotch Vinyl Electrical Tape or approved equal.

100-3.8 Contractor testing and submittals. Equipment and materials list and shop drawings shall be submitted as per FAA-C-1217 G, Section 5.1. Testing shall be required and performed as per FAA-C-1217 G, Section 4.8, and FAA-C-1391 E, Section 3.3.5. The Contractor shall pretest all cable on the reel prior to installation and provide a copy of the test results to the Owner. The Contractor shall be responsible for repairs or replacement of any cable found defective after installation.

The Contractor shall test existing affected circuits prior to start of construction and the installed airfield lighting and miscellaneous power cables at the completion of this project. The results of the testing shall be provided to the Owner for review and acceptance within 48 hours of testing. The Contractor shall be responsible for repairs or replacement of any cable found defective after installation.

Installation tests in addition to all tests contained in other L-Series Items shall be provided as follows:

Item	Test Required	Manufacturer's Rep. Present?
5 kV Rated Airfield Lighting and Power Cables (On the Reel, Not Including Equipment for Contractor Quality Control. Maybe deleted per-coordination with Engineer).	Megger check at 500 to 1000 Volts prior to installation. Values of insulation resistance for each reel shall be noted and given to the Construction Manager/ Owner for acceptance. It is expected that the readings will be greater than 1000 meg-ohms (1 gig-ohm).	No

Item	Test Required	Manufacturer's Rep. Present?
5 kV Rated Airfield Lighting and Power Cables (All Circuits Installed in This Project)	Megger check at 500 to 1000 volts at the completion of installation. Test every circuit for conductor-to-ground and conductor-to-conductor (between circuits) insulation resistance. Test results shall be tabulated and given to the Construction Manager/Owner for acceptance. It is required that the readings be greater than 100 meg-ohms. When new cabling is connected to existing cabling circuit, the new portion should test above 500 mega-ohms and the overall circuit should test above pre-construction condition.	No
5 kV Rated Airfield Lighting and Power Cables (All Circuits Installed in This Project)	Megger check at 500 to 1000 volts at the completion of installation. Test every circuit for conductor-to-ground and conductor-to-conductor (between circuits) insulation resistance. Test results shall be tabulated and given to the Construction Manager/Owner for acceptance.	No
5 kV and 600 Volt and Multi-pair Cables	If a power cable puller is used, continuous-tape pull tension readings for each section of cable shall be provided to the Construction Manager or Owner for review.	No

100-3.9 Notification of testing. The Contractor shall notify the project RE and the Airport, a minimum of 48 hours in advance of system, or partial system, testing including, but not limited to, installed cable megger testing, and operational testing of any modified lighting circuit.

100-3.10 Airfield lighting vault lock-out tag-out policy. The purpose of this procedure is to standardize the lockout tag out procedures between Electrical Contractors, Airport Electricians, Operations and Air Traffic Control Tower (ATCT).

(1) Airport Electricians responding to a lock-out/tag-out request will coordinate with the ATCT.

(2) The Airport Electricians will turn off the closed runways/taxiways.

(3) The Contractor will supply an approved breaker-locking device and lock, then lock off the individual breakers for the circuits to be locked out. These items will remain in the vaults in a lock box provided by Airport Electricians.

(4) The S-1 switches will be pulled, locked, and placed on the corresponding regulator by the electrical contractor.

(5) The electrical contractor must fill out lock-out forms before leaving the vault.

(6) Upon completion of the lockout, the contractor will remove all locks and install the load breaks. All circuits must be verified operational in the manual mode on the regulator. Operations will perform a complete check on the lights in the field, to verify actual operation.

(7) When that has been completed, Airport Electricians will notify Operations when lock-in is complete and regulators are in remote control; Operations will notify the ATCT that they have control of the airfield lighting.

(8) Complete lock-out/lock-in forms.

This procedural checklist must be followed to the letter.

METHOD OF MEASUREMENT

100-4.1 Remove and Salvage Existing Taxiway Edge Light & Isolation Transformer, Remove Existing Base Can The quantity to be measured shall be for the removal of existing taxiway edge lights, fixture mounting base plates and isolation transformers for storage until reinstallation or return to Airport. This shall also include compete removal and disposal off site of existing concrete encased base cans in accordance with the Plans and Specifications and as accepted.

100-4.2 Remove and Salvage Existing Taxiway Edge Light & Isolation Transformer, Existing Base Can to Remain The quantity to be measured shall be for the removal of existing taxiway edge lights, fixture mounting base plates and isolation transformers for storage until reinstallation or return to Airport. Existing concrete encased base cans to remain in accordance with the Plans and Specifications and as accepted.

100-4.3 Remove and Salvage Existing Runway Edge Light & Isolation Transformer, Remove Existing Base Can The quantity to be measured shall be for the removal of existing runway edge lights, fixture mounting base plates and isolation transformers for storage until reinstallation or return to Airport. This shall also include compete removal and disposal off site of existing concrete encased base cans in accordance with the Plans and Specifications and as accepted.

100-4.4 Remove and Salvage Existing Runway Edge Light & Isolation Transformer, Existing Base Can to Remain The quantity to be measured shall be for the removal of existing runway edge lights, fixture mounting base plates and isolation transformers for storage until reinstallation or return to Airport. Existing concrete encased base cans to remain in accordance with the Plans and Specifications and as accepted.

100-4.5 Remove and Salvage Existing Runway Guard Light & Isolation Transformer, Remove Existing Base Can The quantity to be measured shall be for the removal of existing

elevated runway guard lights, fixture mounting base plates and isolation transformers for storage until reinstallation. This shall also include compete removal and disposal off site of existing concrete encased base cans in accordance with the Plans and Specifications and as accepted.

100-4.6 Remove and Salvage Runway Guard Light & Isolation Transformer, Existing Base Can to Remain. The quantity to be measured shall be for the removal of existing elevated runway guard lights, fixture mounting base plates and isolation transformers for safe storage until reinstallation. The existing concrete encased base cans shall remain protected in place during construction in accordance with the Plans and Specifications and as accepted.

100-4.7 Remove Existing Junction Can / Pull Box The quantity to be measured shall be for the excavation and removal of existing electrical junction cans / pull boxes. This shall also include compete removal and disposal off site of existing concrete encased base cans in accordance with the Plans and Specifications and as accepted.

100-4.8 Excavate and Remove Existing Conduit and Conductor. This item shall consist of complete removal of airfield lighting cable and complete removal of existing underground conduits and disposal off site in accordance with the Plans and Specifications and as accepted. No separate measurement will be made for multiple conduits in an existing duct bank. No separate measurement will be made for removal of existing airfield cable within conduits designated for removal or cable slack. This shall also include backfill, compaction and restoration of disturbed area as required.

100-4.9 Remove Existing Conductor, Conduit to Remain. This item shall consist of removal of existing airfield lighting cable from within existing underground conduits in accordance with the Plans and Specifications and as accepted. Cable removal is quantified as an effort to remove any number of conductors from within each conduit in a single run or each duct bank conduit. No separate measurement will be made for multiple conductors located in each conduit. No separate measurement will be made for slack.

100-4.10 Excavate and Remove Existing Concrete Encased Duct Bank. This item shall consist of complete removal and disposal off site of existing concrete encased duct banks in accordance with the Plans and Specifications and as accepted. No separate measurement will be made for multiple conduits in an existing duct bank. No separate measurement will be made for removal of existing airfield cable within conduits designated for removal. This shall also include backfill, compaction and restoration of disturbed area as required.

100-4.11 Remove and Salvage Airfield Guidance Sign and Isolation Transformer, Remove Concrete Sign Base. The quantity to be measured shall be for the removal of existing airfield guidance signs and isolation transformers within the area of construction for storage to protect from damage until reinstallation, return to Airport or disposal. It shall also include removal of existing concrete sign bases and transformer housings per the Plans and Specifications and as accepted.

100-4.12 Remove and Salvage Airfield Guidance Sign and Isolation Transformer, Concrete Sign Base to Remain. The quantity to be measured shall be for the removal of existing airfield guidance signs and isolation transformers within the area of construction for storage to

protect from damage until reinstallation, return to Airport or disposal. Existing concrete sign bases with transformer housings and covers shall remain. Remove any protruding anchor bolts as required per the Plans and Specifications and as accepted.

100-4.13 Excavate and Remove Existing Concrete Hand Hole. This item shall consist of complete removal and disposal off site of existing concrete handholes in accordance with the Plans and Specifications and as accepted. This shall also include backfill and restoration of disturbed area as required by shoulder reconstruction.

100-4.14 Remove Sign Panels From Existing Airfield Guidance Sign. The quantity to be measured shall be for the removal of existing airfield guidance sign panels for replacement with new panels as required per the Plans and Specifications and as accepted.

100-4.15 Temporary Airfield Lighting and Cable Jumpers. The quantity to be measured shall be for the installation of new and / or existing temporary L-824, Type C, #8, 5 kV airfield lighting cables, sleeved and sandbagged for protection to maintain operation of circuits affected by construction. It shall also include furnishing, installing and removal of temporary cables; temporarily mounting and feeding existing signs, temporary sign covers, and re-circuiting lights and signs as detailed on the Drawings. No separate measurement or payment will be made for moving temporary facilities as required to provide Contractor's access to work sites. The use of temporary cables covered under this item shall be limited to "jumpers" as required to maintain circuit continuity during construction. Cable used for temporary application shall not be used for permanent application.

BASIS OF PAYMENT

100-5.1 Electrical services. Payment will be made at the contract price for the electrical services completed and accepted. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete this Item. The unit price of each of these items shall also include the Contractor's overhead, profit, and markup.

Payment will be made under:

Item L-100-5.1	Remove and Salvage Existing Taxiway Edge Light and Isolation Transformer, Remove Existing Base Can – per each
Item L-100-5.2	Remove and Salvage Existing Taxiway Edge Light and Isolation Transformer, Existing Base Can to Remain – per each
Item L-100-5.3	Remove and Salvage Existing Runway Edge Light and Isolation Transformer, Remove Existing Base Can – per each
Item L-100-5.4	Remove and Salvage Existing Runway Edge Light and Isolation Transformer, Existing Base Can to Remain – per each
Item L-100-5.5	Remove and Salvage Existing Runway Guard Light and Isolation Transformer, Remove Existing Base Can – per each

Item L-100-5.6	Remove and Salvage Existing Runway Guard Light and Isolation Transformer, Existing Base Can to Remain – per each
Item L-100-5.7	Remove Existing Junction Can / Pull Box – per each
Item L-100-5.8	Excavate and Remove Existing Conduit and Conductor – per linear foot
Item L-100-5.9	Remove Existing Conductor, Conduit to Remain – per linear foot
Item L-100-5.10	Excavate and Remove Existing Concrete Encased Ductbank – per linear foot
Item L-100-5.11	Remove and Salvage Airfield Guidance Sign and Isolation Transformer, Remove Concrete Sign Base – per each
Item L-100-5.12	Remove and Salvage Airfield Guidance Sign and Isolation Transformer, Concrete Sign Base to Remain – per each
Item L-100-5.13	Excavate and Remove Existing Concrete Hand Hole – per each
Item L-100-5.14	Remove Sign Panels From Existing Airfield Guidance Sign – per each
Item L-100-5.15	Temporary Airfield Lighting Circuit Jumpers – per lump sum

END OF ITEM L-100

ITEM L-108 UNDERGROUND POWER CABLE FOR AIRPORTS

DESCRIPTION

108-1.1 This item shall consist of furnishing and installing power cables that are direct buried and furnishing and/or installing power cables within conduit or duct banks per these specifications at the locations shown on the plans. It includes excavation and backfill of trench for direct-buried cables only. Also included are the installation of counterpoise wires, ground wires, ground rods and connections, cable splicing, cable marking, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the RPR. This item shall not include the installation of duct banks or conduit, trenching and backfilling for duct banks or conduit, or furnishing or installation of cable for FAA owned/operated facilities.

EQUIPMENT AND MATERIALS

108-2.1 General.

a. Airport lighting equipment and materials covered by advisory circulars (AC) shall be approved under the Airport Lighting Equipment Certification Program per AC 150/5345-53, current version.

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

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

d. All materials and equipment used to construct this item shall be submitted to the RPR 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 any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to 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 the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format. The RPR 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.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of 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 Contractor shall maintain a minimum insulation resistance in accordance with paragraph 108-3.10e with isolation transformers connected in new circuits and new segments of existing circuits through the end of

the contract warranty period when tested in accordance with AC 150/5340-26, *Maintenance Airport Visual Aid Facilities*, paragraph 5.1.3.1, Insulation Resistance Test.

108-2.2 Cable. Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits latest edition. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 American wire gauge (AWG), L-824 Type C , 5,000 volts, non-shielded, with cross-linked polyethylene insulation . Conductors for use on 20 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #6 AWG, L-824 Type C, 5,000 volts, non-shielded, with cross-linked polyethylene insulation. L-824 conductors for use on the L-830 secondary of airfield lighting series circuits shall be sized in accordance with the manufacturer's recommendations. All other conductors shall comply with FAA and National Electric Code (NEC) requirements. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Commercial Item Description A-A-59544A and shall be type THWN-2, 75°C for installation in conduit and RHW-2, 75°C for direct burial installations. Conductors for parallel (voltage) circuits shall be type and size and installed in accordance with NFPA-70, National Electrical Code.

Unless noted otherwise, all 600-volt and less non-airfield lighting conductor sizes are based on a 75°C, THWN-2, 600-volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The conduit/duct sizes are based on the use of THWN-2, 600-volt insulated conductors. The Contractor shall make the necessary increase in conduit/duct sizes for other types of wire insulation. In no case shall the conduit/duct size be reduced. The minimum power circuit wire size shall be #12 AWG.

Conductor sizes may have been adjusted due to voltage drop or other engineering considerations. Equipment provided by the Contractor shall be capable of accepting the quantity and sizes of conductors shown in the Contract Documents. All conductors, pigtails, cable step-down adapters, cable step-up adapters, terminal blocks, and splicing materials necessary to complete the cable termination/splice shall be considered incidental to the respective pay items provided.

Cable type, size, number of conductors, strand and service voltage shall be as specified in the Contract Document.

108-2.3 Bare copper wire (counterpoise, bare copper wire ground and ground rods). Wire for counterpoise or ground installations for airfield lighting systems shall be No. 6 AWG bare solid copper wire for counterpoise and/or No. 6 AWG insulated stranded for grounding bond wire per ASTM B3 and ASTM B8 and shall be bare copper wire . For voltage powered circuits, the equipment grounding conductor shall comply with NEC Article 250.

Ground rods shall be copper-clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case be less than 10 feet (2.54 m) long and 3/4 inch (19 mm) in diameter.

108-2.4 Cable connections. In-line connections or splices of underground primary cables shall be of the type called for on the plans and shall be one of the types listed below. No separate payment will be made for cable connections.

a. The cast splice. A cast splice, employing a plastic mold and using epoxy resin equivalent to that manufactured by 3M™ Company, "Scotchcast" Kit No. 82-B, or an approved equivalent, used for potting the splice is acceptable.

b. The field-attached plug-in splice. Field attached plug-in splices shall be installed as shown on the plans. The Contractor shall determine the outside diameter of the cable to be spliced and furnish appropriately sized connector kits and/or adapters. Tape or heat shrink tubing with integral sealant shall be in accordance with the manufacturer's requirements. Primary Connector Kits manufactured by Amerace, "Super Kit", Integro "Complete Kit", or approved equal is acceptable.

c. The factory-molded plug-in splice. Specification for L-823 Connectors, Factory-Molded to Individual Conductors, is acceptable.

d. The taped or heat-shrink splice. Taped splices employing field-applied rubber, or synthetic rubber tape covered with plastic tape is acceptable. The rubber tape should meet the requirements of ASTM D4388 and the plastic tape should comply with Military Specification MIL-I-24391 or Commercial Item Description A-A-55809. Heat shrinkable tubing shall be heavy-wall, self-sealing tubing rated for the voltage of the wire being spliced and suitable for direct-buried installations. The tubing shall be factory coated with a thermoplastic adhesive-sealant that will adhere to the insulation of the wire being spliced forming a moisture- and dirt-proof seal. Additionally, heat shrinkable tubing for multi-conductor cables, shielded cables, and armored cables shall be factory kits that are designed for the application. Heat shrinkable tubing and tubing kits shall be manufactured by Tyco Electronics/ Raychem Corporation, Energy Division, or approved equivalent.

In all the above cases, connections of cable conductors shall be made using crimp connectors using a crimping tool designed to make a complete crimp before the tool can be removed. All L-823/L-824 splices and terminations shall be made per the manufacturer's recommendations and listings.

All connections of counterpoise, grounding conductors and ground rods shall be made by the exothermic process or approved equivalent, except that a light base ground clamp connector shall be used for attachment to the light base. All exothermic connections shall be made per the manufacturer's recommendations and listings.

108-2.5 Splicer qualifications. Every airfield lighting cable splicer shall be qualified in making airport cable splices and terminations on cables rated at or above 5,000 volts AC. The Contractor shall submit to the RPR proof of the qualifications of each proposed cable splicer for the airport cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

108-2.6 Concrete. Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

108-2.7 Flowable backfill. Flowable material used to backfill trenches for power cable trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

108-2.8 Cable identification tags. Cable identification tags shall be made from a non-corrosive material with the circuit identification stamped or etched onto the tag. The tags shall be of the type as detailed on the plans.

108-2.9 Tape. Electrical tapes shall be Scotch™ Electrical Tapes –Scotch™ 88 (1-1/2 inch (38 mm) wide) and Scotch™ 130C® linerless rubber splicing tape (2-inch (50 mm) wide), as manufactured by the Minnesota Mining and Manufacturing Company (3M™), or an approved equivalent.

108-2.10 Electrical coating. Electrical coating shall be Scotchkote™ as manufactured by 3M™, or an approved equivalent.

108-2.11 Existing circuits. Whenever the scope of work requires connection to an existing circuit, the existing circuit's insulation resistance shall be tested, in the presence of the RPR. The test shall be performed per this item and prior to any activity that will affect the respective circuit. The Contractor shall record the results on forms acceptable to the RPR. When the work affecting the circuit is complete, the circuit's insulation resistance shall be checked again, in the presence of the RPR. The Contractor shall record the results on forms acceptable to the RPR. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the existing circuit to bring the second reading above the first reading. All repair costs including a complete replacement of the L-823 connectors, L-830 transformers and L-824 cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance (O&M) Manual.

108-2.12 Detectable warning tape. Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit, and lighting cable) with continuous legend tape shall be polyethylene film with a metalized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item. Detectable warning tape for communication cables shall be orange. Detectable warning tape color code shall comply with the APWA Uniform Color Code.

CONSTRUCTION METHODS

108-3.1 General. The Contractor shall install the specified cable at the approximate locations indicated on the plans. Unless otherwise shown on the plans, all cable required to cross under pavements expected to carry aircraft loads shall be installed in concrete encased duct banks. Cable shall be run without splices, from fixture to fixture.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolation transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections unless otherwise authorized in writing by the RPR or shown on the plans.

In addition to connectors being installed at individual isolation transformers, L-823 cable connectors for maintenance and test points shall be installed at locations shown on the plans. Cable circuit identification markers shall be installed on both sides of the L-823 connectors installed and on both sides of slack loops where a future connector would be installed.

Provide not less than 3 feet (1 m) of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least one foot (30 cm) vertically above the top of the access structure. This requirement also applies where primary cable passes through empty light bases, junction boxes, and access structures to allow for future connections, or as designated by the RPR.

Primary airfield lighting cables installed shall have cable circuit identification markers attached on both sides of each L-823 connector and on each airport lighting cable entering or leaving cable access points, such as manholes, hand holes, pull boxes, junction boxes, etc. Markers shall be of sufficient length for imprinting the cable circuit identification legend on one line, using letters not less than 1/4 inch (6 mm) in size. The cable circuit identification shall match the circuits noted on the construction plans.

108-3.2 Installation in duct banks or conduits. This item includes the installation of the cable in duct banks or conduit per the following paragraphs. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be per the latest version of the National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected, and that any potential interference is avoided.

Duct banks or conduits shall be installed as a separate item per Item L-110, Airport Underground Electrical Duct Banks and Conduit. The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to ensure that the duct bank or conduit is open, continuous, and clear of debris. The mandrel size shall be compatible with the conduit size. The Contractor shall swab out all conduits/ducts and clean light bases, manholes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed, the light bases and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, light bases, 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 re-cleaned at the Contractor's expense. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the RPR of any blockage in the existing ducts.

The cable shall be installed in a manner that prevents harmful stretching of the conductor, damage to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall not exceed the cable manufacturer's recommendations. A non-hardening cable-pulling lubricant recommended for the type of cable being installed shall be used where required.

The Contractor shall submit the recommended pulling tension values to the RPR prior to any cable installation. If required by the RPR, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the RPR. Cable pull tensions shall be recorded by the Contractor and reviewed by the RPR. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor's expense.

The manufacturer's minimum bend radius or NEC requirements (whichever is more restrictive) shall apply. Cable installation, handling and storage shall be per manufacturer's recommendations. During cold weather, particular attention shall be paid to the manufacturer's minimum installation temperature. Cable shall not be installed when the temperature is at or below the manufacturer's minimum installation temperature. At the Contractor's option, the Contractor may submit a plan, for review by the RPR, for heated storage of the cable and maintenance of an acceptable cable temperature during installation when temperatures are below the manufacturer's minimum cable installation temperature.

Cable shall not be dragged across base can or manhole edges, pavement, or earth. When cable must be coiled, lay cable out on a canvas tarp, or use other appropriate means to prevent abrasion to the cable jacket.

108-3.3 Installation of direct-buried cable in trenches. Not Used.

108-3.4 Cable markers for direct-buried cable. Not Used.

108-3.5 Splicing. Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

a. Cast splices. These shall be made by using crimp connectors for jointing conductors. Molds shall be assembled, and the compound shall be mixed and poured per the manufacturer's instructions and to the satisfaction of the RPR.

b. Field-attached plug-in splices. These shall be assembled per the manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. The joint where the connectors come together shall be finished by one of the following methods: (1) wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint (2) Covered with heat shrinkable tubing with integral sealant extending at least 1-1/2 inches (38 mm) on each side of the joint or (3) On connector kits equipped with water seal flap; roll-over water seal flap to sealing position on mating connector.

c. Factory-molded plug-in splices. These shall be made by plugging directly into mating connectors. The joint where the connectors come together shall be finished by one of the following methods: (1) Wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint. (2) Covered with heat shrinkable tubing with integral sealant extending at least 1-1/2 inches (38 mm) on each side of the joint. or (3) On connector kits so equipped with water seal flap; roll-over water seal flap to sealing position on mating connector.

d. Taped or heat-shrink splices. A taped splice shall be made in the following manner:

Bring the cables to their final position and cut so that the conductors will butt. Remove insulation and jacket allowing for bare conductor of proper length to fit compression sleeve connector with 1/4 inch (6 mm) of bare conductor on each side of the connector. Prior to splicing, the two ends of the cable insulation shall be penciled using a tool designed specifically for this purpose and for cable size and type. Do not use emery paper on splicing operation since it contains metallic particles. The copper conductors shall be thoroughly cleaned. Join the conductors by inserting them equidistant into the compression connection sleeve. Crimp conductors firmly in place with crimping tool that requires a complete crimp before tool can be removed. Test the crimped connection by pulling on the cable. Scrape the insulation to assure that the entire surface over which the tape will be applied (plus 3 inches (75 mm) on each end) is clean. After scraping, wipe the entire area with a clean lint-free cloth. Do not use solvents.

Apply high-voltage rubber tape one-half lapped over bare conductor. This tape should be tensioned as recommended by the manufacturer. Voids in the connector area may be eliminated by highly elongating the tape, stretching it just short of its breaking point. The manufacturer's recommendation for stretching tape during splicing shall be followed. Always attempt to exactly half-lap to produce a uniform buildup. Continue buildup to 1-1/2 times cable diameter over the body of the splice with ends tapered a distance of approximately one inch (25 mm) over the original jacket. Cover rubber tape with two layers of vinyl pressure-sensitive tape one-half lapped. Do not use glyptol or lacquer over vinyl tape as they react as solvents to the tape. No further cable covering or splice boxes are required.

Heat shrinkable tubing shall be installed following manufacturer's instructions. Direct flame heating shall not be permitted unless recommended by the manufacturer. Cable surfaces within the limits of the heat-shrink application shall be clean and free of contaminates prior to application.

e. Assembly. Surfaces of equipment or conductors being terminated or connected shall be prepared in accordance with industry standard practice and manufacturer's recommendations. All surfaces to be connected shall be thoroughly cleaned to remove all dirt, grease, oxides, nonconductive films, or other foreign material. Paints and other nonconductive coatings shall be removed to expose base metal. Clean all surfaces at least 1/4 inch (6.4 mm) beyond all sides of the larger bonded area on all mating surfaces. Use a joint compound suitable for the materials used in the connection. Repair painted/coated surface to original condition after completing the connection.

108-3.6 Bare counterpoise wire installation for lightning protection and grounding. If shown on the plans or included in the job specifications, bare solid #6 AWG copper counterpoise wire shall be installed for lightning protection of the underground cables. The RPR shall select one of two methods of lightning protection for the airfield lighting circuit based upon sound engineering practice and lightning strike density.

a. Equipotential. May be used by the RPR for areas that have high rates of lightning strikes. The counterpoise size is determined by the RPR. The equipotential method is applicable to all airfield lighting systems, i.e., runway, taxiway, apron – touchdown zone, centerline, edge, threshold, and approach lighting systems. The equipotential method is also successfully applied to provide lightning protection for power, signal, and communication systems. The light bases, counterpoise, etc. – all components - are bonded together and bonded to the vault power system ground loop/electrode.

Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are installed to contain airfield cables. The counterpoise is centered over the cable/conduit/duct to be protected.

The counterpoise conductor shall be installed no less than 8 inches (200 mm) minimum or 12 inches (300 mm) maximum above the raceway or cable to be protected, except as permitted below:

(1) The minimum counterpoise conductor height above the raceway or cable to be protected shall be permitted to be adjusted subject to coordination with the airfield lighting and pavement designs.

(2) The counterpoise conductor height above the protected raceway(s) or cable(s) shall be calculated to ensure that the raceway or cable is within a 45-degree area of protection, (45 degrees on each side of vertical creating a 90-degree angle).

The counterpoise conductor shall be bonded to each metallic light base, mounting stake, and metallic airfield lighting component.

All metallic airfield lighting components in the field circuit on the output side of the constant current regulator (CCR) or other power source shall be bonded to the airfield lighting counterpoise system.

All components rise and fall at the same potential, with no potential difference, no damaging arcing, and no damaging current flow.

See AC 150/5340-30, Design, and Installation Details for Airport Visual Aids and NFPA 780, Standard for the Installation of Lightning Protection Systems, Chapter 11, for a detailed description of the Equipotential Method of lightning protection.

Reference FAA STD-019E, Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment, Part 4.1.1.7.

b. Isolation. Used in areas where lightning strikes are not common. Counterpoise size is selected by the RPR. The isolation method is an alternate method for use only with edge lights installed in turf and stabilized soils and raceways installed parallel to and adjacent to the edge of the pavement. NFPA 780 uses 15 feet to define “adjacent to”.

The counterpoise conductor shall be installed 8 inches (203 mm) minimum below grade. The counterpoise is not connected to the light base or mounting stake. An additional grounding electrode is required at each light base or mounting stake. The grounding electrode is bonded to the light base or mounting stake with a 6 AWG solid copper conductor.

See AC 150/5340-30, Design and Installation Details for Airport Visual Aids and NFPA 780, Standard for the Installation of Lightning Protection Systems, Chapter 11, for a detailed description of the Isolation Method of lightning protection.

c. Common Installation requirements. When a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a No. 6 AWG bare, annealed, or soft drawn, solid copper conductor. When a nonmetallic light base is used, the grounding electrode shall be bonded to the metallic light fixture or metallic base plate with a No. 6 AWG bare, annealed, or soft drawn, solid copper conductor.

Grounding electrodes may be rods, ground dissipation plates, radials, or other electrodes listed in the NFPA 70 (NEC) or NFPA 780.

Where raceway is installed by the directional bore, jack and bore, or other drilling method, the counterpoise conductor shall be permitted to be installed concurrently with the directional bore, jack and bore, or other drilling method raceway, external to the raceway or sleeve.

The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 feet (150 m) apart around the entire circuit. The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode-grounding system. The connections shall be made as shown on the plans and in the specifications.

Where an existing airfield lighting system is being extended or modified, the new counterpoise conductors shall be interconnected to existing counterpoise conductors at each intersection of the new and existing airfield lighting counterpoise systems.

d. Parallel Voltage Systems. Not Used.

108-3.7 Counterpoise installation above multiple conduits and duct banks. Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete area of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete area of protection measured 45 degrees each side of vertical.

Where duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the duct bank. Reference details on the construction plans.

108-3.8 Counterpoise installation at existing duct banks. When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall

be terminated at ground rods at each end of the existing duct bank where the cables being protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

108-3.9 Exothermic bonding. Bonding of counterpoise wire shall be by the exothermic welding process or equivalent method accepted by the RPR. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the RPR, the welding kits, materials, and procedures to be used for welded connections prior to any installations in the field. The installations shall comply with the manufacturer's recommendations and the following:

a. All slag shall be removed from welds.

b. Using an exothermic weld to bond the counterpoise to a lug on a galvanized light base is not recommended unless the base has been specially modified. Consult the manufacturer's installation directions for proper methods of bonding copper wire to the light base. See AC 150/5340-30 for galvanized light base exception.

c. If called for in the plans, all buried copper and weld material at weld connections shall be thoroughly coated with 6 mm of 3M™ Scotchkote™, or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

108-3.10 Testing. The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the RPR. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the RPR. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase. The Contractor must maintain the test results throughout the entire project as well as during the warranty period that meet the following:

a. Earth resistance testing methods shall be submitted to the RPR for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the RPR. All such testing shall be at the sole expense of the Contractor.

b. Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and tested for continuity. The RPR shall approve of the test method selected. All such testing shall be at the sole expense of the Contractor.

After installation, the Contractor shall test and demonstrate to the satisfaction of the RPR the following:

c. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.

d. That all affected circuits (existing and new) are free from unspecified grounds.

e. That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than **100** megohms. Verify continuity of all series airfield lighting circuits prior to energization.

f. That the insulation resistance to ground of all new non-grounded conductors of new multiple circuits or circuit segments is not less than 100 megohms.

g. That all affected circuits (existing and new) are properly connected per applicable wiring diagrams.

h. That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

i. That the impedance to ground of each ground rod does not exceed 25ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as described by American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81, to verify this requirement. As an alternate, clamp-on style ground impedance test meters may be used to satisfy the impedance testing requirement. Test equipment and its calibration sheets shall be submitted for review and approval by the RPR prior to performing the testing.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the RPR. Where connecting new cable to existing cable, insulation resistance tests shall be performed on the new cable prior to connection to the existing circuit.

There are no approved “repair” procedures for items that have failed testing other than complete replacement.

METHOD OF MEASUREMENT

108-4.1 Cable installed in duct bank or conduit shall be measured by the number of linear feet installed with primary connector kits, grounding conductor and grounding connectors ready for operation, and accepted by Owner / Engineer. Separate measurement shall be made for each single cable (1/C), cable pair (2/C) or multiple conductor feeder set, installed in duct bank or conduit with associated ground wire and connections included in Contractor’s price. The measurement for this item shall include additional quantities required for slack – 5’ per cable end at each light base, junction can or transformer housing and 15’ per cable end at each manhole or hand hole. No separate measurement will be made to multiply the number of individual conductors installed in a single conduit, in one installation effort.

108-4.2 Counterpoise wire and connections are considered incidental to the installation of duct bank or conduit, per item L-110. No separate payment will be made.

108-4.3 Ground rods shall be considered incidental to the installation of counterpoise, light base, transformer housing, sign, or other grounding. No separate payment will be made.

BASIS OF PAYMENT

108-5.1 Payment will be made at the contract unit price for linear feet of cable and equipment ground installed in duct bank or conduit, in place by the Contractor and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item.

Payment will be made under:

Item L-108-5.1 L-824, Type C, 1/C #8 AWG, 5kV Cable, #6 Ground - per linear foot

Item L-108-5.2 L-824, Type C, 2/C #8 AWG, 5kV Cable, #6 Ground - per linear foot

REFERENCES

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

Advisory Circulars (AC)

AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-53	Airport Lighting Equipment Certification Program

Commercial Item Description

A-A-59544A	Cable and Wire, Electrical (Power, Fixed Installation)
A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic

ASTM International (ASTM)

ASTM B3	Standard Specification for Soft or Annealed Copper Wire
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B33	Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes
ASTM D4388	Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes

Mil Spec

MIL-PRF-23586F	Performance Specification: Sealing Compound (with Accelerator), Silicone Rubber, Electrical
MIL-I-24391	Insulation Tape, Electrical, Plastic, Pressure Sensitive

National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)

NFPA-780 STANDARD FOR THE INSTALLATION OF LIGHTNING PROTECTION SYSTEMS

American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

Federal Aviation Administration Standard

FAA STD-019E Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment

END OF ITEM L-108

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. Ground rods and counterpoise wire are incidental to fixture and conduit installation.

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 RPR.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications and acceptable to the RPR. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the RPR 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 RPR 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 RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format, tabbed by specification section. The RPR 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.

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 mils of asphaltum sealer. In lieu of PVC coated RGS, corrosion wrap tape shall be permitted to be used where RGS is in contact with direct earth."

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 and Schedule 80 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 be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

110-2.7 Precast concrete structures. Precast concrete structures shall be furnished by a plant which meets the National Precast Concrete Association Plant Certification Program or another RPR approved third party certification program. Precast concrete structures shall conform to ASTM C478.

110-2.8 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.

110-2.9 Detectable warning tape. Plastic, detectable, American Public Works Association (APWA) red (electrical power lines, cables, conduit, and lighting cable), orange (telephone/fiber optic cabling) 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.

CONSTRUCTION METHODS

110-3.1 General. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The RPR 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 three (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. Under pavement, the top of the duct bank shall not be less than 18 inches (0.5 m) below the subgrade; in other locations, the top of the duct bank or underground conduit shall be not less than 18 inches (0.5 m) below finished grade.

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 RPR 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 (6.3 mm) sieve. Flowable backfill may alternatively be used

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 RPR. 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 RPR, the unsuitable material shall be removed per Item P-152 and replaced with suitable material. Additional duct bank supports shall be installed, as approved by the RPR.

All excavation shall be unclassified and shall be considered incidental to Item L-110. Dewatering necessary for duct installation, and erosion per federal, state, and local requirements is incidental to Item L-110.

Unless otherwise specified, excavated materials that are deemed by the RPR 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 RPR 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 RPR, 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 inches (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 RPR 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 RPR 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 RPR.

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 (6.3 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 lot 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 RPR 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 RPR, 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 RPR. 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 RPR. 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 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 RPR.

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 Item 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 RPR.

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.

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, counterpoise conductor, ground rods and connections, locator tape, trenching and backfill with designated material, and restoration, 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. Ground rods and counterpoise wire are incidental to fixture and conduit installation.

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	Single-way, (1) - 2" Conduit, Direct Buried (Temporary Circuit Jumper Sleeve) – per Linear Foot
Item L-110-5.2	Single-way, (1) - 2" Conduit, Slurry Encased – per Linear Foot
Item L-110-5.3	Single-way, (1) - 2" Conduit, Concrete Encased – per Linear Foot
Item L-110-5.4	Multiple-way, (4) - 2" Conduit, Slurry Encased – per Linear Foot
Item L-110-5.5	Multiple-way, (4) - 2" Conduit, Concrete Encased – per Linear Foot
Item L-110-5.6	Multiple-way, (2) - 4" Conduit, Slurry Encased – per Linear Foot
Item L-110-5.7	Multiple-way, (2) - 4" Conduit, Concrete Encased – per Linear Foot

REFERENCES

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

Advisory Circular (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program

ASTM International (ASTM)

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

National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)

Underwriters Laboratories (UL)

UL Standard 6	Electrical Rigid Metal Conduit - Steel
UL Standard 514B	Conduit, Tubing, and Cable Fittings
UL Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL Standard 1242	Electrical Intermediate Metal Conduit Steel
UL Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings

UL Standard 651A Type EB and A Rigid PVC Conduit and HDPE Conduit

END OF ITEM L-110

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ITEM L-115 ELECTRICAL MANHOLES AND JUNCTION STRUCTURES

DESCRIPTION

115-1.1 This item shall consist of electrical manholes and junction structures (hand holes, pull boxes, junction cans, etc.) installed per this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the Engineer. This item shall include the installation of each electrical manhole and/or junction structures with all associated excavation, backfilling, sheeting, and bracing, concrete, reinforcing steel, ladders, appurtenances, testing, dewatering and restoration of surfaces to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

115-2.1 General.

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

Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. 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.

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 any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to 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 the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

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 Electronic PDF, labeled and 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.

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 the date of 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.

115-2.2 Concrete structures. Cast-in-place concrete structures are not used.

Provide precast concrete structures where shown on the plans. Precast concrete structures shall be an approved standard design of the manufacturer. Precast units shall have mortar or bitumastic sealer placed between all joints to make them watertight. The structure shall be designed to withstand **100,000** lbs. aircraft loads, unless otherwise shown on the plans. Openings or knockouts shall be provided in the structure as detailed on the plans.

Threaded inserts and pulling eyes shall be cast in as shown.

If the Contractor chooses to propose a different structural design, signed and sealed shop drawings, design calculations, and other information requested by the Engineer shall be submitted by the Contractor to allow for a full evaluation by the Engineer. The Engineer shall review per the process defined in the General Provisions.

115-2.3 Junction Boxes. Junction boxes shall be L-867 Class 1 (non-load bearing) or L-868 Class 1 (load bearing) airport light bases that are encased in concrete. The light bases shall have a galvanized steel blank cover, gasket, and stainless steel or coated steel hardware per FAA Engineering Brief (EB) #83. Covers shall be 3/8-inch thickness for L-867 and 3/4-inch thickness for L-868.

115-2.4 Mortar. The mortar shall be composed of one part of Portland cement and two parts of mortar sand, by volume. The Portland cement shall be per the requirements in ASTM C150, Type I. The sand shall be per the requirements in ASTM C144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15% of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C6. Water shall be potable, reasonably clean, and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

115-2.5 Concrete. All concrete used in structures shall conform to the requirements of Item P-610, Structural Portland Cement Concrete.

115-2.6 Frames and Covers. The frames shall conform to one of the following requirements:

a.	ASTM A48	Gray iron castings
b.	ASTM A47	Malleable iron castings
c.	ASTM A27	Steel castings
d.	ASTM A283, Grade D	Structural steel for grates and frames
e.	ASTM A536	Ductile iron castings
f.	ASTM A897	Austempered ductile iron castings

All castings specified shall withstand a maximum tire pressure of **125** psi and maximum load of **100,000** lbs.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

Each cover shall have the word "**ELECTRIC**" or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

Each manhole shall be provided with a "**DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER**" safety warning sign as detailed in the Contract Documents and in accordance with OSHA 1910.146 (c)(2).

115-2.7 Ladders. Ladders, if specified, shall be galvanized steel or as shown on the plans.

115-2.8 Reinforcing Steel. All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A615, Grade 60.

115-2.9 Bedding/Special Backfill. Bedding or special backfill shall be as shown on the plans.

115-2.10 Flowable Backfill. Flowable material used to backfill shall conform to the requirements of Item P-153, Controlled Low Strength Material.

115-2.11 Cable Racks. Cable Racks shall be of non-conductive plastic. Cable racks shall be located as shown on the plans.

115-2.12 Plastic Conduit. Plastic conduit shall comply with Item L-110, Airport Underground Electrical Duct Banks and Conduits.

115-2.13 Conduit Terminators. Conduit terminators shall be pre-manufactured for the specific purpose and sized as required or as shown on the plans.

115-2.14 Pulling-In Irons. Pulling-in irons shall be manufactured with 7/8-inch diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, 1/2 inch diameter with an ultimate strength of 270,000 psi (1862 MPa)). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

115-2.15 Ground Rods. Ground rods shall be one piece, copper clad**.** The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 10 feet long nor less than ¾ inch in diameter.

CONSTRUCTION METHODS

115-3.1 Unclassified excavation. It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Damage to utility lines, through lack of care in excavating, shall be repaired or replaced to the satisfaction of the Engineer without additional expense to the Owner.

The Contractor shall perform excavation for structures and structure footings to the lines and grades or elevations shown on the plans or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown.

All excavation shall be unclassified and shall be considered incidental to the respective L-115 pay item of which it is a component part. Dewatering necessary for L-115 structure installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay item as a part of Item L-115. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-115 Item.

Boulders, logs, and all other objectionable material encountered in excavation shall be removed. All rock and other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped or serrated, as directed by the Engineer. All seams, crevices, disintegrated rock, and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

The Contractor shall provide all bracing, sheeting, and shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheeting, and shoring shall be included in the unit price bid for the structure.

Unless otherwise provided, bracing, sheeting, and shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb, or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

After each excavation is completed, the Contractor shall notify the Engineer. Structures shall be placed after the Engineer has approved the depth of the excavation and the suitability of the foundation material.

Prior to installation the Contractor shall provide a minimum of 12 inches of ¾” gravel or a material approved by the Engineer as a suitable base to receive the structure. The base material shall be compacted and graded level and at proper elevation to receive the structure in proper relation to the conduit grade or ground cover requirements, as indicated on the plans.

115-3.2 Concrete Structures. Concrete structures shall be built on prepared foundations conforming to the dimensions and form indicated on the plans. The concrete and construction methods shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is placed.

115-3.3 Precast Unit Installations. Precast units shall be installed plumb and true. Joints shall be made watertight by use of sealant at each tongue-and-groove joint and at roof of manhole. Excess sealant shall be removed and severe surface projections on exterior of neck shall be removed.

115-3.4 Placement and Treatment of Castings, Frames and Fittings. All castings, frames and fittings shall be placed in the positions indicated on the Plans or as directed by the Engineer and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

Field connections shall be made with bolts, unless indicated otherwise. Welding will not be permitted unless shown otherwise on the approved shop drawings and written permission is

granted by the casting manufacturer. Erection equipment shall be suitable and safe for the workman. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the Engineer and approval of the method of correction shall be obtained. Approved corrections shall be made at Contractor's expense.

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

Pulling-in irons shall be located opposite all conduit entrances into structures to provide a strong, convenient attachment for pulling-in blocks when installing cables. Pulling-in irons shall be set directly into the concrete walls of the structure.

115-3.5 Installation of Ladders. Not Used.

115-3.6 Removal of Sheeting and Bracing. In general, all sheeting and bracing used to support the sides of trenches or other open excavations shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a structure shall be withdrawn, unless otherwise directed, before more than 6 inches of material is placed above the top of the structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The Engineer may order the Contractor to delay the removal of sheeting and bracing if, in his judgment, the installed work has not attained the necessary strength to permit placing of backfill.

115-3.7 Backfilling. After a structure has been completed, the area around it shall be backfilled in horizontal layers not to exceed 6 inches in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

Backfill shall not be placed against any structure until permission is given by the Engineer. In the case of concrete, such permission shall not be given until tests made by the laboratory under supervision of the Engineer establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

Where required, the Engineer may direct the Contractor to add, at his own expense, sufficient water during compaction to assure a complete consolidation of the backfill. The Contractor shall be responsible for all damage or injury done to conduits, duct banks, structures, property, or persons due to improper placing or compacting of backfill.

115-3.8 Connection of Duct Banks. To relieve stress of joint between concrete-encased duct banks and structure walls, reinforcement rods shall be placed in the structure wall and shall be formed and tied into duct bank reinforcement at the time the duct bank is installed.

115-3.9 Grounding. A ground rod shall be installed in the floor of all concrete structures so that the top of rod extends 6 inches above the floor. The ground rod shall be installed within one foot

of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4-inch diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of one foot above the floor of the structure and separate from other cables. No. 2 American wire gauge (AWG) bare copper pigtails shall bond the grounding bus to all cable trays and other metal hardware within the concrete structure. Connections to the grounding bus shall be exothermic. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. Hardware connections may be mechanical, using a lug designed for that purpose.

115-3.10 Cleanup and Repair. After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound per MIL-P-21035. Surfaces shall be prepared, and compound applied per the manufacturer's recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

115-3.11 Restoration. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have the backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

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.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

115-3.12 Inspection. Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 25 ohms. Each ground rod shall be tested using the fall-of-potential ground impedance test per American National Standards Institute / Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

115-3.13 Manhole Elevation Adjustments. The Contractor shall adjust the tops of existing manholes in areas designated in the Contract Documents to the new elevations shown. The Contractor shall be responsible for determining the exact height adjustment required to raise the top of each manhole to the new elevations. The existing top elevation of each manhole to be adjusted shall be determined in the field and subtracted/added from the proposed top elevation.

The Contractor shall remove/extend the existing top section or ring and cover on the manhole structure or manhole access. The Contractor shall then install precast concrete sections or grade rings of the required dimensions to adjust the manhole top to the new proposed elevation or shall cut the existing manhole walls to shorten the existing structure, as required by final grades. Finally, the Contractor shall reinstall the manhole top section or ring and cover on top and check the new top elevation.

The Contractor shall construct a concrete slab around the top of adjusted structures located in graded areas that are not to be paved. The concrete slab shall conform to the dimensions shown on the plans.

115-3.14 Duct Extension to Existing Ducts. Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

METHOD OF MEASUREMENT

115-4.1 Precast Electrical manholes, junction structures or junction boxes and cans shall be measured by each unit completed in place and accepted. The following items shall be included in the price of each unit: All required excavation and dewatering; sheeting and bracing; all required backfilling with on-site materials; restoration of all surfaces and finished grading and turfing; all required connections; temporary cables and connections; and ground rod testing.

115-4.2 Provide and Install RGL Isolation Boxes and Conduits in New or Existing Concrete Hand Hole. This item shall include the installation of new PVC boxes and PVC conduit or flexible liquid tight conduit and fittings for housing all RGL circuit cables and L-823 connections within the existing structures. This item shall be measured by each unit completed in place and accepted.

115-4.3 New L-867B Junction Can with Steel Blank Cover. Installation of new L-867B junction can shall be measured by each unit completed in place and accepted. The following items shall be included in the price of each unit: All required excavation and dewatering; forms; concrete, finishing; counterpoise / grounding, connections, gaskets, covers, bolts and all required backfilling with on-site materials; restoration of all surfaces and finished grading and infield rock placement.

BASIS OF PAYMENT

115-5.1 The accepted quantity of electrical manholes and junction structures will be paid for at the Contract unit price per each, complete and in place. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials,

furnishing and installation of appurtenances and connections to duct banks and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools, and incidentals necessary to complete the structure.

Payment will be made under:

Item L-115-5.1	New Handhole, Prefabricated Concrete 4'x4'x4' with Aircraft Rated Lid, Furnished and Installed - Per Each
Item L-115-5.2	Provide and Install RGL Isolation Boxes and Conduits in New or Existing Concrete Hand Hole - Per Each
Item L-115-5.3	New L-867B Junction Can with Steel Blank Cover - Per Each

MATERIAL REQUIREMENTS

ANSI/IEEE STD 81 IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

Advisory Circular

(AC) 150/5345-7	Specifications for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program

Commercial Item Description

A-A 59544	Cable and Wire, Electrical (Power, Fixed Installation)
ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123 Steel Products	Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and

ASTM A283 Steel Plates	Standard Specification for Low and Intermediate Tensile Strength Carbon
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C206	Standard Specification for Finishing Hydrated Lime
FAA EB #83	In Pavement Light Fixture Bolts
MIL-P-21035	Paint High Zinc Dust Content, Galvanizing Repair
NFPA-70	National Electrical Code (NEC)

END OF ITEM L-115

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ITEM L-125 INSTALLATION OF AIRPORT LIGHTING SYSTEMS

DESCRIPTION

125-1.1 This item shall consist of airport lighting systems furnished and installed in accordance with this specification, the referenced specifications, and the applicable advisory circulars (ACs). The systems shall be installed at the locations and in accordance with the dimensions, design, and details shown in the plans. This item shall include the furnishing of all equipment, materials, services, and incidentals necessary to place the systems in operation as completed units to the satisfaction of the RPR.

EQUIPMENT AND MATERIALS

125-2.1 GENERAL.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified under the Airport Lighting Equipment Certification Program in accordance with AC 150/5345-53, current version. FAA certified airfield lighting shall be compatible with each other to perform in compliance with FAA criteria and the intended operation. If the Contractor provides equipment that does not performs as intended because of incompatibility with the system, the Contractor assumes all costs to correct the system for to operate properly.

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

c. All materials and equipment used shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Clearly mark each copy to identify pertinent 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 clearly made with arrows or circles (highlighting is not acceptable). The Contractor shall be responsible for delays in the project accruing directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be submitted in electronic PDF format, tabbed by specification section. The RPR reserves the right to reject any or all equipment, materials or procedures, which, in the RPR’s opinion, does not meet the system design and the standards and codes, specified herein.

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.

f. All LED light fixtures, with the exception of obstruction lighting (AC 150/5345-43) must be warranted by the manufacturer for a minimum of 4 years after date of installation inclusive of all electronics. Obstruction lighting warranty is set by the individual manufacturer.

EQUIPMENT AND MATERIALS

125-2.2 CONDUIT/DUCT. Conduit shall conform to Specification Item L-110 Airport Underground Electrical Duct Banks and Conduits.

125-2.3 CABLE AND COUNTERPOISE. Cable and Counterpoise shall conform to Item L-108 Underground Power Cable for Airports.

125-2.4 TAPE. Rubber and plastic electrical tapes shall be Scotch Electrical Tape Numbers 23 and 88 respectively, as manufactured by 3M Company or an approved equal.

125-2.5 CABLE CONNECTIONS. Cable Connections shall conform to Item L-108 Installation of Underground Cable for Airports.

125-2.6 RETROREFLECTIVE MARKERS. Retroreflective markers shall be type L-853, stake mounted and shall conform to the requirements of AC 150/5345-39.

125-2.7 RUNWAY AND TAXIWAY LIGHTS. Runway and taxiway lights shall conform to the requirements of AC 150/5345-46. Lamps shall be of size and type indicated, or as required by fixture manufacturer for each lighting fixture required under this contract. Filters shall be of colors conforming to the specification for the light concerned or to the standard referenced.

LIGHTS

Type	Class	Mode	Style	Option	Base	Filter	Transformer	Notes
L-861T(L)	2	1	N/A	4 – (Mounting Hardware)	L-867 1.5” threaded hubs	Blue LEDs & Globes	10/15W	LED 14” Height
L-861T	2	1	N/A	4 – (Mounting Hardware)	L-867 1.5” threaded hubs	Blue Globes	30/45	Quartz Halogen 14” Height
L-804(L)	1A Adjustable – Base Mounted	1	N/A	4 – (Mounting Hardware)	L-867 2” threaded hubs	Traffic Yellow LEDs	65W	LED ON/OFF Switches

125-2.8 RUNWAY AND TAXIWAY SIGNS. Runway and Taxiway Guidance Signs should conform to the requirements of AC 150/5345-44.

SIGNS

Type	Size	Style	Class	Mode	Notes
L-858Y L-858L L-858R	1	2	2	2	LED Modules as Required - Refer to Plans

125-2.9 RUNWAY END IDENTIFIER LIGHT (REIL). Not Used.

125-2.10 PRECISION APPROACH PATH INDICATOR (PAPI). Not Used.

125-2.11 CIRCUIT SELECTOR CABINET. Not Used.

125-2.12 LIGHT BASE AND TRANSFORMER HOUSINGS. Light Base and Transformer Housings should conform to the requirements of AC 150/5345-42. Light bases shall be Type L-867, Class 1A, Size B shall be provided as indicated or as required to accommodate the fixture or device installed thereon. Base plates, cover plates, and adapter plates shall be provided to accommodate various sizes of fixtures.

125-2.13 ISOLATION TRANSFORMERS. Isolation Transformers shall be Type L-830, size as required for each installation. Transformer shall conform to AC 150/5345-47.

INSTALLATION

125-3.1 INSTALLATION. The Contractor shall furnish, install, connect and test all equipment, accessories, conduit, cables, wires, buses, grounds and support items necessary to ensure a complete and operable airport lighting system as specified here and shown in the plans.

The equipment installation and mounting shall comply with the requirements of the National Electrical Code and state and local code agencies having jurisdiction.

The Contractor shall install the specified equipment in accordance with the applicable advisory circulars and the details shown on the plans.

125-3.2 TESTING. All lights shall be fully tested by continuous operation for not less than 24 hours as a completed system prior to acceptance. The test shall include operating the constant current regulator in each step not less than 10 times at the beginning and end of the 24-hour test. The fixtures shall illuminate properly during each portion of the test.

125-3.3 SHIPPING AND STORAGE. Equipment shall be shipped in suitable packing material to prevent damage during shipping. Store and maintain equipment and materials in areas protected from weather and physical damage. Any equipment and materials, in the opinion of the RPR,

damaged during construction or storage shall be replaced by the Contractor at no additional cost to the owner. Painted or galvanized surfaces that are damaged shall be repaired in accordance with the manufacturer's recommendations.

125-3.4 ELEVATED AND IN-PAVEMENT LIGHTS. Water, debris, and other foreign substances shall be removed prior to installing fixture base and light.

A jig or holding device shall be used when installing each light fixture to ensure positioning to the proper elevation, alignment, level control, and azimuth control. Light fixtures shall be oriented with the light beams parallel to the runway or taxiway centerline and facing in the required direction. The outermost edge of fixture shall be level with the surrounding pavement. Surplus sealant or flexible embedding material shall be removed. The holding device shall remain in place until sealant has reached its initial set.

METHOD OF MEASUREMENT

125-4.1 Reflective markers will be measured by the number of new stake mounted in existing asphalt, in accordance with the plans as completed units in place, ready for operation, and accepted by the RPR.

Taxiway lights will be measured by the number of each type installed as completed units in place, ready for operation, and accepted by the RPR.

Elevated Runway guard lights will be measured by the number of each type installed on L-867 base cans including concrete encasement as completed units in place, ready for operation, and accepted by the RPR.

Guidance signs and sign panels will be measured by the number of each type and size installed on new or existing sign concrete foundation including excavation required as completed units, in place, ready for operation, and accepted by the RPR.

Spare Taxiway lights with stems, frangible couplings and isolation transformers will be measured by the number of each type, as completed units provided to Airport, ready for operation, and accepted by the RPR.

New L-867B taxiway edge light bases with steel cover plates measured by the number of each including concrete encasement as completed units in place, ready for operation, and accepted by the RPR.

New size 1 sign panels installed in existing signs will be measured by the number of each type, as completed ready for operation, and accepted by the RPR.

BASIS OF PAYMENT

125-5.1 Payment will be made at the Contract unit price for each complete runway or taxiway light, guidance sign or sign panel installed by the Contractor and accepted by the RPR. This payment will 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.

Payment will be made under:

Item L-125-5.1	New L-804(L) LED Elevated RGL with On/Off Switch and Isolation Transformer on New L-867 Base Can - Per Each
Item L-125-5.2	Install Salvaged Elevated RGL and Isolation Transformer on New L-867 Base Can - Per Each
Item L-125-5.3	New L-858(L) Size 1, Style 2, 2-Module, Airfield Guidance Sign, on New Concrete Sign Base w/ Asphalt Maintenance Pad - Per Each
Item L-125-5.4	Salvaged Size 1, Style 2, 2-Module, Airfield Guidance Sign, on New Concrete Sign Base w/ Asphalt Maintenance Pad - Per Each
Item L-125-5.5	New L-858(L) Size 1, Style 2, 3-Module, Airfield Guidance Sign, on New Concrete Sign Base w/ Asphalt Maintenance Pad - Per Each
Item L-125-5.6	Salvaged Size 1, Style 2, 3-Module, Airfield Guidance Sign, on New Concrete Sign Base w/ Asphalt Maintenance Pad - Per Each
Item L-125-5.7	New L-858(L) Size 1, Style 2, 4-Module, Airfield Guidance Sign, on New Concrete Sign Base w/ Asphalt Maintenance Pad - Per Each
Item L-125-5.8	Salvaged Size 1, Style 2, 4-Module, Airfield Guidance Sign, on New Concrete Sign Base w/ Asphalt Maintenance Pad - Per Each
Item L-125-5.9	Salvaged Size 1, Style 2, 5-Module (2-Mod + 3-Mod), Airfield Guidance Sign, on New Concrete Sign Base w/ Asphalt Maintenance Pad - Per Each
Item L-125-5.10	Install New Size 1 Sign Panels in Existing Signs - Per Each
Item L-125-5.11	New Elevated L-861T(L) LED Taxiway Edge Light and Isolation Transformer on New L-867 Base Can - Per Each
Item L-125-5.12	New Elevated L-861T Quartz Taxiway Edge Light and Isolation Transformer on New L-867 Base Can - Per Each
Item L-125-5.13	New Steel Blank Cover Plate on Existing L-867B Taxiway Edge Light Base - Per Each
Item L-125-5.14	Salvaged Runway Edge Light and Isolation Transformer on Existing L-867 Base Can - Per Each
Item L-125-5.15	New L-853 Retroreflective Taxiway Edge Reflector - Blue, Stake Mounted - Per Each

Item L-125-5.16 New L-861T(L) LED Taxiway Edge Light w/ Stems, Frangible Couplings and Isolation Transformers (Spares) - Per Each

REFERENCES

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

Advisory Circulars (AC)

AC 150/5340-18	Standards for Airport Sign Systems
AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-5	Circuit Selector Switch
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-28	Precision Approach Path Indicator (PAPI) Systems
AC 150/5345-39	Specification for L-853, Runway and Taxiway Retroreflective Markers
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5345-44	Specification for Runway and Taxiway Signs
AC 150/5345-46	Specification for Runway and Taxiway Light Fixtures
AC 150/5345-47	Specification for Series-to-Series Isolation Transformers for Airport Lighting Systems
AC 150/5345-51	Specification for Discharge-Type Flashing Light Equipment
AC 150/5345-53	Airport Lighting Equipment Certification Program

Engineering Brief (EB)

EB No. 67	Light Sources Other than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures

END OF ITEM L-125

SECTION III-E

GEOTECHNICAL INVESTIGATION REPORT

DESCRIPTION

1.1 GENERAL. The Geotechnical Investigation Report and Laboratory Analysis for this project was prepared by Hoque & Associates, Inc., dated October 20, 2023. The report contains existing soil condition summaries, laboratory test summaries along with graphical bore logs, subgrade treatment recommendations, and new pavement design options.

This report provided a pre-design analysis on existing pavement thickness and subsurface soil conditions, and this information is shown on the plans. However, this information shall not be used for contractual purposes as a warranty of interpreted subsurface conditions such as those indicated by borings, corings, cross sections or discussion of the subsurface conditions contained in the reports. The Geotechnical services were provided, the findings obtained and recommendations were prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

HOQUE & ASSOCIATES

Consulting Geotechnical, Materials and Environmental Engineers

Geotechnical Exploration Report and Pavement Recommendation

For

Deer Valley Airport Taxiway C Connectors at 1510 West Deer Valley Road

Phoenix, Arizona

COP# AV31000096

Prepared For:

Mr. Chintan S. Jhaveri, P.E.
Trace Consulting, LLC.
1201 East Jefferson Street, Suite 3
Phoenix, Arizona 85014

Prepared by:

Hoque & Associates, Inc.
4325 South 34th Street
Phoenix, Arizona 85040
Phone: (480) 921-1368

Project Number: 22070

October 20, 2023

HOQUE & ASSOCIATES

Consulting Geotechnical, Materials and Environmental Engineers

October 20, 2023

Mr. Chintan S. Jhaveri, P.E.
Trace Consulting, LLC.
1201 East Jefferson Street, Suite 3
Phoenix, Arizona 85014

Subject: COP Project # AV31000096
Geotechnical Exploration Report for Deer Valley Airport Taxiway C Connectors Located at 1510 West Deer Valley Road, Phoenix, Arizona

HA Project No. 22070

Dear Mr. Jhaveri:

Hoque & Associates, Inc. (HA) has completed a geotechnical exploration program for the proposed Taxiway C Connectors at Deer Valley Airport. HA was retained by Trace Consulting, LLC to perform a geotechnical exploration and engineering services to complete field borings, laboratory tests and recommend the taxiway C connectors pavement thickness. This report provides this information.

The subject site currently contains multiple connectors between Runway 7R/25L and taxiway C. The Deer Valley Airport has decided to demolish some of the taxiways including C5, C6, C7, C8, and C10 and modify C9. After demolition, new right angle taxiway connectors naming C4, C7 and C10 will be constructed. New acute angle connectors naming C5, C6, and C9 will be constructed while C9 will be renamed as C8. These reconstruction and upgrade taxiway C connectors between Taxiways C and Runway 7R25L, will enhance airplane mobility.

The scope of HA's services for this project included geotechnical exploration, laboratory testing, engineering analysis, and recommendations for the design parameters and construction of the proposed features. This report includes an introduction, scope of work, geotechnical field exploration, laboratory tests, data analysis, pavement recommendations, and recommendations for earthwork.

HA appreciates the opportunity to work on this project. If you have any questions, or if we can be of any further assistance, please contact us at (480) 921-1368.

Sincerely,
Hoque & Associates, Inc.

Dawson Gardiner, E.I.T.
Geotechnical Engineering Staff

Enamul Hoque, P.E.
President

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Appendices

1.0 INTRODUCTION

1.1 General

Hoque & Associates, Inc. (HA) has completed a geotechnical exploration program and pavement design services for the reconstruction and upgrading of some of the taxiway C connectors. These connectors are at angles and acute angles. Some of them including C5, C6, C7, C8 and C10 will be demolished to have new connectors. The project also includes modifications of existing connector C9 and new design of right-angle connectors C4, C7 and C10. Design also called for new acute angle connectors C5, C6 and C9. The proposed taxiway connectors will come into the active area of the airport from the runway 7R/25L to south to connect to Taxiway C3 Taxiway alignment. These taxiway connectors will facilitate movement of planes between hangars, runways, and existing taxiways.

Figure 1: Project Site

1.2 Purpose and Scope of Work

The purpose of this geotechnical exploration was to characterize the site surface and subsurface conditions and provide geotechnical data for the design and construction of the proposed developments. To fulfill this purpose, HA has completed the following scope of work:

- Review of project background information provided by Trace Consulting, LLC (Trace);
- A site reconnaissance to document the site conditions that could influence the geotechnical field work, construction, and performance of the proposed taxiway;
- Drilling of six test borings at the site utilizing a truck mounted auger rig with eight-inch diameter continuous flight hollow stem augers. The borings were extended to 4.5 to 10 feet below the surrounding grade;

- Laboratory tests consisting of particle size analysis, Atterberg limits, Proctor compaction; and CBR testing;
- Completed discussions on test results and engineering analysis to develop recommendations for airport pavement section thickness, and provided recommendations for design parameters and earthwork construction for the proposed developments; and,
- Preparation of this geotechnical exploration report.

1.3 Project Background

Project information was gathered from Trace via telephone conversations and electronic transformation. HA was provided with a site plan depicting existing site features and proposed locations of soil borings. Based on the information provided by Trace, HA understands that Deer Valley Airport wishes to expand and modify the existing the airport runway infrastructure at this site to enable movement of airplanes. This will require the construction and modification of an existing taxiway C connectors suitable for proposed airport loads and subsequent adjustment and modification of site grading and drainage.

Trace provided to HA a fleet mix of aircrafts used by this airport to determine the loads imparted by the plans that utilize the airport. The fleet mix comes from a Speedie & Associates DVT-Run Up Aprons Report that was dated April 26, 2017. This fleet mix was utilized for the Taxiway C analysis per the direction of the City of Phoenix. Annual growth rates were taken from the City of Phoenix Aviation Department Report “Aviation Activity Forecast – Master Plan Update” report.

This fleet mix includes the plans that will use the taxiway and the number of annual departures for each airplane type. This mix includes a growth factor for projected increases in the number of annual operations for each of the plane types utilizing the airport over the next 20-year design life of the taxiway pavement. The fleet mix is provided in Table 1 below.

Table 1: Fleet Mix

Aircraft	Maximum Take-off Weight (lbs)	Yearly Operations	% Annual Growth
Cessna 172/180 (SEP)	2,450	29,490	2.5
Piper Archer (SEP)	2,550	29,490	2.5
Cessna 421 (MEP)	6,840	4,042	2.5
Beech King Air 200 (MEP)	12,500	4,042	2.5
Eclipse 500	5,950	126	2.5
Cessna 550 Citation Bravo	14,800	126	2.5
Learjet 45 Twin Jet	21,500	126	2.5
Cessna Citation 10 Twin Jet	36,600	126	2.5
Embraer 175	82,673	126	2.5
Learjet 34A Twin Jet	18,000	126	2.5
Gulfstream IV Twin Jet	73,200	126	2.5

The project site is located within the operational area of the Deer Valley Airport Runways and is secured by the operations department. Any access to the site requires special security clearance and coordination with numerous personnel. HA accessed the site overnight while the runway was closed. The corresponding table was input into the FAARFIELD program and can be seen in Appendix E.

2.0 GEOTECHNICAL EXPLORATION

2.1 Surface Conditions

HA visited the site during drilling operations to monitor the drilling and collect soil samples. HA coordinated with Trace, Arizona Blue Stake, and Deer Valley Airport to mark boring locations, locate existing utilities, or underground features, review the access for the drill rig and support vehicles during field explorations, and complete subsurface exploration. During site visits, HA observed and documented the site conditions. The site reconnaissance included observation of existing site features and structures which would influence the design and construction of the proposed taxiway at the site. Brief descriptions of the site conditions are presented below.

At the time of our site visit the runway site was developed. The site was developed with a fully paved runway (Runway 7R/25L), taxiway (Taxiway C), and taxiway C connectors on the southern portion of the site that run parallel to runway that runs along the southern boundary of the site. These connectors are on north side of taxiway C and taxiway C also is located north of taxiway D. The area between the runway 7R/25L and taxiway C is mostly undeveloped open areas with some rock mulch for dust and weed control. However, the area also has medium dense growth of vegetation.

The infill area that will house the proposed taxiway is graded and sloped away from existing runway and taxiway features as a storm water drainage control measure. As such, part of this area is below the runway and taxiway grade. The top of the infill area has received three to five inches of rock mulch. The gravel mulch consists of 3 inch minus crushed rock pieces, and they had been compacted to provide a firm, smooth, undulating, yet competent surface for the nose gears of potentially skidding aircrafts. This rock mulch is providing dust control, and the sizes are kept in uniform consistencies so that they do not create any flying debris during aircraft movements.

2.2 Field Soil Exploration

HA's field exploration included drilling of six soil test borings. The soil borings were completed to provide design information for the proposed pavement based on expected airplane loads.

A total of six (6) test borings were completed extending to depths of 4.5 to 10 feet. The locations of these test borings and detailed descriptions of the materials encountered at the boring locations are provided in Appendix C. The test borings were completed on March 30, 2023. HA completed soil test borings utilizing a Mobile CME-55 drill rig fitted with an 8-inch outside diameter continuous flight hollow-stem auger. The drilling operation was monitored and documented by experienced personnel from HA. HA

collected representative bulk soil samples at the selected vertical spacing and classified the soils in the field utilizing the Unified Soil Classification System (USCS).

Split spoon samples were taken from borings B-1, B-3, and B-4. The bulk samples were collected from the full extent of the boring to collect sufficient sample to perform laboratory tests. Standard penetration testing, in conformance with ASTM D 1586, was performed in the field during drilling utilizing a two-inch diameter split spoon sampler driven 18 inches with a 140-pound hammer falling freely for 30 inches. The resistance or number of blows required to drive the last 12 inches of the split spoon sampler was recorded as N-values. For further information regarding soil classification and soil investigation methods, refer to Appendix B. A ring sample was collected from each boring at 2.5 feet below surface grade.

After the completion of the drilling, the boreholes were backfilled with site material. This material was compacted. All collected soil samples were secured and transported to HA's laboratory for testing. No ground water table was encountered.

2.3 Subsurface Conditions

Detailed information regarding the subsurface conditions encountered at each boring location is provided in the boring logs contained in Appendix C. A total of four test borings were completed extending to a maximum depth of 10 feet. Brief descriptions of subsurface conditions as depicted within the borings are described below.

The drilling at boring location B-1 consisted of brown, clayey SAND (SC) with clay and gravel. This material was moist near optimum. The boring was terminated at a depth of 10 feet. Bulk samples were taken every five vertical feet.

The drilling at boring location B-2 consisted of brown, moist gravelly SAND (SC) with clay. The boring was terminated at a depth of 4.5 feet due to auger refusal. As a result, the rig relocated 5 feet south of B-2 to attempt boring B-2a. This boring encountered brown, moist, clayey SAND with gravel and terminated at a depth of 5 feet due to auger refusal.

The drilling at boring location B-3 and B-4 consisted of light brown, gravel, and SAND with some clay. This material was damp. These borings were terminated at a depth of three feet after auger refusal. Bulk samples were not able to be sampled due to the excessive amount of rock and cobble sized particles as well as auger refusal.

The drilling at boring location B-5 consisted of brown, clayey SAND (SC) with gravel. This material was moist. The boring was terminated at a depth of 5 feet. Bulk samples were taken at five feet. The boring remained open without collapse for the full depth of the boring.

Boring B-6 encountered brown sandy GRAVEL (GC) with some clay. The boring was terminated at six feet depth on auger refusal.

Saturated conditions and/or a groundwater table were not encountered during the soil exploration.

Upon completion of drilling, all the boreholes were backfilled with site material. This material was compacted.

2.4 Laboratory and Field Tests

The laboratory testing program was designed to evaluate the physical properties of the subsurface soils. The results of the laboratory tests were utilized in the engineering analysis to estimate design parameters for the proposed taxiway construction. Laboratory test results were also utilized for earthwork construction recommendations.

The following laboratory tests were performed to characterize the subsurface soils encountered at the project site:

- Four Gradation (ASTM D 422);
- Four Atterberg Limits (ASTM D 4318);
- One Proctor Compaction (ASTM D 698); and,
- One California Bearing Ratio (CBR) (ASTM D1883) tests.

Gradation and Atterberg limits tests were conducted to classify the soil and estimate other physical properties by correlation such as strength, compressibility, and potential to change in volume due to exposure to environment especially excess water. Other tests were conducted to estimate soil resistance to traffic loading. All the tests were performed in accordance with ASTM, AASHTO, or other applicable standards. Detailed laboratory test results are contained in Appendix D with some of the select soil properties provided in the following table:

Table 2: Soil Classification

Boring Number	Depth (feet)	Fines Content (% Passing #200 Sieve)	Liquid Limit	Plasticity Index	Soil Classification (USCS)	Correlated R-Values
B-1	0-5	21.7	25	8	SC (w/gravel)	55
B-2	0-5	20.4	31	9	SC (w/gravel)	54
B-5	0-5	39.1	28	8	SC (w/gravel)	43
B-6	0-5	12.4	29	12	GC	53

Gradations, Atterberg limits, and CBR tests (performed by TERRACON) were performed on bulk samples collected from the borings to evaluate the different types of soils encountered at the site. The results of the laboratory tests indicated that the soils collected during the geotechnical exploration are mostly SAND and GRAVEL with clay and medium plasticity within the upper 0 to 10 feet. For these soils, fines contents are found to vary from 12 to 40 and plasticity indices vary from 8 to 12. While high value of plasticity index at boring B-6 indicates the presence of problematic soils at the site, amount of gravel will counteract the adverse impact.

The standard Proctor compaction and CBR tests were completed on samples from both borings completed at the site. The standard Proctor test indicated a maximum dry density of 137.7 pounds per cubic foot (pcf) and an optimum moisture content of 6.2 percent.

Resistance R-value test was not performed, but correlated R-values from the Arizona Department of Transportation Pavement Design Manual was reviewed and R-values are provided in the table above. R-values varied from 43 to 55 with an average value of 51.

CBR tests exhibited value of 21.6.

Resistivity and pH testing was completed in the laboratory. These values are 1,924 Ohm-cm and 8.4 respectively. Field sampling of the material showed the soil collected to be highly hydrochloric acid reactive in all locations, denoting corrosion potential.

3.0 PAVEMENT ANALYSIS

HA performed analysis for the proposed pavements at the site based on new traffic loads (airplane type, weight, number). HA utilized the FAA program FAARFIELD for flexible pavement designs.

3.1 Pavement Design and Construction

The design of airport pavement sections involves the consideration of the following items:

- Pavement performance under the loads imposed by aircrafts;
- Year-round all-weather support to operations of aircraft and other vehicular traffic by providing smooth, firm, stable surface free of dust or foreign particles that could be picked up by propeller wash or jet blast;
- Firm and unyielding subgrade soil that would provide support to the imposed loads under adverse weather condition and would not impose differential movement of soils under changing environment or under deleterious conditions;
- Materials of construction including Portland cement concrete pavement, asphalt concrete pavements, and any other courses that may be included. Generally economy, life cycle cost analysis, availability of materials and ease of construction are guiding factors to choose the pavement type;
- Drainage and Environmental consideration that could affect the performance of subgrade soils, unbound granular materials by reducing their strength or by pumping of concrete pavement with subsequent faulting, cracking, and general deterioration of pavements; and pumping of fines from subgrade to the granular base course resulting in loss of support; and
- Life cycle cost analysis including construction cost, maintenance costs, and rehabilitation costs.

The design of the taxiway pavement started with data collection. The data collection included aircraft volume and mix, design aircraft determination, and determination of equivalent design aircrafts. Based upon the Speedie and Associates report and telephone conversations with Trace, HA utilized a fleet mix with the number of annual departures for each airplane type and included projected increases in the number of annual operations for each of the plane types utilizing the airport over the next 20-year design life of the taxiway pavement. Information for FAARFIELD was compiled utilizing these sources. As FAARFIELD does not have a designation for all airplanes, generic terms of equivalent planes were utilized with specific airplanes from the fleet mix listed in parenthesis.

According to these sources, the aircraft with the heaviest takeoff weight is classified as a Regional Jet-700 (Embraer 175) with an 82,673-pound gross weight and 126 annual departures. The highest volume of takeoffs is completed by Single Wheel Aircraft (Cessna 172/180) and Skyhawk-172 (Piper Archer) aircraft with gross weights at 2,450 and 2,550 pounds. The annual departures for such planes were both 29,490. The full fleet mix is provided in Table 1.

Three CBR tests were performed on samples collected from a depth of zero to five feet from three borings. HA also estimated an R-value based on correlation of R-values with soil plasticity index and percent fines as per ADOT. The correlated R-values were determined to be 32. A design R-value of 25 was conservatively utilized to determine modulus of resilience (M_r) for flexible pavement. The flexible pavement design utilizes a value of M_r for thickness of the pavement sections.

The modulus of resilience was determined utilizing the R-values from the Arizona Department of Transportation Material Preliminary Engineering and Design Manual (Table 202.02 - 3).

$$M_r = 1{,}000 + 555*\text{R-value}$$

Resilient modulus determined was 28,440 psi.

A value of California Bearing Ratio (CBR) 12.51 was determined utilizing the following equation:

$$M_r = 1{,}500*\text{CBR}$$

A resilient modulus value was determined to be 32,400.

Laboratory testing resulted in a CBR of 21.6. A conservative value of 21.0 was utilized for further design analysis.

The asphalt concrete pavement design in the taxiway utilized the FAA program design guidelines for flexible pavements. Airport Pavement design method provided in Federal Aviation Administration's Advisory Circular "Airport Pavement Design and Evaluation" (AC No. 150/5320-6D) was utilized for pavement design thickness. Design calculations including construction recommendations are provided below.

Based on available data and on the analysis, the following pavement section has been determined for the flexible pavement layer system.

Table 3: Flexible Pavement Section

Section No.	Surface Layer (in.) P401/P403 HMA Surface	Aggregate Base Course (in.) P-209 Crushed Aggregate	Total Thickness (in.)
1	4.0	6.0	10.0

Again, the pavement layer system should be chosen based on factors discussed earlier.

The above analyses assumes that at least twelve (12) inches of the native subgrade soils should be recompacted at or above 95 percent of its maximum dry density in relation to its modified Proctor compaction test (ASTM D 1557) placed within 3 percent of the optimum moisture content. Soils should be tested for plasticity index and CBR during construction. Plasticity index more than 15 or CBR less than 12 within the upper 12 inches of soil should be remedied by mixing (or replacing) the native soil with low plasticity native materials or imports.

Soils can be stabilized/modified during construction with chemicals such as lime to reduce or eliminate possible pumping. Lime treated soils may have to be cured for one to two weeks to achieve proper firmness before placement of ABC.

The P-209 base layer should achieve **100 percent of its maximum dry density in relation to its modified Proctor compaction (ASTM D 1557) test.** In addition, the surface of the pavement base consisting of P-209 material and prepared native subgrade surfaces should have a minimum of one percent positive slope to route any run-off water or infiltrated water away from the subgrade.

Aggregate base course and asphalt concrete should meet the requirements of FAA specifications or the specifications of the applicable local authority.

HA recommends that the following conditions be implemented to enhance the performance of the pavements by minimizing the infiltration of water into the pavement base:

- Provide a minimum of one percent, preferably two percent, surface grade.
- Provide drainage for any water trapped in the aggregate base course.

Shoulders shall be composed of a minimum of 8 inches of soil cement material or 12 inches of lime stabilized material. This subgrade soil beneath the stabilized soil shall have a minimum thickness of twelve (12) inches. This subgrade should be recompacted at or slightly above 90 percent of its maximum dry density in relation to its modified Proctor compaction test (ASTM D 1557) placed 3 percent points above its optimum moisture content.

The taxiway should have sufficient grade to divert runoff water out of the pavement structure. The subgrade of the taxiway should also be graded to route any infiltrating water away from the taxiway pavement.

HA recommends that the following conditions be implemented to enhance the performance of the shoulder by minimizing the infiltration of water into the pavement base:

- Provide a minimum of 1.5 percent to a maximum of 5 percent surface grade.
- Provide drainage for any trapped water.

Shoulder widths and lengths shall meet the requirements of FAA specifications.

At the time of construction, mix designs shall be performed to establish the required minimum lime content to stabilize the soil should lime stabilization be utilized at taxiway shoulders.

3.2 Surface and Subsurface Drainage

Moisture that infiltrates into pavement subgrade could adversely affect these features. Therefore, HA recommends that positive drainage be provided in the final design. The maintenance of storm water and subsurface drainage systems should be done during the entire life of the structures. Surface and subsurface drainage of water into the subsoil should be prevented. The design should divert water away from where it could infiltrate into the subsoil. All retention basins should be located away from pavement or other structures.

4.0 EARTHWORK CONSTRUCTION AND ENGINEERED FILL

The site of the proposed taxiway includes required grading for the maneuver of the larger size airplanes. During the grading of the site, it is possible that some localized spots on the subgrades could be disturbed. Also, the existing site may have disturbed areas due to past work related to control of storm drainage and utilities construction. After achieving the proposed grade, all disturbed subgrade areas should be proof rolled to delineate any soft or uncompacted areas. In addition, any disturbed or loose areas at the proposed grade should be backfilled and compacted. Thus, all excavations/pits created during excavation and grading should be backfilled with compacted fill as recommended herein.

4.1 On-Site Materials and Import Materials

On-site materials removed from excavation, grading, trenches, and/or foundations will be suitable for use as backfill provided they meet the compaction and moisture condition requirements. On-site materials to be used as fill shall be clean and free of deleterious matters. Soils from the excavation or grading should be suitable as fill soil provided they are free of particles of size larger than six inches in any dimension.

If necessary, import soils may also be utilized as fill. The swell potential of the compacted import soil should be less than 1.5 percent when tested under a vertical pressure of 100 psf in accordance with ASTM D4546 procedures.

On-site gravel mulch materials could be separated and reused as gravel mulch on the sides of the proposed taxiway. Excess gravel mulch may be utilized in other areas for use or removed from the site. Alternately, these excess gravel mulch may be mixed with fill materials and recompacted to the requirements of the specifications. Nesting of the gravel mulch in fill areas should not be allowed.

4.2 Fill Placement

HA recommends that on site soils beneath the pavements be scarified and moisture conditioned to a minimum depth of 8 inches and be compacted to a minimum of 95 percent of its maximum dry density in relation to its standard Proctor compaction test placed at or within three percent above optimum moisture content. Due to the presence of large cobbles within the upper depths of the site, disking of the site may be necessary as part of soil conditioning.

The fill surface should be adequately maintained during construction in order to achieve an acceptable compaction and interlift bonding. The surface should be sloped properly to prevent ponding and provide drainage of runoff water. If precipitation is

anticipated, HA recommends that the fill surface be made smooth by rolling with a smooth drum roller.

4.3 Lime Modification/Stabilization

The pavement construction within the taxiway area may encounter localized soft clay soil with possible pumping phenomenon which can be resolved utilizing lime. Lime can modify almost all fine-grained soils, but the most dramatic improvement occurs in clay soils of moderate to high plasticity (plasticity index of 12 and higher) provided the lime treated material is allowed the proper curing length as noted in previous sections. Lime is an excellent choice for short-term modification of soil producing the following benefits:

- Plasticity reduction
- Reduction in moisture-holding capacity (drying)
- Swell reduction
- Improved stability
- The ability to construct a solid working platform.

4.4 Trenching, Pipe Bedding, and Backfilling

HA recommends that pipe trenches be excavated to the required depth. Trench excavation should be of sufficient width to provide working space at both sides of the trench and around the installed pipes as required for joining, backfilling, and compacting. Before backfilling, the trench bottom should be inspected for loose materials and for competent subgrade conditions by the geotechnical engineer or his/her representative. In areas where soft, unstable materials are encountered upon which cohesionless bedding materials are to be placed, remove unstable materials, and replace them with compacted materials approved by the geotechnical engineer. The removal should extend to suitable materials.

Based on the mechanics of load transfer in the circular or elliptical pipe, it is important to note that good lateral distribution of the upward reaction be considered. This is most readily achieved by pre-shaping bedding material by means of a template (or by other means) to fit the contour of the conduit. In general, the width of the pre-shaped cut may range from 0.5 to 0.6 times the diameter of the conduit with a height of 6 to 12 inches. The spaces adjacent to and under the conduit should be filled with granular materials and thoroughly tamped on each side in six-inch lifts for the full length of the pipes.

The practice of backfilling around conduits influences the development of active lateral earth pressure on the sides of pipes and hence influences the supporting reaction. HA recommends that backfill should continue on both sides of the pipes simultaneously.

Backfill materials surrounding the pipes should be placed and compacted in such a way that the elevations on two sides are even to ensure that the pipes are not displaced. The backfill within the spring line of the pipe especially below the sidewalls of the pipes may be placed and compacted by hand. Backfill over the pipe extending to 12 inches above the pipes should be placed and compacted carefully utilizing hand devices such as power tampers so that the pipes are not stressed. All pipeline backfills should be placed horizontally and compacted to its 95 percent relative compaction of ASTM D 698 with percent of density compensated for rock content larger than No. 4 Sieve size. At least one density test should be performed per 650 lineal feet of trench backfill per lift or layer of backfill.

4.5 Corrosion

Various metals and other materials corrode when placed on or in contact with soils. Some materials corrode more rapidly when in contact with certain types of soils than when in contact with others. Corrosion is a physical-biochemical process that converts metals into ions. For corrosion to take place, soil moisture is needed to form solutions of soluble salts. In addition, other factors such as pH, oxygen concentration (aeration), anaerobic conditions, site drainage, stray current created by different materials such as lenticularness of natural soils or housing pipes in natural medium, and activities of organisms capable of causing oxidation-reduction reaction also affect corrosion potential. Corrosion evaluation is commonly based on resistance of soil to the flow of electrical current (minimum resistivity), total acidity, soil drainage, soil texture, and some other properties of soils such as sulfate content, redox potential, chloride content.

No sulfates or soluble salts testing was completed as this soil is mostly granular with low plasticity fines. HA trusts that the corrosion will be at a minimum.

4.6 Inspections and Quality Control Testing

A geotechnical engineer should verify the nature and integrity of the subsurface soils and should inspect all subgrade excavations.

If the subgrade is disturbed or saturated, the disturbed or saturated materials should be recompacted or removed and replaced with suitable fill materials.

HA recommends that site preparation, subgrade preparation, backfill placement, re-compaction, and pavement subgrade are observed and/or tested by a qualified and experienced representative of a geotechnical engineer. This representative should at least observe and document the following:

- All deleterious objects are removed from the pavement areas;
- Subgrades are compacted, firm, and do not contain deleterious objects;

- All compaction and moisture contents of backfill soils meet the specified minimum values;
- Performance of on-site density testing in engineered fill or ABC at a required frequency;
- Preparation of a final report documenting all on-site activities, test results, and conclusions.

The prepared fill, subgrade, and/or trenches should not be exposed to the environment as this can affect the moisture content and density of the fill.

5.0 CONSTRUCTION CONSIDERATIONS

Based on the type of materials encountered at the site and the site geology, excavation for the construction of the proposed acute angle taxiway will be completed utilizing conventional construction equipment.

HA recommends that all excavation slopes in undisturbed soil should be maintained at 1.5:1 (horizontal to vertical) or flatter for the sandy clay soils. Slopes may have to be flattened to 2:1 or flatter in disturbed soil. If an excavation remains open for long time, to avoid raveling and spall off or localized caving, HA recommends that all cut slopes be stabilized with an application of shotcrete, gunite, or other polymer-based spray. If excavations are required to be steeper than the recommended slope, HA recommends that a shoring system be designed and installed at the site. Earth pressure parameters for a shoring design will be provided if requested. The shoring system may also have to be designed for vehicular traffic and highway loadings located within the vicinity of work.

6.0 LIMITATIONS

Due to the inherent natural variations of the soil stratification and the nature of geotechnical exploration, there is always a possibility that soil conditions between two borings may be different from those encountered at the boring locations. Therefore, HA should observe and document the construction to verify that the site conditions are as we anticipated during the preparation of this report, and to modify our recommendations to include the changed conditions, if encountered.

The practice of geotechnical engineering is such that the risks involved in building an efficient, functional and economical structure cannot be assessed with confidence until construction begins. Therefore, we recommend that our input is sought during design and a competent engineer makes engineering observations during the construction.

This report is not intended for use as a bid document. We provided some comments and discussed some construction techniques or procedures for the designer's guideline. HA's intentions are not to develop specifications. Therefore, this report should not be interpreted to dictate construction procedures or to relieve the contractor of his responsibility for construction.

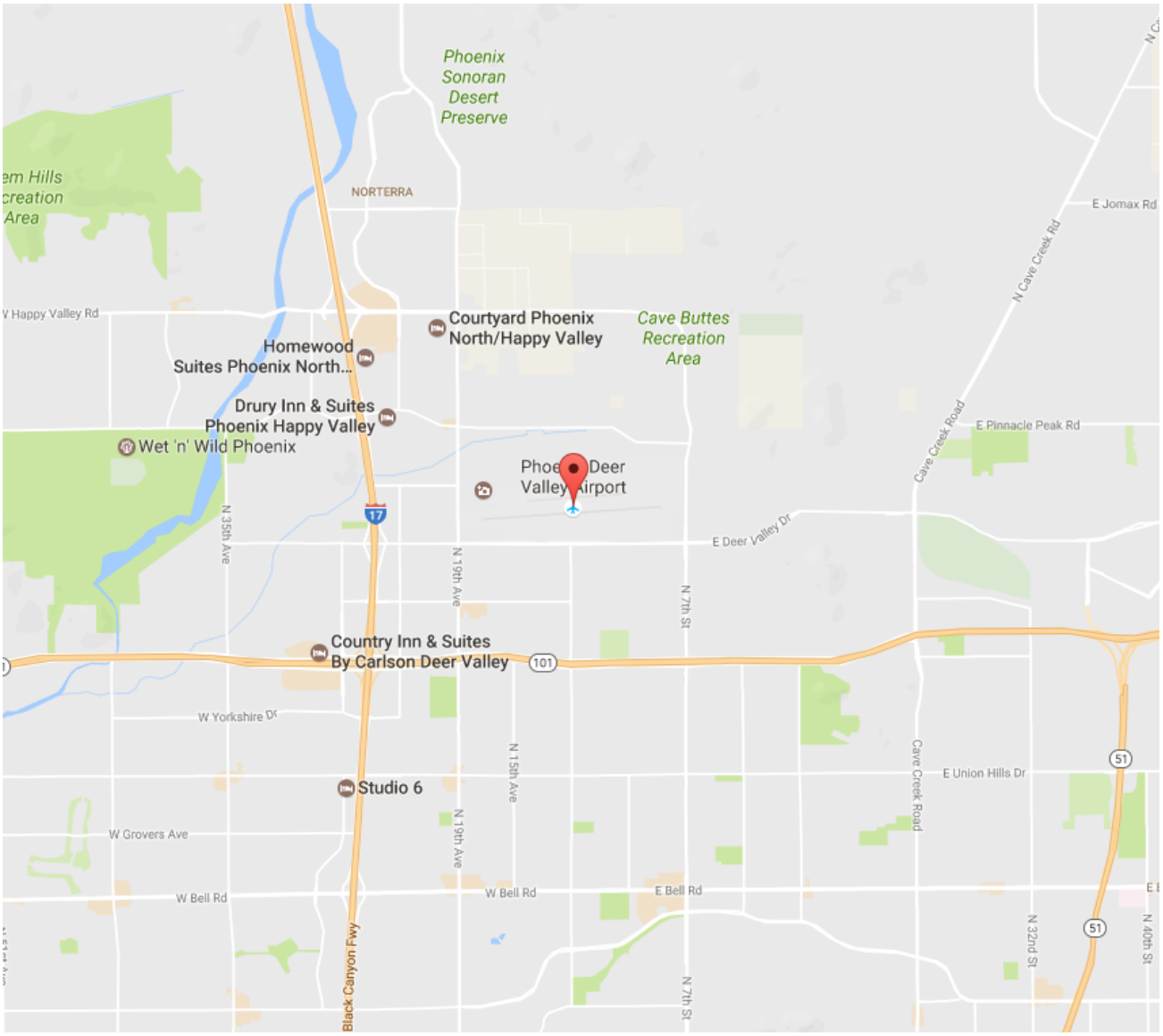
Any pavements built on soil as a subgrade are subject to risks that cannot be entirely calculated or eliminated. Detrimental hazards such as settlement, concentrated drainage, fatigue, hydro-compaction, and expansive or collapsible soil movements due to unidentified geologic conditions are not uncommon. The geotechnical exploration performed with limited boreholes, limited laboratory tests, and extending to limited depths may not delineate these hazards. The geotechnical borings and laboratory tests only can identify the risks delineated at those points. However, risks from these hazards can be reduced by employing appropriate design professionals, qualified contractors, and proper maintenance.

HA would also like to disclose that our recommendations are valid for this proposed development at the issuance date of this report. Changes in the site by human activities, changes in codes due to legislative action, or broadening of knowledge may affect the conclusions and recommendations. Accordingly, these findings may be invalidated.

Appendices

Appendix A: Site Location Map
Appendix B: Soil Classification and Soil Investigation Methods
Appendix C: Boring Locations Diagram and Boring Logs
Appendix D: Laboratory Test Results
Appendix E: FAARFIELD – Airport Pavement Design

Appendix A: Site Location Map



N

Not to Scale

SITE LOCATION MAP
Deer Valley Airport
Taxiway B3 Relocation
1510 West Deer Valley Road
Phoenix, Arizona
HA Project # 16105

Hoque & Associates, Inc.
Geotechnical, Materials, and Environmental Engineers
4325 South 34th Street
Phoenix, Arizona 85040
Tel: (480) 921-1368 Fax: (480) 921-0194
www.hoqueandassociates.com

Appendix B: Soil Classification and Soil Investigation Methods

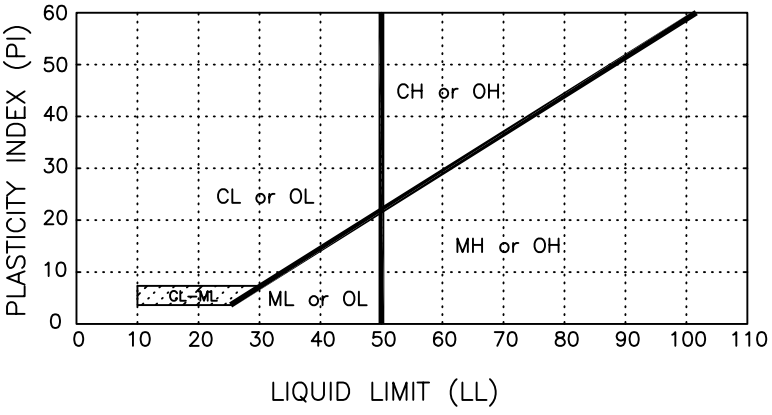
UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified by the United Soil Classification System (USCS) on the boring logs presented in this report. Grain size analysis and Atterberg limits tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see "The Unified Soil Classification System" Corps of Engineers, US Army Technical Memorandum No. 3–357 (Revised April 1960) or ASTM Designation: D2487–66T.

MAJOR DIVISIONS				GROUP SYMBOL	TYPICAL NAMES
COARSE – GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)		GW	Well graded gravels, gravel–sand mixtures, or sand–gravel–cobble mixtures.
				GP	Poorly graded gravels, gravel–sand mixtures, or sand–gravel–cobble mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below the "A" line & hatched zone on plasticity chart	GM	Silty gravels, gravel–sand–silt mixtures.
			Limits plot above the "A" line & hatched zone on plasticity chart	GC	Clayey gravels, gravel–sand–clay mixtures.
	SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 sieve)		SW	Well graded sands, gravelly sands.
				SP	Poorly graded sands, gravelly sands.
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below the "A" line & hatched zone on plasticity chart	SM	Silty sands, sand–silt mixtures.
			Limits plot above the "A" line & hatched zone on plasticity chart	SC	Clayey sands, sand–clay mixtures.
FINE – GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS (Limits Plot Below "A" Line & hatched Zone on Plasticity Chart)	SILTS OF LOW PLASTICITY (Liquid Limit Less Than 50)		ML	Inorganic silts, non–plastic or slightly plastic.
		SILTS OF HIGH PLASTICITY (Liquid Limit More Than 50)		MH	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts.
	CLAYS (Limits Plot Above "A" Line & hatched Zone on Plasticity Chart)	CLAYS OF LOW PLASTICITY (Liquid Limit Less Than 50)		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		CLAYS OF HIGH PLASTICITY (Liquid Limit More Than 50)		CH	Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity.

NOTE:
Coarse grained soils with between 5% & 12% passing the No. 200 sieve and fine grained soils with Atterberg limits plotting in the hatched zone on the plasticity chart shall have dual symbol. In Arizona, local streams contain sand, gravel & cobble type material, which are locally known as SGC or riverrun material. The USCS is not used to divide and symbolize this material.

PLASTICITY CHART



DEFINITIONS OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
Cobbles	Above 3 in.
Gravel	3 in. to No. 4 sieve
Coarse gravel	3 in. to 3/4 in.
Fine gravel	3/4 in. to No. 4 sieve
Sand	No. 4 to No. 200
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Fines (silt & clay)	Below No. 200 sieve
Clay	Smaller than 2 microns
Colloid	Smaller than 5 microns

Appendix C: Boring Locations Diagram and Boring Logs

NOTE: All relative and apparent locations of features including right angles and boundaries are approximate

Legend

⊗ - Approximate Boring Location

BORING LOCATION DIAGRAM

City of Phoenix
Deer Valley Airport
Phoenix, Arizona
HA Project # 22070

HOQUE & ASSOCIATES, INC.

4325 South 34th Street
Phoenix, Arizona 85040
Tel: (480) 921-1368 Cell: (602) 595-2460
dgardiner@hoqueandassociates.com
www.hoqueandassociates.com

BORING LOG

BORING NO. B-1

File: 22070 - Deer Valley Taxiway C Date Printed: 8/22/2023

PROJECT: Deer Valley Taxiway C Connectors **PROJECT NO.:** 22070
CLIENT: Trace Consulting **DATE:** 3/30/2023
LOCATION: 702 W Deer Valley Road, Phoenix, AZ 85027 **ELEVATION:**
DRILLER: Wildcat Drilling | Mark/Quentin **LOGGED BY:** Dawson G.
DRILLING METHOD: CME75
DEPTH TO - WATER> INITIAL: **AFTER 24 HOURS:**

DEPTH (feet)	Bulk	Samplers	Soil Type	USCS	Description
0			SC		Dark brown, damp to moist conditions, low PI, sand with clay and coarse aggregates.
2.5					
5					
7.5					Refusal/End of boring.

TEST RESULTS
Percent Passing #200 ×
Plastic Limit ⊢—⊣ Liquid Limit
Water Content - ●
Penetration - △
10 20 30 40 50

HOQUE & ASSOCIATES

BORING LOG

BORING NO. B-2

File: 22070 - Deer Valley Taxiway C Date Printed: 8/22/2023

PROJECT: Deer Valley Taxiway C Connectors **PROJECT NO.:** 22070
CLIENT: Trace Consulting **DATE:** 3/30/2023
LOCATION: 702 W Deer Valley Road, Phoenix, AZ 85027 **ELEVATION:**
DRILLER: Wildcat Drilling | Mark/Quentin **LOGGED BY:** Dawson G.
DRILLING METHOD: CME75
DEPTH TO - WATER> INITIAL: **AFTER 24 HOURS:**

DEPTH (feet)	Bulk	Samplers	Soil Type	USCS	Description
0			SC		Dark brown, damp to dry conditions, sand with clay.
2.5					
5					Refusal/End of boring.

TEST RESULTS
Percent Passing #200 ×
Plastic Limit ⊢—⊣ Liquid Limit
Water Content - ●
Penetration - △
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

HOQUE & ASSOCIATES

Figure

BORING LOG

BORING NO. B-3

File: 22070 - Deer Valley Taxiway C Date Printed: 8/22/2023

PROJECT: Deer Valley Taxiway C Connectors **PROJECT NO.:** 22070
CLIENT: Trace Consulting **DATE:** 3/30/2023
LOCATION: 702 W Deer Valley Road, Phoenix, AZ 85027 **ELEVATION:**
DRILLER: Wildcat Drilling | Mark/Quentin **LOGGED BY:** Dawson G.
DRILLING METHOD: CME75
DEPTH TO - WATER> INITIAL: **AFTER 24 HOURS:**

DEPTH (feet)	Bulk	Samplers	Soil Type	USCS	Description
0					Dark brown, damp, low PI.
2.5					
5					Refusal/End of boring.

TEST RESULTS
Percent Passing #200 ×
Plastic Limit ⊢—⊣ Liquid Limit
Water Content - ●
Penetration - △
10 20 30 40 50

HOQUE & ASSOCIATES

BORING LOG

BORING NO. B-4

File: 22070 - Deer Valley Taxiway C Date Printed: 8/22/2023

PROJECT: Deer Valley Taxiway C Connectors **PROJECT NO.:** 22070
CLIENT: Trace Consulting **DATE:** 3/30/2023
LOCATION: 702 W Deer Valley Road, Phoenix, AZ 85027 **ELEVATION:**
DRILLER: Wildcat Drilling | Mark/Quentin **LOGGED BY:** Dawson G.
DRILLING METHOD: CME75
DEPTH TO - WATER> INITIAL: **AFTER 24 HOURS:**

DEPTH (feet)	Bulk	Samplers	Soil Type	USCS	Description
0					Dark brown, sand with clay, damp to moist.
2.5					
5					Refusal/End of boring.

TEST RESULTS
Percent Passing #200 ×
Plastic Limit ⊢—⊣ Liquid Limit
Water Content - ●
Penetration - △
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

HOQUE & ASSOCIATES

Figure

BORING LOG

BORING NO. B-5

File: 22070 - Deer Valley Taxiway C Date Printed: 8/22/2023

PROJECT: Deer Valley Taxiway C Connectors **PROJECT NO.:** 22070
CLIENT: Trace Consulting **DATE:** 3/30/2023
LOCATION: 702 W Deer Valley Road, Phoenix, AZ 85027 **ELEVATION:**
DRILLER: Wildcat Drilling | Mark/Quentin **LOGGED BY:** Dawson G.
DRILLING METHOD: CME75
DEPTH TO - WATER> INITIAL: **AFTER 24 HOURS:**

DEPTH (feet)	Bulk	Samplers	Soil Type	USCS	Description
0			SC		Dark brown, sand with clay, low PI.
2.5					
5					
7.5					Refusal/End of boring.

TEST RESULTS
Percent Passing #200 ×
Plastic Limit ⊢—⊣ Liquid Limit
Water Content - ●
Penetration - △
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

HOQUE & ASSOCIATES

Figure

BORING LOG

BORING NO. B-6

File: 22070 - Deer Valley Taxiway C Date Printed: 8/22/2023

PROJECT: Deer Valley Taxiway C Connectors **PROJECT NO.:** 22070
CLIENT: Trace Consulting **DATE:** 3/30/2023
LOCATION: 702 W Deer Valley Road, Phoenix, AZ 85027 **ELEVATION:**
DRILLER: Wildcat Drilling | Mark/Quentin **LOGGED BY:** Dawson G.
DRILLING METHOD: CME75
DEPTH TO - WATER> INITIAL: **AFTER 24 HOURS:**

DEPTH (feet)	Bulk	Samplers	Soil Type	USCS	Description
0			GC		Dark brown with hue of gray, sand with clay, large coarse aggregate present.
2.5					Refusal/End of boring.

TEST RESULTS
Percent Passing #200 ×
Plastic Limit ⊢—⊣ Liquid Limit
Water Content - ●
Penetration - △
10 20 30 40 50

HOQUE & ASSOCIATES

KEY TO SYMBOLS

Symbol Description

Strata symbols

Clayey sand

Clayey gravel

Misc. Symbols

×

Description not given for: "X"

Soil Samplers

Bulk sample

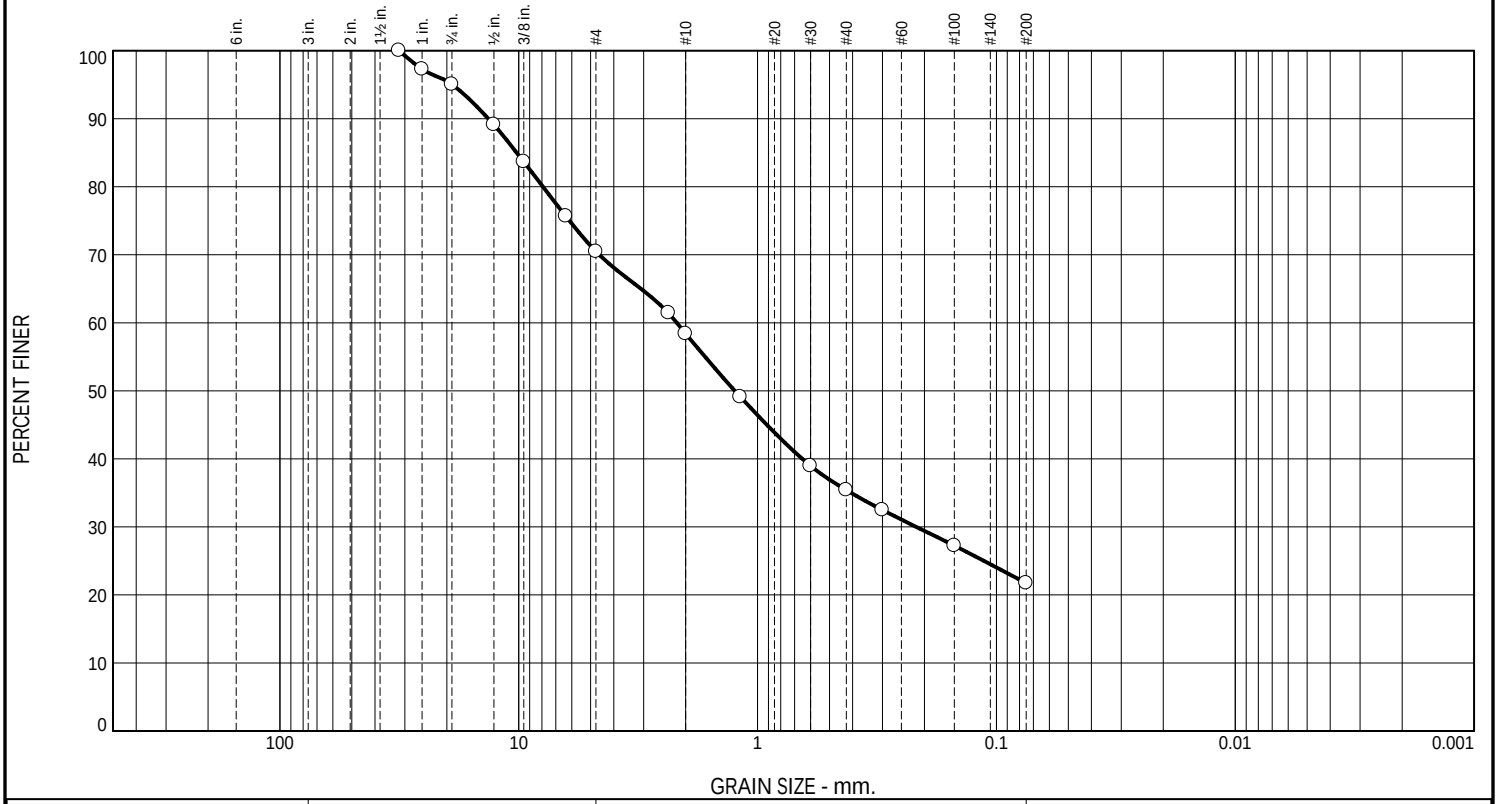
Notes:

1. **Exploratory borings using auger.**
2. **Boring locations were selected by HA.**
3. **These logs are subject to the limitations, conclusions, and recommendations in this report.**

Appendix D: Laboratory Test Results

Particle Size Distribution Report

ASTM C117 & C136



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.0	24.5	12.1	23.0	13.7	21.7	

Test Results (ASTM C117 & C136)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
1-1/4"	100.0			
1"	97.3			
3/4"	95.0			
1/2"	89.1			
3/8"	83.7			
1/4"	75.7			
#4	70.5			
#8	61.4			87.2
#10	58.4			82.8
#16	49.1			69.7
#30	39.0			55.3
#40	35.4			50.3
#50	32.5			46.1
#100	27.2			38.6
#200	21.7			30.8

* (no specification provided)

Material Description

clayey sand with gravel

Atterberg Limits

PL= 17 LL= 25 PI= 8

Coefficients

D_{90}= 13.4015 D_{85}= 10.2030 D_{60}= 2.1773
D_{50}= 1.2461 D_{30}= 0.2167 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-4(0)

Test Remarks

Location: B-1
Sample Number: 23L0148 Depth: 0-5' Sample Date: 3-31-23

Hoque & Associates, Inc.
4325 South 34th Street
Phoenix, Arizona 85040

Client: Trace Consulting
Project: Deer Valley Airport

Project No: 22070 Lab Number 23L0148

Tested By: Drew Sutton Checked By: Tyler Romano

Particle Size Distribution Report

ASTM C117 & C136

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.0	23.0	13.3	25.4	14.9	20.4	

Test Results (ASTM C117 & C136)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
1-1/4"	100.0			
1"	97.4			
3/4"	97.0			
1/2"	94.7			
3/8"	91.8			
1/4"	82.5			
#4	74.0			
#8	64.1			86.6
#10	60.7			82.0
#16	50.3			67.9
#30	39.3			53.1
#40	35.3			47.7
#50	32.0			43.2
#100	25.5			34.5
#200	20.4			27.5

* (no specification provided)

Material Description

clayey sand with gravel

Atterberg Limits

PL= 22 LL= 31 PI= 9

Coefficients

D_{90}= 8.6565 D_{85}= 6.9981 D_{60}= 1.9307
D_{50}= 1.1623 D_{30}= 0.2444 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-4(0)

Test Remarks

Location: B-2
Sample Number: 23L0149 Depth: 0-5' Sample Date: 3-31-23

Hoque & Associates, Inc.
4325 South 34th Street
Phoenix, Arizona 85040

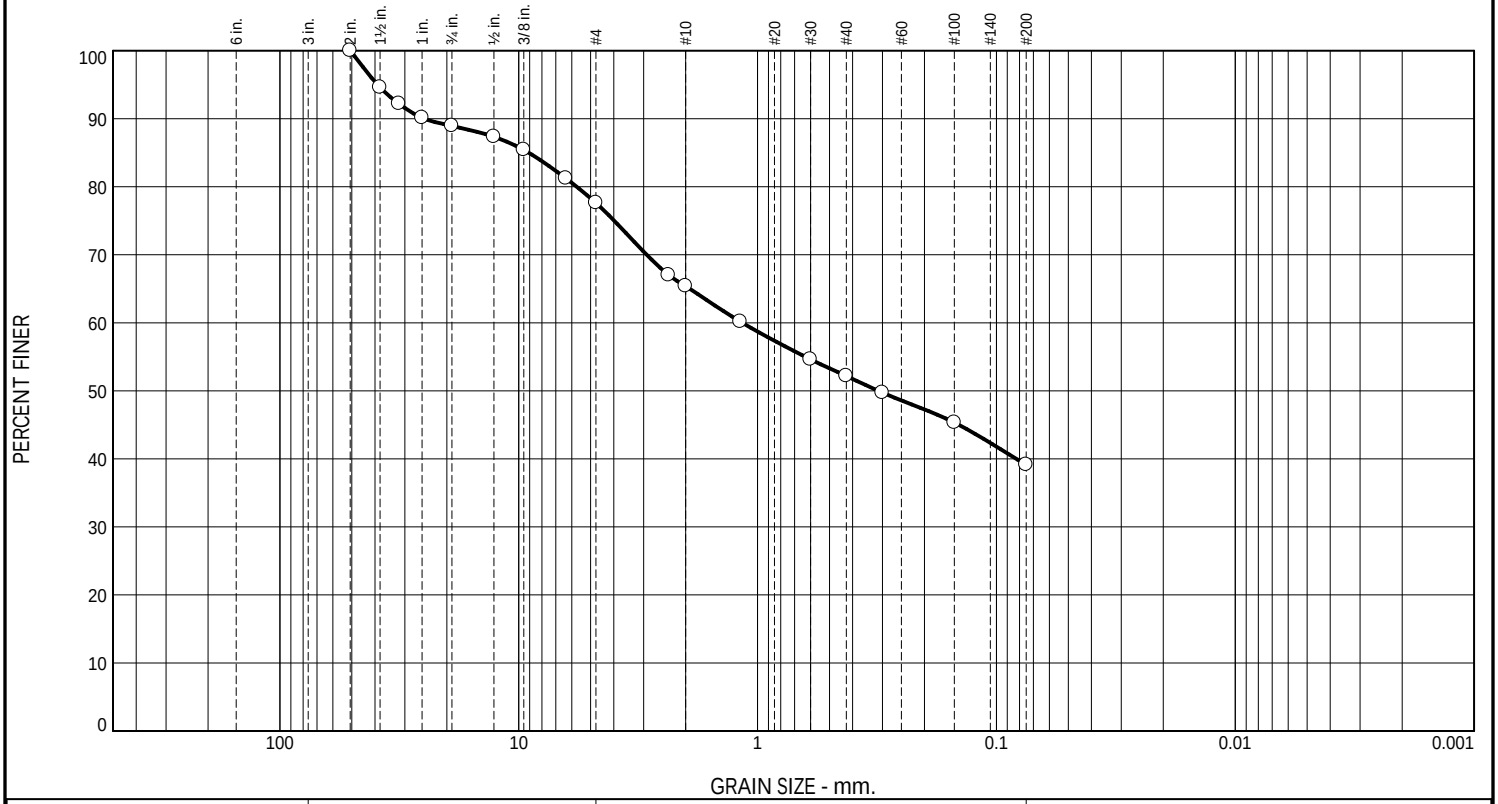
Client: Trace Consulting
Project: Deer Valley Airport

Project No: 22070 Lab Number 23L0149

Tested By: Dawson Gardiner Checked By: Tyler Romano

Particle Size Distribution Report

ASTM C117 & C136



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.0	11.4	12.2	13.2	13.1	39.1	

Test Results (ASTM C117 & C136)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
2"	100.0			
1-1/2"	94.6			
1-1/4"	92.2			
1"	90.1			
3/4"	89.0			
1/2"	87.3			
3/8"	85.4			
1/4"	81.2			
#4	77.6			
#8	67.0			86.3
#10	65.4			84.2
#16	60.2			77.5
#30	54.6			70.4
#40	52.2			67.2
#50	49.7			64.1
#100	45.3			58.4
#200	39.1			50.4

* (no specification provided)

Material Description

clayey sand with gravel

Atterberg Limits

PL= 20 LL= 28 PI= 8

Coefficients

D_{90}= 24.9190 D_{85}= 9.0841 D_{60}= 1.1579
D_{50}= 0.3120 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-4(0)

Test Remarks

Location: B-5
Sample Number: 23L0152 Depth: 0-5' Sample Date: 3-31-23

Hoque & Associates, Inc.
4325 South 34th Street
Phoenix, Arizona 85040

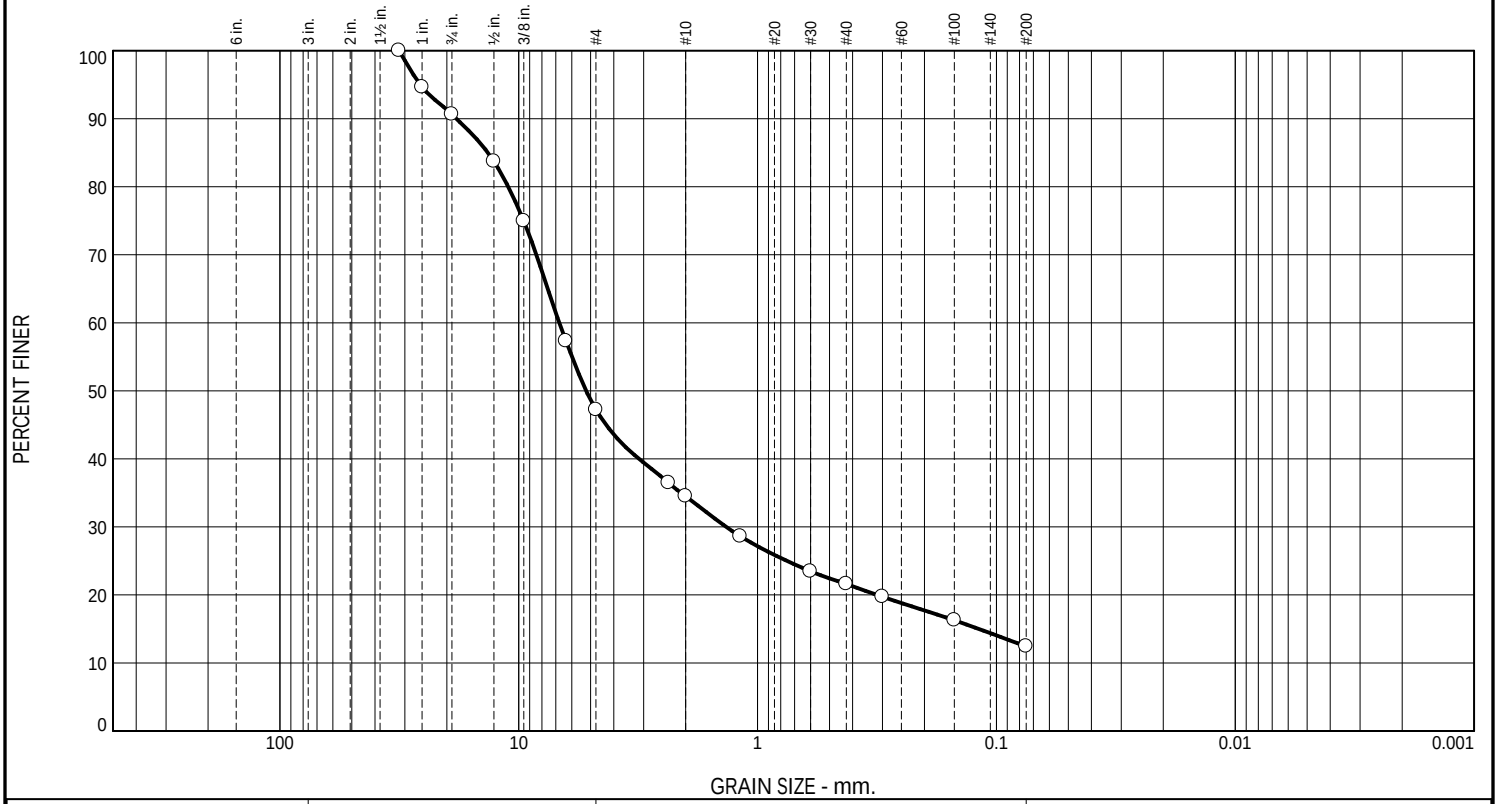
Client: Trace Consulting
Project: Deer Valley Airport

Project No: 22070 Lab Number 23L0152

Tested By: Jason Garnett Checked By: Tyler Romano

Particle Size Distribution Report

ASTM C117 & C136



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.4	43.4	12.7	12.9	9.2	12.4	

Test Results (ASTM C117 & C136)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
1-1/4"	100.0			
1"	94.7			
3/4"	90.6			
1/2"	83.7			
3/8"	75.0			
1/4"	57.3			
#4	47.2			
#8	36.5			77.2
#10	34.5			73.1
#16	28.6			60.6
#30	23.5			49.7
#40	21.6			45.7
#50	19.7			41.8
#100	16.3			34.5
#200	12.4			26.3

* (no specification provided)

Material Description

clayey gravel with sand

Atterberg Limits

PL= 17 LL= 29 PI= 12

Coefficients

D_{90}= 18.2598 D_{85}= 13.4491 D_{60}= 6.7724
D_{50}= 5.2195 D_{30}= 1.3531 D_{15}= 0.1186
D_{10}= C_u= C_c=

Classification

USCS= GC AASHTO= A-2-6(0)

Test Remarks

Location: B-6
Sample Number: 23L0153 Depth: 0-5' Sample Date: 3-31-23

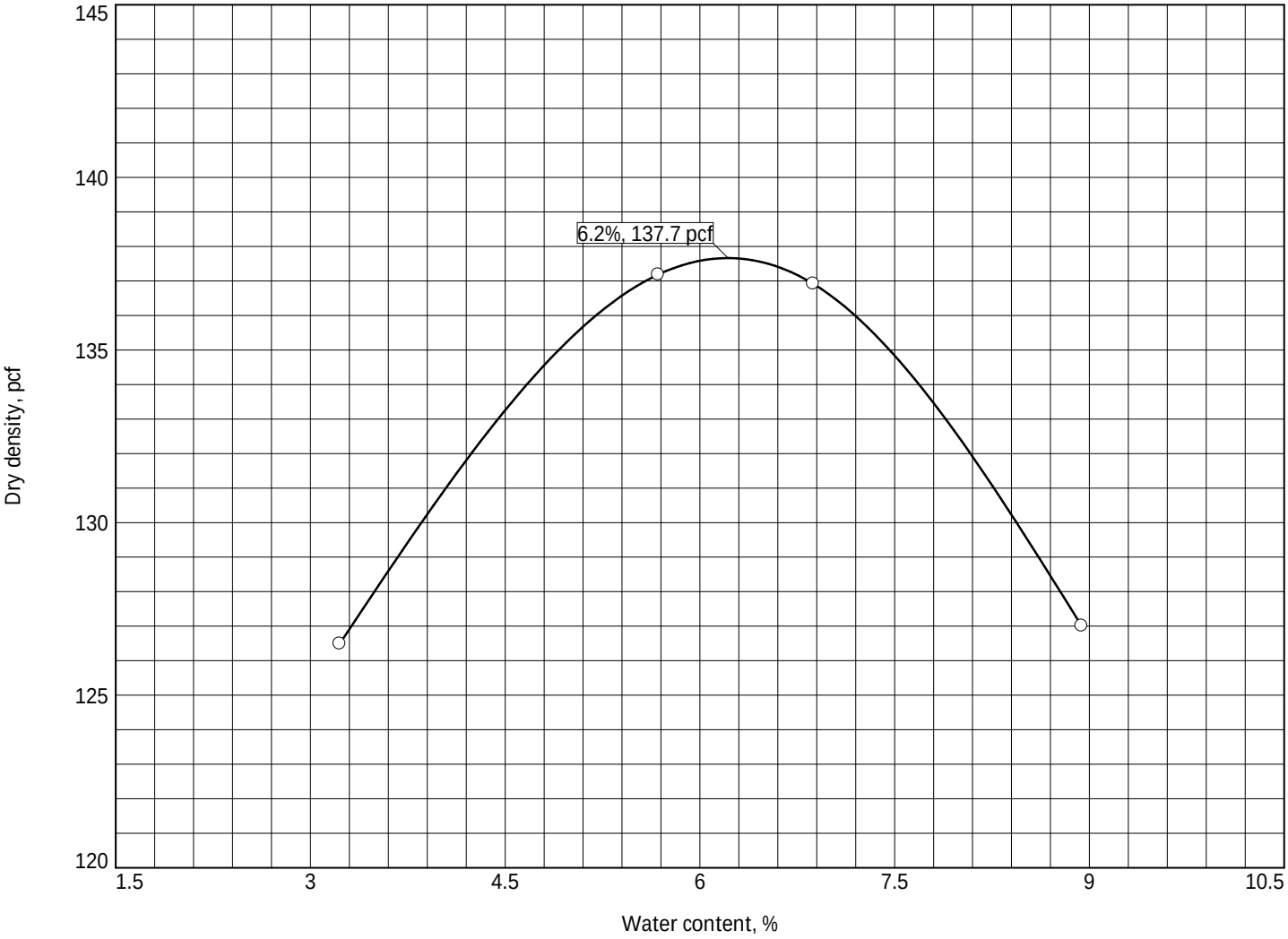
Hoque & Associates, Inc.
4325 South 34th Street
Phoenix, Arizona 85040

Client: Trace Consulting
Project: Deer Valley Airport

Project No: 22070 Lab Number 23L0153

Tested By: Jason Garnett Checked By: Tyler Romano

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Method C Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
0-5'	SC	A-2-4(0)			25	8	5.0	21.7

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 137.7 pcf Optimum moisture = 6.2 %	clayey sand with gravel

Project No. 22070 Client: Trace Consulting

Project: Deer Valley Airport

Date: 4-19-23

○ Location: B-1 Sample Number: 23L0148

Hoque & Associates, Inc.
4325 South 34th Street
Phoenix, Arizona 85040

Remarks:

Lab Number 23L0148

Tested By: Alejandro Munoz Checked By: Tyler Romano

HOQUE & ASSOCIATES

PROJECT:	Deer Valley Airport	**CLIENT:**	Trace Consulting
LOCATION:	Phoenix, AZ	**JOB NO:**	22070
MATERIAL:	Native	**LAB NO:**	See below
SAMPLE SOURCE:	See below	**DATE ASSIGNED:**	04/06/23

pH & RESISTIVITY (AZ 236)

LAB NO	SAMPLE SOURCE	RESISTIVITY (Ohm-cm)	pH
23L0150	B-3 @ 0-5'	1,924	8.4

REVIEWED BY

Trent Titchenal
Lab Manager

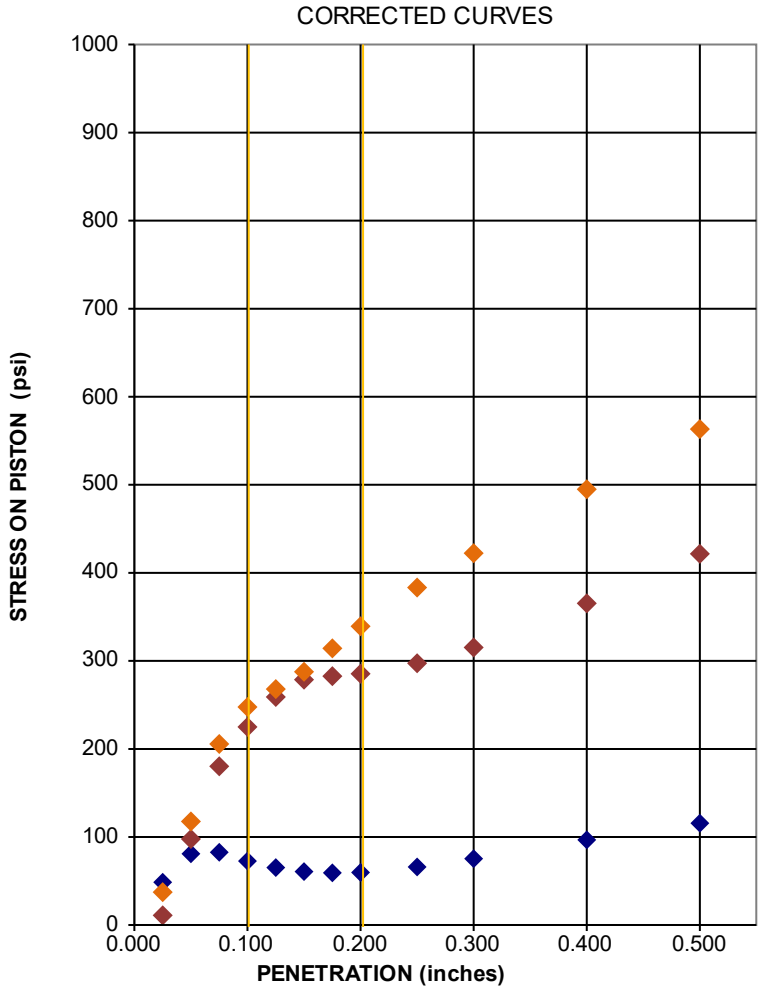
CBR(CALIFORNIA BEARING RATIO) OF LABORATORY-COMPACTED SOILS
ASTM D1883 (SOAKED)

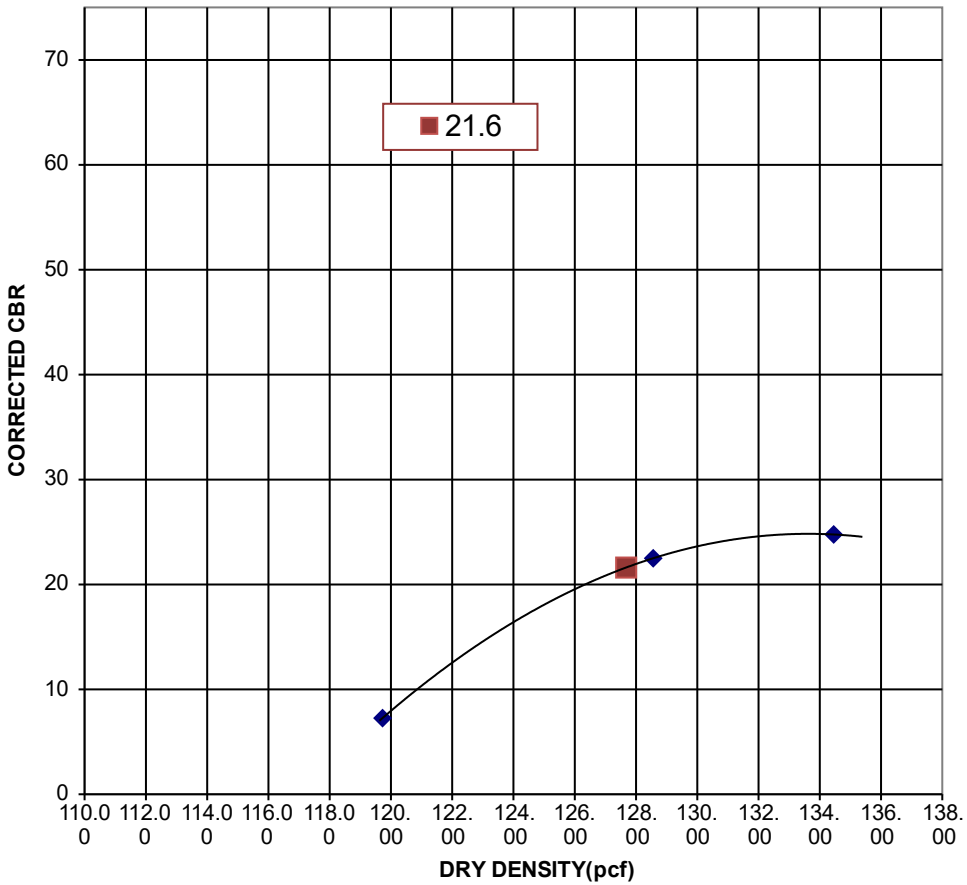
Terracon

PROJECT:	Hoque & Associates On-Call Testing	**JOB NO:**	65201096
LOCATION:	Phoenix, AZ	**WORK ORDER NO:**	65201096.0028
MATERIAL:	CS-1	**LAB NO:**	5715
SAMPLE SOURCE:	Project #22070	**DATE SAMPLED:**	5/25/23

	Correction Factor		Corrected CBR		
	0.1"	0.2"	0.1"	0.2"	CBR
Point 1	0.00	0.00	7.3	4.0	7.3
Point 2	0.00	0.00	22.5	19.0	22.5
Point 3	0.00	0.00	24.8	22.6	24.8

ASTM D1557				95% COMPACTION CBR
Moisture	Dry Density (pcf)			
%	100%	95%	90%	
8.1	134.4	127.7	121.0	21.6





Appendix E: FAARFIELD – Airport Pavement Design

Federal Aviation Administration FAARFIELD 2.0 Section Report

FAARFIELD 2.0.18 (Build 05/26/2022)

Job Name: Deer Valley Airport Taxiway C Connectors

Section: Taxiway C Connectors

Analysis Type: HMA on Aggregate

Last Run: Thickness Design 2023-10-20 14:28:57

Design Life = 20 Years

Total thickness to the top of the subgrade = 10.0in.

Pavement Structure Information by Layer

No.	Type	Thickness (in.)	Modulus (psi)	Poisson's Ratio	Strength R (psi)
1	P-401/P-403 HMA Surface	4.0	200,000	0.35	0
2	P-209 Crushed Aggregate	6.0	70,191	0.35	0
3	Subgrade	0	32,400	0.35	0

Airplane Information

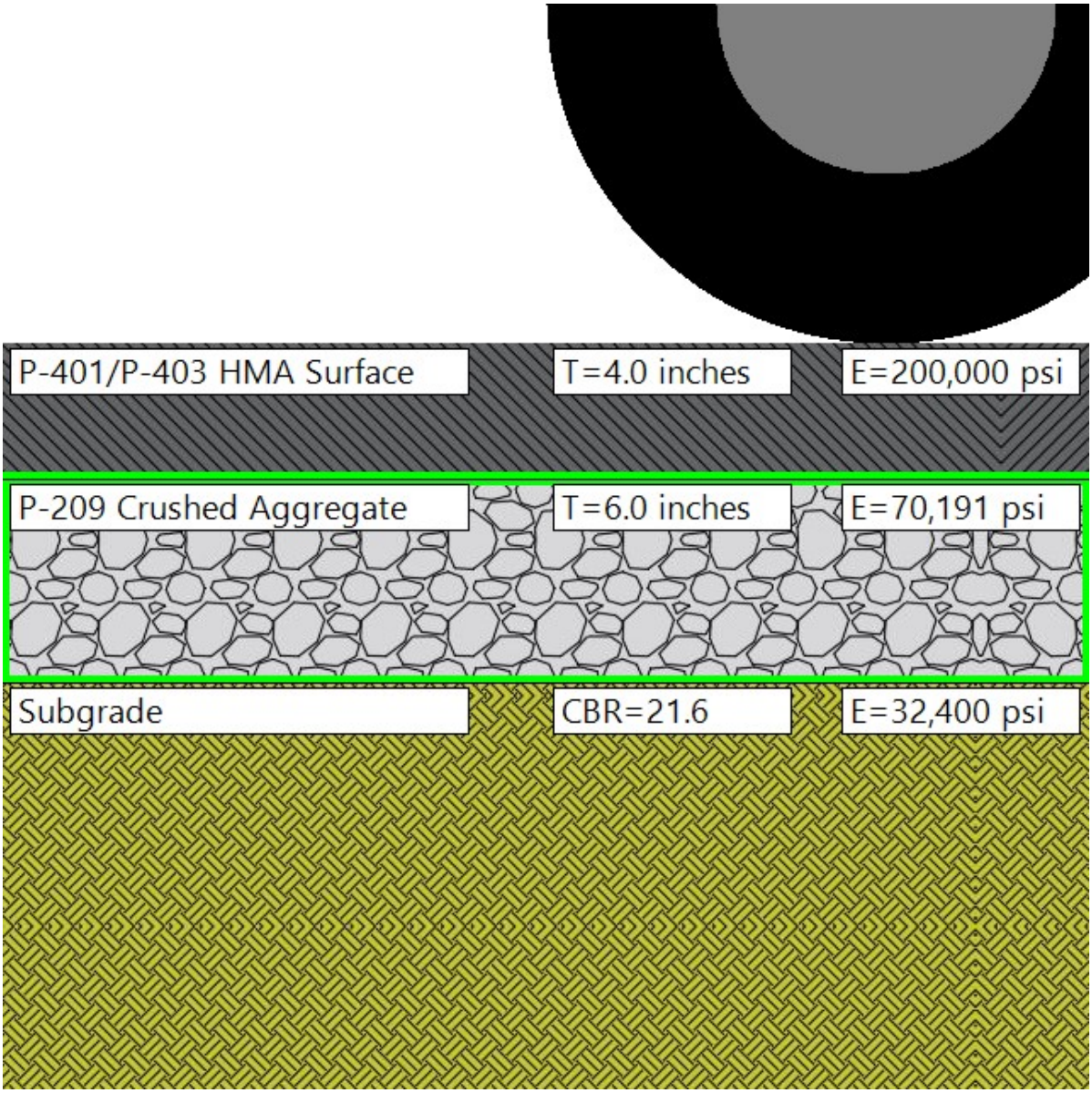
No.	Name	Gross Wt. (lbs)	Annual Departures	% Annual Growth
1	Cessna 172 Skyhawk	2,450	29,490	2.5
2	S-3	2,550	29,490	2.5
3	S-10	6,840	4,042	2.5
4	Beechcraft King Air B200	12,500	4,042	2.5
5	S-5	5,950	126	2.5
6	Cessna Citation II/Bravo C550/551	14,800	126	2.5
7	Learjet 45/55B	21,500	126	2.5
8	Cessna Citation X	36,600	126	2.5
9	EMB-175 STD	82,673	126	2.5
10	Learjet 35/36/35A/36A	18,000	126	2.5
11	Gulfstream-G-IV	73,200	126	2.5

Additional Airplane Information

Subgrade CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	Cessna 172 Skyhawk	0.00	0.00	5.37
2	S-3	0.00	0.00	5.29
3	S-10	0.00	0.00	4.2
4	Beechcraft King Air B200	0.00	0.00	2.98
5	S-5	0.00	0.00	4.84
6	Cessna Citation II/Bravo C550/551	0.00	0.00	4.66
7	Learjet 45/55B	0.00	0.00	2.97
8	Cessna Citation X	0.00	0.00	2.81
9	EMB-175 STD	0.01	0.01	2.08
10	Learjet 35/36/35A/36A	0.00	0.00	2.97
11	Gulfstream-G-IV	0.06	0.06	2.33

User Is responsible For checking frost protection requirements.


P-401/P-403 HMA Surface
T=4.0 inches
E=200,000 psi
P-209 Crushed Aggregate
T=6.0 inches
E=70,191 psi
Subgrade
CBR=21.6
E=32,400 psi

SECTION III-F

AIRPORT CONSTRUCTION SAFETY AND PHASING PLAN

DESCRIPTION

1.1 GENERAL. The following is the Airport Construction Safety and Phasing Plan. The Contractor shall provide all information necessary to complete the plan and submit that information to the Airport and Engineer.

CONSTRUCTION SAFETY PHASING PLAN (CSPP)

DVT TAXIWAY CONNECTORS C4-C10
GMP 1
JANUARY 31, 2024

ADOT Grant No's: E2S4V 01C & E3S3K 01C
COP Project No.: AV31000096 FAA/ADOT

DRAFT

PREPARED FOR:

THE CITY OF PHOENIX AVIATION DEPARTMENT
PHOENIX-DEER VALLEY AIRPORT

702 W. DEER VALLEY ROAD
PHOENIX, AZ 85027

PREPARED BY:

1201 E. JEFFERSON ST, STE 3
PHOENIX, AZ 85034

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APPENDICES

1. COORDINATION

Aviation safety is the primary consideration at airports, especially during construction. This Construction Safety and Phasing Plan (CSPP) will serve as a companion document to the project plans and specifications for the Taxiway Connectors C4-C10 GMP1 project (Project), at Phoenix-Deer Valley Airport (DVT) and is intended to comply with FAA AC 150/5370-2G, Operational Safety on Airports During Construction, dated December 13, 2017. The phasing developed for this project is intended to minimize the impact the project with have on the airport while providing a logical sequence of construction activities. The subsequent sections of this document will address scheduling, coordination, and airfield safety precautions as they relate to the project.

DVT, by authority from the Federal Aviation Administration (FAA) is tasked with ensuring federal regulations and standards are enforced and complied with. In addition to these federal requirements, DVT has established rules and regulations backed by Civil Code which are enforced to ensure safe and secure operations at DVT. Airside Operations staff authorized with enforcement of these rules and regulations must be strictly obeyed at all times while working at DVT. All contractors operating on the airfield must recognize and abide by this authority.

Scope of Work

The major items associated with the scope for this project are as follows:

- Construct new right-angle taxiway connectors C7 and C10 (ADG II).
- Remove existing acute-angle taxiway connector C10.
- Obliterate taxiway pavement markings and remove airfield signage and lighting to decommission existing acute-angle taxiway connector C7.
- Infield grading to meet grading requirements per current FAA Standards as set forth in FAA AC 150/5300-13B, dated March 31, 2022.
- Install airfield electrical infrastructure required for the taxiway construction and adjust existing airfield electrical utility structures to remain to be consistent with the new grading and paving.
- Install storm drain system modifications to be consistent with the new grading and paving and to improve infield transverse slopes according to FAA AC 150/5300-13B.

Prior to the start of any construction operations on the airfield, a pre-construction meeting will be scheduled in order to discuss operational safety, phasing, quality control/quality acceptance, labor requirements, and potential issues that could arise during construction. A general outline of topics that will be discussed at the meeting include, but are not limited to the items listed below:

1. Project Overview and Safety Items
2. Construction Items
3. Labor Requirements

4. Civil Rights Requirements

1.a Contractor Progress Meetings

Progress meeting will be held on a weekly basis and will be conducted by the City of Phoenix Project Manager of this project. These meetings will be attended by the Contractor, the Construction Manager, and City staff to discuss operational safety, scheduling, testing, quality control, quality acceptance, security, safety, labor requirements, and environmental factors

1.b Scope or Schedule Changes

Scope and schedule changes will be discussed as needed during Weekly Construction Progress Meetings. Changes to the project scope or schedule that necessitate revisions to the CSPP shall require review and approval by the City of Phoenix and the FAA.

1.c FAA ATO Coordination

FAA ATO coordination will be performed by the City of Phoenix for this project.

2. SCHEDULING OF CONSTRUCTION PHASING

2.a GMP1 Phasing Elements

2.a.1. Phase 1 Activities

Phase 1 activities generally consist of removal of aggregate slope protection, airfield electrical demolition, pavement sawcut, pavement removal, grading and earthwork, subgrade compaction, lime stabilization, pavement section construction, pavement marking placement, airfield electrical infrastructure construction, and excavation for and installation of a storm drain structure.

Phase 1 activities will be performed within the Runway 7R-25L Runway Safety Area (RSA), between Taxiway C6 and C8, and at Taxiway C9.

Phase 1 will be constructed with nighttime work only and will require nightly Runway 7R-25L closures. The closures shall be coordinated between the Contractor and DVT Airport Operations Staff. Work completed within the RSA limits of Runway 7R-25L during the closure will need to be completed to a level such that Runway 7L-25R may be reopened to full operation upon completion of the night shift and still maintain compliance with FAA AC 150/5370-2G requirements.

The Contractor will implement the Storm Water Pollution Prevention Plan (SWPPP) during this phase by installing the required inlet protection for the existing catch basins.

Construction duration is shown on the Phasing Plans.

2.a.2. Phase 2 Activities

Phase 2 activities will begin after the completion of Phase 1. Phase 2 activities generally consist of pavement sawcut, pavement removal, grading and earthwork, subgrade

compaction, lime stabilization, pavement section construction, pavement marking placement, and airfield electrical infrastructure construction within Phase 2's work area.

Phase 2 activities are generally limited to the shoulder area of Taxiway C and tie-in interface with Taxiway C.

Phase 2 will be constructed with nighttime work only and will require nightly Runway 7R-25L closures. The closures shall be coordinated between the Contractor and DVT Airport Operations Staff. Work completed within the RSA limits of Runway 7R-25L during the closure will need to be completed to a level such that Runway 7L-25R may be reopened to full operation upon completion of the night shift and still maintain compliance with FAA AC 150/5370-2G requirements.

The Contractor will implement the Storm Water Pollution Prevention Plan (SWPPP) during this phase by installing the required inlet protection for the existing catch basin.

Construction duration is shown on the Phasing Plans.

2.a.3. Phase 3 Activities

Phase 3 activities will begin after the completion of Phase 2. Phase 3 activities generally consist of airfield sign removal, taxiway edge light removal, pavement marking obliteration, and pavement marking application in the vicinity of Taxiway C6.

Phase 3 will be constructed with nighttime work only and will require nightly Runway 7R-25L closures. The closures shall be coordinated between the Contractor and DVT Airport Operations Staff. Work completed within the RSA limits of Runway 7R-25L during the closure will need to be completed to a level such that Runway 7L-25R may be reopened to full operation upon completion of the night shift and still maintain compliance with FAA AC 150/5370-2G requirements.

The Contractor will implement the Storm Water Pollution Prevention Plan (SWPPP) during this phase by installing the required inlet protection for the existing catch basins.

During this phase, a majority of Taxiway C remains operational. The Contractor will be required to be escorted by DVT Airport Operations Staff along the designated haul route.

Construction duration is shown on the Phasing Plans.

2.b Construction Safety Drawings

Initial project construction phasing drawings describing the phases and activities in paragraphs above are included as Appendix A of this CSPP.

The contractor shall provide a detailed schedule of work for each phase and the overall project.

3. AREAS OF OPERATIONS AFFECTED BY THE CONSTRUCTION ACTIVITY

3.a Identification of Affected Areas

This project involves the demolition, grading, and construction of new taxiway connectors C7 and C10 at DVT, along with modifications to the storm drain network and installation of airfield signage and lighting infrastructure. Construction activities will occur in these infields which are shown in initial phasing drawings in Appendix A. Nighttime shifts will be primarily used for all work except for paving operations which will occur during daytime shifts to provide higher quality pavement. Runway closures will be required to accommodate work within the Runway Safety Area (RSA). Aircraft operations will be restricted for all phases during construction activities but will be restored to full operational condition at the end of each shift when indicated by the phasing plans.

Construction will occur within the restricted Runway Object Free Area (ROFA) limits and will comply with the requirements described in Section 18.b of this report and in accordance with FAA AC 150/5370-2G standards.

Construction will occur within the restricted Taxiway Object Free Area (TOFA) limits during this project. Section 18.d details the additional restrictions that will be put in place in order to complete the construction activities within the TOFA.

Construction activities are prohibited in the runway safety area, and may be restricted in the taxiway safety area, and taxiway object free area while the associated runway or taxiway is open to aircraft operations. In addition, personnel, material, and/or equipment may not penetrate the obstacle free zone while the runway is open for aircraft operations.

See Section 2 and the phasing plans in Appendix A for limits of these closures.

3.b Mitigation of Effects

Mitigating the effects on the portions of the airfield can be assisted by adhering to the items within this CSPP; compliance with DVT Airport Operations instructions and policies regarding airfield safety and maneuvering about the airfield; and enforcement of the Contractor’s Safety Plan Compliance Document (SPCD).

Taxiway and runway operations may be temporarily changed based on the construction phasing of the project. Appropriate notification measures should be taken according to Section 9 of this CSPP.

DVT does not have a dedicated ARFF station; however, emergency vehicles and other airport vehicles should be able to conduct their business using designated haul routes and perimeter service roads as shown in the initial phasing drawings in Appendix A.

The maintenance of essential utilities shall be conducted by the Contractor. Improvements to electrical utilities and storm drain utilities will be incorporated into the project construction as indicated in the initial phasing drawings in Appendix A.

Any temporary changes to air traffic control procedures will need to be coordinated between the tower and DVT Operations through the issuance of NOTAMs as discussed in Section 9 of this CSPP.

All parties involved during the construction process should be aware of coordination protocol as provided in Section 1 of this CSPP; Phasing, closures, and areas affected by this project as provided in Sections 2 and 3 of this CSPP; Rules regarding Contractor site access as provided in Section 5 of this CSPP; and notification procedures and emergency contact information as provided in Section 9 of this CSPP.

4. PROTECTION OF NAVIGATIONAL AIDS (NAVAIDS)

No work under this project is anticipated to be in immediate proximity of operational NAVAID critical areas.

5. CONTRACTOR ACCESS

5.a Location of Stockpiled Construction Materials

The Contractor Staging Area and Stockpile Area are depicted in the initial phasing drawings in Appendix A. Upon project completion, the Contractor shall restore storage and staging areas to pre-project conditions.

Stockpiles shall not exceed a height of 3 feet above adjacent grade.

The Contractor may also request specific equipment and materials to be left within the confines of the work area boundaries provided that:

- The requirements of AC 150/5370-2G Sections 2.9 and 2.22 are met, and;
- Approval is obtained by DVT Airport Operations Staff.

5.b Vehicle and Pedestrian Operations

5.b.1. Construction Site Parking

The Contractor employee parking area is depicted in the initial phasing drawings in Appendix A. Any additional parking areas required by the Contractor shall be coordinated with DVT Operations Staff prior to beginning any construction activities. Any employee parking area will be located outside the Airport Operations Area (AOA). The parking areas should provide reasonable Contractor employee access to the job site.

5.b.2. Construction Equipment Parking

Contractor employees must park and service all construction vehicles in an area designated by the airport operator outside the OFZ and never in the safety area of an active runway or taxiway. Employees should also park construction vehicles outside the OFA when not in use by construction personnel (for example, overnight, on weekends, or during other periods when construction is not active). Parking areas must not obstruct the clear line of sight by the ATCT to any taxiways or runways under

air traffic control nor obstruct any runway visual aids, signs, or navigation aids. Parking for construction equipment shall be at the Contractor Staging Area; however, the Contractor shall coordinate the location of construction equipment parking with DVT Operations Staff prior to beginning any construction activities.

5.b.3. Access and Haul Routes

The haul route from the AOA fence to the Contractor Staging Area for all phases of this project begin at Gate 7 on North 7th Street. The route enters the AOA from the east side of the airport and proceeds south along the vehicle service road and follows the vehicle service road turning west to the Contractor Staging Area, south of the east runup area as shown in Appendix A. This haul route and other haul routes are subject to approval by DVT Operations Staff and are subject to change based on airport operational needs. Contractor site access and haul routes are depicted in the initial phasing drawings in Appendix A.

The haul routes and contractor site access to the project area for Phases 1 and 2 begin at the Contractor Staging Area and go north onto Taxiway D12, then continues west via Taxiway C to the project area. Taxiway C is closed nightly between C7 and C13 during Phases 1 and 2.

Newly constructed corporate hangars may require access to Runway 7L-25R during construction of Phase 1 and 2. If this access is required, Contractor vehicles will be escorted by DVT Operations Staff west, across the taxilane, then north onto Taxiway C and west towards the project site. Taxiway C is closed nightly between C7 and the corporate hangar taxilane if Runway 7L-25R access is required.

Haul routes and contractor site access to the project area for Phase 3 begin at the Contractor Staging Area and go north onto Taxiway D12, then continues west via Taxiway C to the project area. Contractor use of this haul route is restricted and will require escort from DVT Operations Staff as Taxiway C will only be closed between C6 and C8.

All existing airfield pavement (runways, taxiways) to be used by contractor shall be plated and all pavements, including service roads, shall be restored to pre-construction condition at no additional cost to the City.

The Contractor shall include any additional routes required for specific construction activities (i.e. paving activities) to DVT Operations Staff for evaluation and approval as part of the SPCD before beginning construction activities.

All access into movement areas will be coordinated by the Contractor with escort provided by Airport Operations, as indicated in AC 150/5370-2G.

In all cases the Contractor shall adhere to the following requirements:

- Haul routes shall include provisions to prevent inadvertent entry to movement areas.

- Fire Fighting, Police, and Airport Operations equipment and personnel shall not be impeded at any time.

- Haul route activity shall not interfere with NAVAIDs or approach surfaces of operational taxiways or runways.

- The Contractor shall protect the haul routes from damage. Any damage occurring shall be repaired by the contractor at no cost to the City of Phoenix.

- The contractor shall maintain a dedicated full-time power-vacuum on the haul route at all times. Two manned power-vacuums shall be required when Bituminous Pavement is being hauled.

- Workers must remain in the work areas during work hours. If more than one work area is active at the same time, there shall be no movement between areas unless they are adjacent and Airport Operations has given prior approval. Only personnel will be allowed to enter and leave the work areas in vehicles with proper warning lights/flagging per FAA and DVT requirements.

The Contractor is cautioned that portions of the haul route are adjacent to active taxiways within active aprons that will include propeller and jet aircraft. The Contractor shall assume responsibility for any damage caused by Foreign Object Debris (FOD) created by their operations.

5.b.4. Contractor Vehicles

All Contractor vehicles operating within the Airport Operations Area (AOA) shall adhere to the following:

- Insurance coverage per the Project Documents.

- The Company name and/or logo on each side of the vehicle (no paper signs).

- During day light hours, vehicles must be provided with a 3-foot by 3-foot square flag with a checkered pattern of international orange and white squares at least 1-foot on each side; or a yellow flashing light that is mounted on the uppermost part of the vehicle. The light must be visible from any direction, day and night, including from the air.

- During nighttime hours from dusk to dawn, and during periods of limited visibility, all vehicles shall be equipped with a flashing yellow light.

- All vehicles entering the work area may be searched by the owner on a random basis. The Contractor shall allow additional time to accommodate searches.

5.b.5. Vehicle Operator Requirements and Training

Any individual with unescorted access and required to operate a vehicle in the restricted areas of the airport, but exclusive of the airport movement areas must have an Airfield Driver's Permit (ADP) icon affixed on their airport issued SIDA identification media. To obtain the ADP icon, the individual will be required to:

1. Read the "Airfield Driver Permit Study Guide" prior to taking the test. (Material obtained at the Security Badging Office)

2. Possess a valid unexpired state issued driver's license

3. Successfully pass the ADP test administered by the Security Badging Office.

Individuals who do not pass the test will be instructed to review the study guide and will then be allowed to test again on another day.

The City of Phoenix Aviation Department Operations Division will provide training for all individuals requiring an ADP. This training is provided through a self-paced interactive computer program. Information presented in the Airfield Driver Permit Study Guide or other media (e.g. videos) is tested through a series of multiple choice and true/false questions.

5.b.6. Situational Awareness

Vehicle drivers must confirm by personal observation that aircraft is approaching their position (either in the air or on the ground) when given clearance to cross runway, taxiway, or any other area open to airport operations. In addition, it is the responsibility of escort vehicle driver to verify the movement/position of all escorted vehicles at any given time.

5.c Two-Way Radio Communication

The Contractor will not be allowed to communicate by radio on DVT or FAA frequencies. All communication will be directly with the Construction Manager or Airport Operations Staff. The Contractor shall not utilize any equipment that interferes with DVT or FAA radio frequencies.

5.d Airport Security

The Contractor shall, at a minimum, have his/her Superintendent and Foreman obtain site specific training and direction from DVT Operations Staff for driving within the AOA. This training shall be relayed to each worker as part of the daily Contractor Safety Meeting. The Contractor shall maintain a full-time gate guard on any access gate controlled by the Contractor. Gate security shall be maintained as indicated in AC

150/5370-2G Section 2.9. Access gates shall be locked when not manned by a gate guard.

5.d.1. Work Area

The work areas shall be as indicated in the Project Layout Plan in **Appendix A** of this CSPP. The Contractor shall adhere to the requirements on these sheets and as follows:

- The Work Area is that area under construction, flagged, barricaded, closed to aircraft and separated from other areas of active aircraft movements. Work Area boundaries shall be as shown on the drawings and shall be suitably marked by the Contractor with a barricade line spaced according to Section 16.b.1 of this CSPP. At a minimum, each barricade shall have one steady burn red light attached. Each barricade shall be anchored and/or filled satisfactorily to prevent overturning and movement from wind or jet blast.

- In locations where it is deemed that additional protection is required to protect ground personnel and vehicles from construction activities, concrete barriers with solid burn red lights may also delineate construction activities.

- The type of construction delineators and other barriers to be used shall be submitted for advanced approval by the Construction Manager and shall remain the property of the Contractor at the completion of construction.

- The Contractor shall have sanitary facilities, adequate water supply, tools, equipment, and supplies to support work needs and requirements when in the work zones. Inadequate preparation will not be allowed as a basis for extra or additional time.

- The Contractor shall take all necessary items to control the work zone, all cleanup equipment necessary to clean the work zone, and return all equipment supplies and incidentals to the staging areas at the end of shifts unless otherwise allowed by DVT Operations Staff whereby an additional work shift is replacing the current shift. No equipment, materials, or incidentals may be left in the work zone at any time without personnel working in the work zone.

- The Contractor shall be equipped with the necessary communication equipment to control the work zone activities and to communicate with DVT Operation Staff.

6. WILDLIFE MANAGEMENT

6.a Trash

The Contractor shall carefully control and continuously remove waste or loose material that might attract wildlife or otherwise become foreign object debris (FOD).

6.b Standing Water

The Contractor shall not allow water to pool or otherwise remain standing that might attract wildlife.

6.c Tall Grass and Seeds

Not applicable to this project.

6.d Poorly Maintained Fencing and Gates

The Contractor shall maintain all fencing and gates under their control to prevent wildlife from gaining access to the AOA.

6.e Disruption of Existing Wildlife Habitat

Not applicable to this project.

7. FOREIGN OBJECT DEBRIS (FOD) MANAGEMENT

Waste and loose materials, referred to as FOD, can cause damage to aircraft landing gear, propellers, and jet engines. The contractor shall not leave or place FOD on or near active aircraft movement areas. Materials tracked onto those areas must be continuously removed during the project. Additionally, smaller items such as paper, plastics, cans, bottles, and the like shall never be allowed to be deposited anywhere in the airfield perimeter. The Contractor shall immediately remove or secure waste and loose materials from the work site and haul routes.

The Contractor shall maintain full time vacuum equipment in accordance with the project specifications.

8. HAZARDOUS MATERIAL (HAZMAT) MANAGEMENT

All construction activities with the potential to generate or require the use of hazardous materials shall be performed in accordance with all local, state, and federal regulatory requirements. All project personnel shall be trained to recognize hazardous wastes on the project and to respond appropriately to ensure safety and protect the environment. In the event of a hazardous material spill, the procedures provided in the emergency response section pertaining to notification and response responsibilities shall apply.

9. NOTIFICATION OF CONSTRUCTION ACTIVITIES

9.a List of Responsible Representatives

The Contractor shall provide the phone numbers for five (5) of its responsible personnel, including the project superintendent and, the responsible personnel from each of the key subcontractor firms, each of whom may be contacted in case of an emergency. Personnel shall be on-call 24 hours per day for maintaining construction hazard lighting and barricades. The Contractor will designate a person responsible to maintain and service all traffic control equipment. This contact list must be determined once the job

has been bid and a Contractor has been selected. This list will be provided by the Contractor for distribution at the preconstruction meeting.

City of Phoenix Project Manager Contact Information

Scott Clark, PE
Design & Construction Services Division City of Phoenix – Aviation Department
Mobile: (623) 298-9392
Office: (602) 681-5349
Email: Scott.Clark@phoenix.gov

9.b NOTAMs

NOTAM issuance will occur when construction activity areas are adjacent to or directly impact aircraft operations. Airport Operations personnel shall issue all NOTAM's. It is incumbent on the Contractor to notify Airport Operations, through the Construction Manager, of any activities that may require a NOTAM a minimum of 72 hours in advance of starting such activities.

9.c Emergency Notification Procedures

For all emergencies involving life safety (injuries, fires, security breaches, etc.) the Contractor will immediately call 911, the DVT Emergency number as soon as possible by contacting the Airport's Emergency number. The typical "911" call will connect to the emergency dispatcher outside of the airport and will have to be re-routed to this number. Please remind all your project team members of this procedure.

EMERGENCY TELEPHONE NUMBER – 911

NON-EMERGENCY TELEPHONE NUMBER

623-869-0977

FOR

POLICE FIRE RESCUE

9.d Coordination with ARFF Personnel

There is Aircraft Rescue and Fire Fighting (ARFF) at DVT. All communications relating to typical ARFF operations will be made through Airport Operations Staff.

9.e Notification to the FAA

FAA Form 7460-1 will be necessary for this project. It will be filed by the City of Phoenix prior to construction. It is incumbent on the Contractor to notify the City of Phoenix,

through the Construction Manager, of any additional activity that may require an additional Form 7460-1 a minimum of forty-five (45) calendar days in advance of starting such activities.

10. INSPECTION REQUIREMENTS

10.a Daily (Or More Frequent) Inspections

Airport Operations personnel along with the Construction Manager will conduct inspections of the work area at least twice daily to ensure that the Contractor is complying with the safety plan and that altered construction activities do not create potential safety hazards

10.b Final Inspections

Airport Operations personnel along with the Construction Manager will conduct an inspection at the completion of each area of work and project and prior to opening to traffic to ensure no safety hazards exist. Construction activity will be stopped should interference to existing utilities be caused by the Contractor activities. In case of emergency, when the Contractor's personnel believe they may be in an area of existing utilities, the Construction Manager shall be notified immediately.

11. UNDERGROUND UTILITIES

The safety plan must provide procedures for notifying the City of Phoenix if construction requires shutting off or otherwise disrupting any water line or fire hydrant on the airport or adjoining areas, or if required, the blocking and/or rerouting of emergency access drive lanes or building entrances/exits. This notification shall be provided with as much advance notice as possible (48 hours at a minimum) and shall be coordinated through the Construction Manager, then directly to Airport Operations. Airport Operations will then be responsible to make the appropriate notifications.

Any trenches or excavations must be in compliance with the safety standards and guidelines set forth in AC 150/5370-2G Chapter 3. Airport Operations will have final authority for inspection and approval of all trenches, excavations, and cover requirements.

12. PENALTIES

Penalties for non-compliance offenses vary on the severity and can result in the removal of the violator from the airport. The table below lists the Safety and Security Non-Conformance Contract Adjustment (deduction) schedule as used at Phoenix Deer Valley Airport.

Runway Incursion	$15,000.00
Active Taxiway Incursion	$10,000.00
Runway/Taxiway Safety Area	$1,000.00
Security or Badging/Licensing Non-Compliance	
First Offense	$1,000.00
Second Offense	$5,000.00
Each Additional Offense	$15,000.00
Aviation Department has the option to issue warnings on first offense, *if* the incident is justified.	
Individuals involved in a non-compliance violation may be required to surrender their security badge and airfield driver's license pending investigation of the matter.	

13. SPECIAL CONDITIONS

Airport emergencies and closures (i.e. presidential visits) take precedent over all other activities. If an emergency or closure occurs on Airport property that requires evacuation, stoppage of work, or clearing of work area and returning that area to service, the contractor(s) shall follow the directions of Airport Operations, City of Phoenix Fire, or City of Phoenix Police to ensure safety and protection of all affected by the emergency.

The Contractor shall be aware that tall equipment (i.e. concrete pumps and cranes) will require a Form 7460-1 issued for specific equipment. The Form will be submitted to the FAA as indicated in Section 9 of this document. Tall equipment shall have checkered flags and or flashing lights attached at the top of the boom.

14. RUNWAY AND TAXIWAY VISUAL AIDS

The CSPP must ensure that areas where aircraft will be operating are clearly and visibly separated from construction areas, including closed runways. Throughout the duration of the construction project, verify that these areas remain clearly marked and visible at all times and that marking, lighting, signs, and visual NAVAIDs remain in place and operational. The CSPP must address the following, as appropriate:

14.a General

Airport markings, lighting, signs and visual NAVAIDs must be clearly visible to pilots, not misleading, confusing, or deceptive. All must be secured in place to prevent movement by prop wash, jet blast, wing vortices, or other wind currents and constructed of material that would minimize damage to an aircraft in the event of inadvertent contact. Markings, lighting, signs and visual NAVAIDs are frangible structures as required by the Advisory Circulars.

14.b Markings

There will be low profile and vertical panel barricades that will be used to delineate the construction site. The barricades shall be checked daily to be sure they are properly positioned and that the lights are functioning properly.

This project will require the closure of existing connector taxiways C6 and C10. Barricades and an “X” will be placed at the entrance to the closed taxiways from the runways in accordance with AC 150/5370-2G.

14.c Lighting and Visual NAVAIDs

Placement of construction area lighting for nighttime construction must be coordinated with Airport Operations to ensure no adverse impacts to ATCT or pilot visibility. All Temporary Airfield lighting must be approved by Airport Operations Staff. Airport Operations Staff will be responsible for ensuring that any temporary lighting is compliant with AC 150/5340-30J, AC 150/5345-50B, and AC 150/5345-53D.

14.d Signs

There will be closed taxiways during construction that will require the existing runway and taxiway signs to be covered to prevent misdirecting pilots. These sign coverings shall be secured to prevent the material from blowing away during normal airport operations and/or weather events.

All plans for temporary airfield signage must be approved by Airport Operations, and any temporary signage must comply with AC 150/5345-44K, AC 150/5340-18G, AC 150/5345-53D, and Engineering Brief 93. Airport Operations will be responsible for forwarding the airport’s approved sign plan to the FAA for approval. Details regarding any temporary airfield signage or lighting needed for this project are included in Appendix A of this CSPP.

15. MARKING AND SIGNS FOR ACCESS ROUTES

Pavement markings and signs for construction personnel shall conform to AC 150/5340-18G and, to the extent practicable, with the Federal Highway Administration Manual on Uniform Traffic Control Devices (MUTCD) and/or State highway specifications. Signs adjacent to areas used by aircraft must comply with the frangibility requirements of AC 150/5220-23A, Frangible Connections, which may require modification to size and height guidance in the MUTCD.

16. HAZARD MARKING, LIGHTING AND SIGNING

The Contractor shall adhere to the requirements of AC 150/5370-2G Section 2.20. Low level barricades equipped with solid red lights must be placed to properly delineate the work areas from the remainder of the airport.

16.a Purpose

Hazard marking, lighting, and signing prevents pilots from entering areas closed to aircraft and construction personnel from entering areas open to aircraft, and they serve

as comprehensible warning indicators for any area affected by construction that is normally accessible to aircraft, personnel, or vehicles. Hazard marking and lighting shall also be used to identify open manholes, open trenches, small areas under repair, stockpiled materials, waste locations and any other potentially hazardous site conditions during construction. Other construction-related hazards may include disruption to the instrument landing system (ILS) and underground power lines along with construction activity adjacent to various safety areas. These hazards will be identified and marked in accordance with AC 150/5370-2G to ensure contractor personnel interact with these hazards appropriately.

16.b Equipment

16.b.1. Barricades

Low profile barricades with the MUTCD standard reflective orange and white marking with flashing red lights mounted on the ends of the barricade and vertical panel barricades with the MUTCD standard reflective orange and white marking with flashing red light mounted on the top of the barricade will be used to delineate the construction site. See Appendix B for sample barricades for use on this project. The spacing of barricades must be such that a breach is physically prevented barring a deliberate act. The barricades shall be spaced no more than 40 feet apart where shown on the safety plan in order to prevent aircraft breaches into the work area. The barricades shall be weighed against prop wash and capable of withstanding up to 100 MPH wind forces. The Contractor shall identify the person responsible for the maintenance and the marking and lighting in Section 9. Provision must be made for ARFF access if necessary.

16.b.2. Lights

Flashing red caution lights shall be battery or solar operated and shall maintain such intensity so as to be readily identified in accordance with the 2009 edition of the Manual on Uniform Traffic Control Devices (MUTCD) and the 2021 Arizona Department of Transportation (ADOT) Standard Specifications for Road and Bridge Construction.

16.b.3. AOA – General

Barricades are not permitted in an active safety area. Within a runway or taxiway object free area, and on aprons, use barricades as noted above to separate all construction areas from the movement area. The proper barricade type shall be used when delineating construction activities. All barricades, temporary markers, and other objects left in areas adjacent to any open runway or taxiway/taxilane safety area or apron must be as low as possible to the ground and no more than 18 inches high, exclusive of supplementary lights and flags. Barricade placement shall be in accordance with AC 150/5370-2G, this CSPP, and the initial phasing drawings included in Appendix A of this CSPP.

16.b.4. Maintenance

The Contractor shall be responsible for the maintenance and the markings, lighting and barricades and is required to have a person on call 24 hours a day for emergency maintenance of airport hazard lighting and barricades. The Contractor shall file the contact person's information with DVT Operations Staff that checks for proper operation at least once per day, in accordance to Section 9 of this CSPP.

17. WORK ZONE LIGHTING FOR NIGHTTIME CONSTRUCTION

This project includes nighttime construction activities for the majority of the project duration and lighting equipment will be required to adequately illuminate the work area. All support equipment, except haul trucks, are recommended to be equipped with artificial illumination to safely illuminate the area immediately surrounding their work areas. Light towers will be positioned to aim away from the ATCT cabs and the active Runway and will be removed from the work area following the end of each shift. Standards and recommendations for the lighting of support equipment and the use of light towers will be in accordance with AC 150/5370-2G.

18. PROTECTION OF RUNWAY AND TAXIWAY SAFETY AREAS

The Contractor shall adhere to the requirements of AC 150/5370-2G Section 2.22. Runway and Taxiway Safety Areas shall be preserved to all extents practical. Open trenches, equipment storage, and stockpiles within any of these safety areas will not be permitted unless the pavement is closed to aircraft. Coordination with DVT Operations Staff is necessary to properly delineate the closed, active and restricted portions of the Runway and Taxiway Safety Areas.

18.a Runway Safety Area (RSA)

Access into movement area or Safety Areas without an Airport Operations escort is prohibited. The Contractor shall ensure that no personnel or equipment enters into the active movement areas or their associated Safety Areas without appropriate Airport Operations escort. All access into movement areas must be coordinated and approved by the on-duty Airside Operations Supervisor. All communications with the Air Traffic Control Tower (DVT ATCT) will be the responsibility of Airport Operations.

1. **No Construction within the RSA.**
   No construction may take place within the Runway Safety Area of an open Runway.

2. **Airport Operator Coordination.**
   Runway closures shall be coordinated with and approved by DVT Operations staff prior to any construction activities within the RSA.

3. **Blasting.**
   Excavation via blasting is not permitted for this project.

4. **Excavations.**
   a) No open trenches are permitted in the safety areas while the runway is open. In the event that excavations are located within the RSA and cannot be backfilled before the associated runway is to be opened to its full unrestricted operation, the Contractor shall immediately place a cover to allow for the safe operation of the heaviest aircraft operating on the runway without damage to the aircraft.

   b) Marking and lighting methods shall be used to delineate excavations in the construction areas in accordance with AC 150/5370-2G. Contractors must prominently mark open trenches and excavations at the construction site with red or orange flags, as approved by Airport Operations Staff and light them with red lights during hours of restricted visibility or darkness. The closure of taxiways will require that Section 9 and Section 14 be referenced for proper methods of NOTAMs issuance and visual aids to delineate the construction area. Coordination with the FAA will be discussed to determine the appropriate airspace evaluation requirements.

5. **Erosion Control.**
   The Contractor is responsible for maintaining the RSA standards for soil erosion including ensuring that the RSA is cleared and graded and has no potentially hazardous ruts, humps, depressions, or other surface variations. They will also be responsible for ensuring that, at the end of each shift, the unrestricted RSA is capable of supporting all vehicles and equipment that may traverse these areas along with the supporting the occasional passage of aircraft without causing structural damage to the aircraft. Silt screens shall be placed inside the grates of airfield catch basins in order to prevent construction debris from infiltrating the storm drain network.

18.b Runway Object Free Area (ROFA)

Construction may be permitted in the ROFA provided that all equipment be removed from the ROFA when not in use, and materials will not be stockpiled in the ROFA. All project phases have construction in the ROFA. Normal operations shall not be affected to complete construction within the ROFA.

18.c Taxiway Safety Area (TSA)

The Contractor shall ensure that no personnel or equipment enters into the active movement areas or their associated Safety Areas without appropriate Airport Operations escort. Access into movement area or Safety Areas without an Airport Operations escort is prohibited. All access into movement areas must be coordinated and approved by the on duty Airside Operations Supervisor. All communications with

the Air Traffic Control Tower (DVT ATCT) will be the responsibility of Airport Operations.

1. **No Construction within the TSA.**
   Typically no construction will take place within the Taxiway Safety Area of an open taxiway. In rare circumstances where the section of taxiway is indispensable for aircraft movement, open trenches or excavations may be permitted in the TSA while the taxiway is open to aircraft operations, subject to the restrictions outlined in Section 2.22.3.4.2 of FAA Advisory Circular 150/5370-2G. Portions of the Taxiway network are anticipated to be closed throughout the project. Phasing and construction limits have been established so that much of the work is outside any open, active taxiway safety areas. Connector taxiways will be closed at different times to enable construction and to prevent aircraft from entering any active TSA.

2. **Airport Operator Coordination.**
   Taxiway Safety Area dimension adjustments are the responsibility of the airport operator, ATCT and the proper FAA representative. A NOTAM must be issued in accordance with Section 9 of this CSPP as part of the TSA adjustment process.

3. **Blasting.**
   Excavation via blasting is not permitted for this project.

4. **Excavations.**
   a) No open trenches are permitted in the safety areas while the taxiway is open. In the event that excavations are located within the TSA and cannot be backfilled before the associated taxiway is open to unrestricted operations, the Contractor shall immediately place a cover to allow for the safe operation of the heaviest aircraft operating on the taxiway without damage to the aircraft.

   b) Marking and lighting methods shall be used to delineate excavations in the construction areas. The closure of both runways and various taxiways will require that Section 9 and Section 14 be referenced for proper methods of NOTAMs issuance and visual aids to delineate the construction area. Coordination with the FAA will be discussed to determine the appropriate airspace evaluation requirements.

5. **Erosion Control.**
   The Contractor is responsible for maintaining the TSA standards for soil erosion including ensuring that the TSA is cleared and graded and has no potentially hazardous ruts, humps, depressions, or other surface variations. They will also be responsible for ensuring that, at the end of each shift, the unrestricted TSA is capable of supporting all vehicles and equipment that may traverse these areas along with the supporting the occasional passage of aircraft without causing

structural damage to the aircraft. Silt screens shall be placed inside the grates of airfield catch basins in order to prevent construction debris from infiltrating the storm drain network.

18.d Taxiway Object Free Area (TOFA)

No construction may occur within the taxiway object free area while the taxiway is open for aircraft operations except as provided in Section 2.22.4 of FAA Advisory Circular 150/5370-2G. A portion of the construction activities in the AN8 infield will occur in Taxiway A's TOFA which is permitted subject to the following conditions:

- Taxiing speed is limited to 10 MPH.
- NOTAMs issued advising taxiing pilots of hazard and recommending reduced taxiing speeds on the taxiway.
- Marking and lighting meeting the provisions of AC 150/5370-2G and as described in Section 14 and Section 16 of this CSPP.
- Appropriate orange construction signs installed at the request of Airport Operations in accordance with AC 150/5370-2G and as described in Section 14.d of this CSPP.
- Five-foot clearance is maintained between equipment/materials and any part of an aircraft, including wingtip overhang. It will be necessary to move personnel and equipment for the passage an aircraft that cannot maintain such clearance.
- Flaggers furnished by the contractor must be used to direct and control construction equipment and personnel to a pre-established setback distance for safe passage of aircraft or airport personnel. Flaggers will also be used to direct taxiing aircraft.

Taxiways associated with this project have a restricted TOFA width of 89 feet. It is anticipated that a small portion of the construction activities to take place in the AN8 infield will need to occur within an active TOFA. Before this work takes place, the contractor shall notify the appointed DVT Operations Staff so that a NOTAM can be issued as described in Section 9.b of this CSPP. Refer to Section 5 on proper vehicle and personnel movement within safety areas. Any stockpiling of materials shall refer to Section 5.a for information on stockpiling of materials.

18.e Obstacle Free Zone (OFZ)

In general, personnel, material and equipment may not penetrate the OFZ while the runway is open for aircraft operations. The Runway Obstacle Free Zone (ROFZ) has a width of 400 feet. During all phases of work, all construction activity is completed during nightly runway closures. The timing and duration of closures is shown on the Phasing Plans in Appendix A.

18.f Runway Approach/Departure Surfaces

The Contractor shall take precautions to protect the runway approach/departure areas and clearway areas during construction and be sure that equipment is removed from the areas when not in use. No construction will take place within the Runway Protection Zone of an open runway. The project phasing and construction limits have been established so that all work is outside any open, active RPZs. No Construction activities are anticipated to occur in these areas.

19. OTHER LIMITATIONS ON CONSTRUCTION

19.a Prohibitions

Construction activities shall not interfere with any NAVAIDS, safety areas, obstacle-free zones, object free areas, approach and departure surfaces, and any threshold citing criteria. This includes limitations on equipment height and stockpiled material.

Contractors shall not use open flame welding or torches unless adequate fire safety precautions are provided, and the Construction Manager has approved their use. Under no circumstances should flare pots be used within the AOA at any time. The use of electrical blasting caps is not permitted on, or within 1,000 feet of, the airport property (see AC 150/5370-10, Standards for Specifying Construction on Airports).

19.b Restrictions

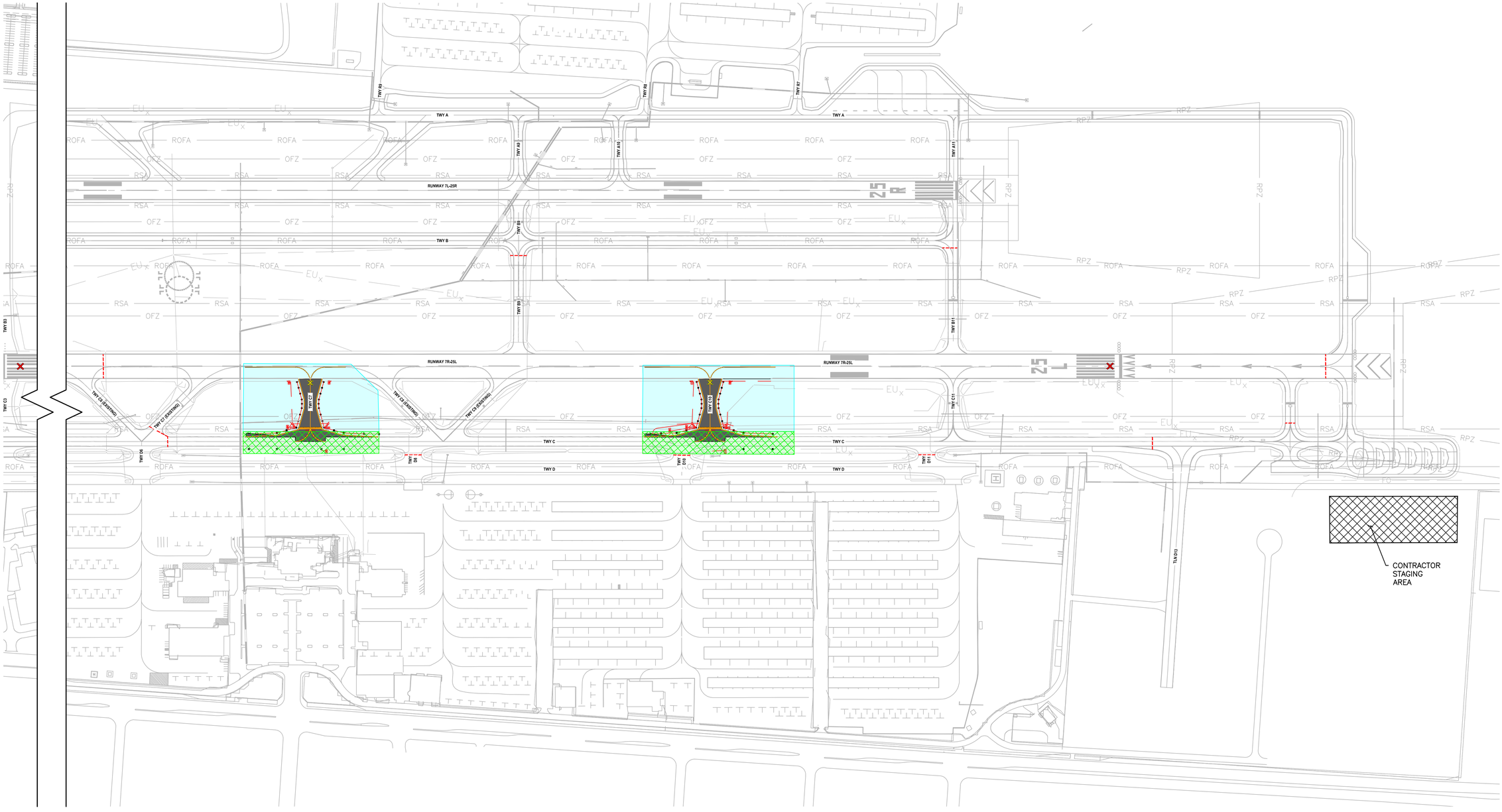
During Phase 1 and 2 Runway 7R-25L is closed nightly. Taxiway C is closed nightly between C7 and C13. Taxiways D6, D8, D10, D11, D12, and D13 are closed nightly. Taxiway A is closed nightly between Taxiway A11 and Taxiway A13. Taxiway A13 is closed nightly. Taxiways C7, C8, C9, and C11 are closed nightly. Taxiways B9 and B11 south of Taxiway B are closed nightly. The east run up area is closed nightly. Taxiway C10 is being demolished during this phase and is closed daily. All closures are lifted daily with the exception of Taxiway C10, and the airfield can continue operations without restrictions during the day.

During Phase 2, work will be completed at the edge of Taxiway C and will encroach into the Taxiway pavement. As a result, portions of Taxiway C will be closed 24 hours a day. During Phase 2, Taxiway C will be closed between Taxiway C7 and C11 daily. Taxiways D8 and D10 are closed daily. Taxiways C8 and C9 are closed daily. Taxiway C10 is demolished during Phase 1. Once Phase 2 is complete, the listed taxiways above will reopen.

During Phase 3 work will be completed to remove airfield lighting and signage and pavement markings associated with the old Taxiway C7. Work will occur at night and will involve the nightly closure of Runway 7R-25L. Taxiway C is closed nightly between C5 and C8. Taxiway C6, C7, C8, and C10 are closed nightly. Contractor site access will require DVT Operations Staff escort of all Contractor vehicles to the work site because the site access route is along portions of active Taxiway C. All

closures are lifted daily, and the airfield can continue operations without restrictions during the day.

APPENDIX A
PHASING PLANS



PHASE 1 AND 2 ELEMENTS:
PHASE 1 AND 2 ACTIVITIES GENERALLY CONSIST OF PAVEMENT SAWCUT, PAVEMENT REMOVAL, PAVEMENT MARKING REMOVAL, GRADING AND EARTHWORK, SUBGRADE PREPARATION, PAVING OPERATIONS, EXCAVATION FOR AND INSTALLATION OF PIPE AND STORM DRAIN STRUCTURES, EXCAVATION FOR AND INSTALLATION OF AIRFIELD ELECTRICAL INFRASTRUCTURE, LIGHTING AND SIGNAGE.

AREAS CLOSED TO AIRCRAFT OPERATIONS:
RUNWAY 7R–25L CLOSED NIGHTLY.
TAXIWAY B9 AND B11 SOUTH OF TAXIWAY B CLOSED NIGHTLY.
TAXIWAY C BETWEEN TAXIWAY C7 AND TAXIWAY C13 CLOSED NIGHTLY.
TAXIWAYS D6, D8, D10, D11, AND D13 ARE CLOSED NIGHTLY.
THE EAST RUN UP AREA IS CLOSED NIGHTLY.
TAXIWAY C10 IS CLOSED.

DURATION OF CLOSURES:
RUNWAY AND TAXIWAY RESTRICTIONS AND CLOSURES ARE EXPECTED NIGHTLY BETWEEN 2100 AND 0600 HOURS FOR THE ENTIRE PHASE DURATION OF A MAXIMUM OF 75 CALENDAR DAYS.

ARFF ACCESS ROUTES:
ARFF ACCESS ROUTES ARE TO BE MAINTAINED.

CONSTRUCTION STAGING AND STOCKPILE AREAS:
CONTRACTOR STAGING AND STOCKPILE AREAS ARE SHOWN.

IMPACTS TO NAVAIDS:
THERE IS NO ANTICIPATED IMPACT TO NAVAIDS DURING THIS PHASE OF CONSTRUCTION.

AVAILABLE RUNWAY LENGTH:
EXISTING AVAILABLE RUNWAY LENGTHS WILL BE MAINTAINED. NO REDUCTIONS TO THE EXISTING ADG ARE ANTICIPATED.

WORK ZONE LIGHTING FOR NIGHTTIME CONSTRUCTION:
LIGHTING EQUIPMENT MUST ADEQUATELY ILLUMINATE THE WORK AREA AND SHALL BE DIRECTED AWAY FROM THE ATCT. ALL SUPPORT EQUIPMENT, EXCEPT HAUL TRUCKS, SHALL BE EQUIPPED WITH ARTIFICIAL ILLUMINATION.

LEAD TIMES REQUIRED FOR NOTIFICATIONS:
THE CONTRACTOR IS REQUIRED TO NOTIFY AIRPORT OPERATIONS A MINIMUM OF 72 HOURS IN ADVANCE TO PROVIDE REQUIRED NOTIFICATIONS.

LEGEND

- PHASE 1
- PHASE 2
- LOW PROFILE BARRICADES AT 10 FT SPACING
- RUNWAY CLOSURE MARKER
- TAXIWAY CLOSURE MARKER

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NO	REVISIONS / SUBMISSIONS	DATE

PHX DVT BYR
CITY OF PHOENIX AVIATION DEPARTMENT

DVT TAXIWAY C CONNECTORS C4-C10 (GMP 1 - C7 AND C10)

AV31000096 FAA/ADOT

Designed by: GS
Drawn by: TR
Checked by: CJ
Date: 01/2024
Dwg scale: AS SHOWN

ADOT GRANT NUMBER(S):
E2S4V 01C & E3S3K 01C

SHEET OVERVIEW TITLE

CONSTRUCTION SAFETY & PHASING PLAN - PHASE 1 & 2 NIGHT WORK

SHEET REFERENCE NUMBER:
FIG. 1

SHEET 01 OF 04

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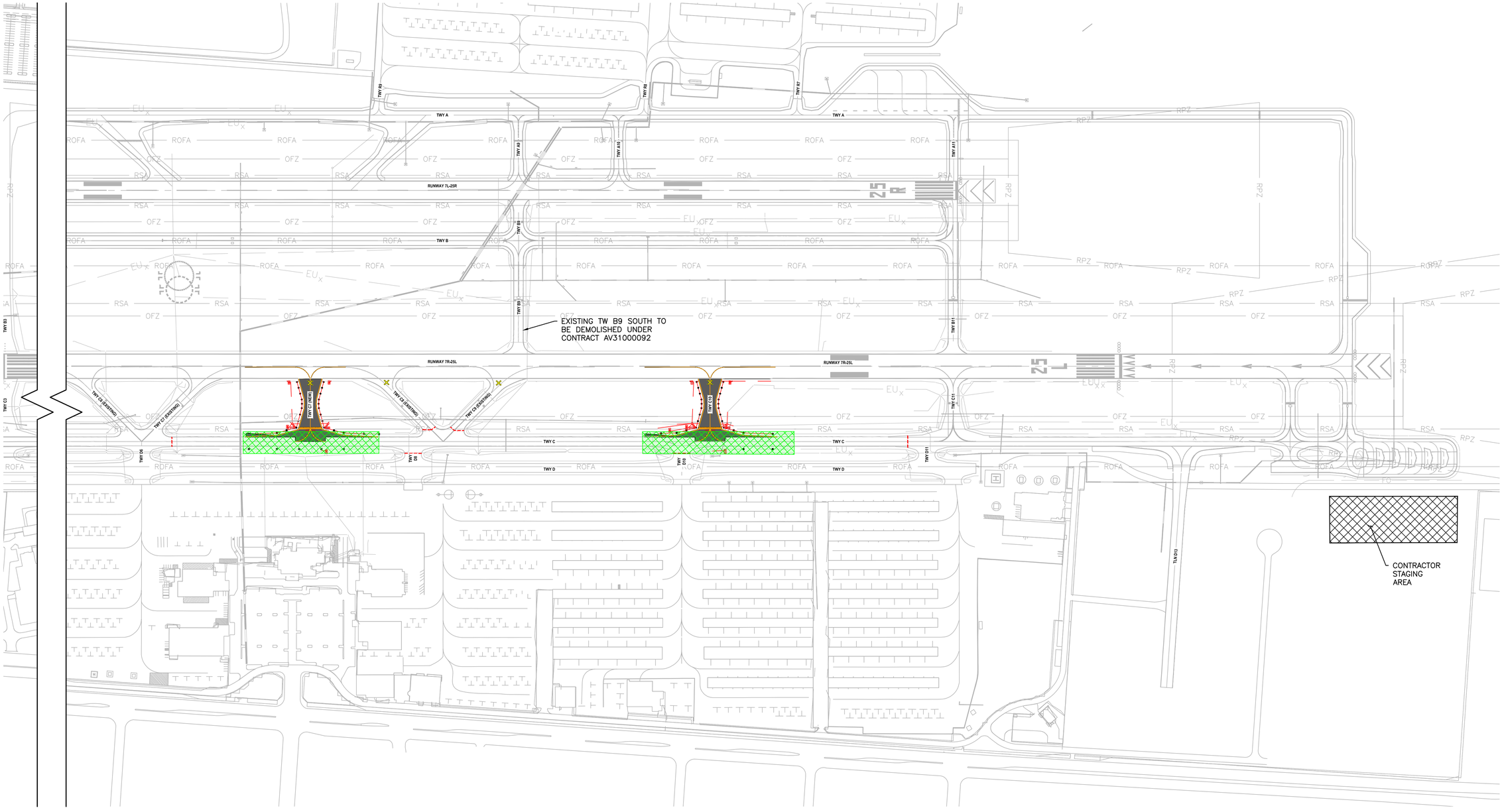

PHASE 2 ELEMENTS:
THE CONTRACTOR IS NOT PERFORMING ANY WORK DURING PHASE 2 DAILY CLOSURES.

AREAS CLOSED TO AIRCRAFT OPERATIONS:
TAXIWAY C BETWEEN TAXIWAY D6 AND TAXIWAY D11 CLOSED.
TAXIWAY C8 CLOSED.
TAXIWAY C9 CLOSED.
TAXIWAY C10 CLOSED.
TAXIWAY D8 CLOSED.
TAXIWAY D10 CLOSED.

DURATION OF CLOSURES:
RUNWAY AND TAXIWAY RESTRICTIONS AND CLOSURES ARE EXPECTED NIGHTLY BETWEEN 2100 AND 0600 HOURS FOR THE ENTIRE PHASE DURATION.

ARFF ACCESS ROUTES:
ARFF ACCESS ROUTES ARE TO BE MAINTAINED EXCEPT IN AREAS OF PAVEMENT DEMOLITION.

CONSTRUCTION STAGING AND STOCKPILE AREAS:
CONTRACTOR STAGING AND STOCKPILE AREAS ARE SHOWN.

IMPACTS TO NAVAIDS:
THERE IS NO ANTICIPATED IMPACT TO NAVAIDS DURING THIS PHASE OF CONSTRUCTION.

AVAILABLE RUNWAY LENGTH:
EXISTING AVAILABLE RUNWAY LENGTHS WILL BE MAINTAINED. NO REDUCTIONS TO THE EXISTING ADG ARE ANTICIPATED.

WORK ZONE LIGHTING FOR NIGHTTIME CONSTRUCTION:
LIGHTING EQUIPMENT MUST ADEQUATELY ILLUMINATE THE WORK AREA AND SHALL BE DIRECTED AWAY FROM THE ATCT. ALL SUPPORT EQUIPMENT, EXCEPT HAUL TRUCKS, SHALL BE EQUIPPED WITH ARTIFICIAL ILLUMINATION.

LEAD TIMES REQUIRED FOR NOTIFICATIONS:
THE CONTRACTOR IS REQUIRED TO NOTIFY AIRPORT OPERATIONS A MINIMUM OF 72 HOURS IN ADVANCE TO PROVIDE REQUIRED NOTIFICATIONS.

LEGEND

- PHASE 2
- LOW PROFILE BARRICADES AT 10 FT SPACING
- TAXIWAY CLOSURE MARKER

N

0 200' 400'

SCALE:1"=200'

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CITY OF PHOENIX AVIATION DEPARTMENT

DVT TAXIWAY C CONNECTORS C4-C10 (GMP 1 - C7 AND C10)

AV31000096 FAA/ADOT

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Drawn by: TR
Checked by: CJ
Date: 01/2024
Dwg scale: AS SHOWN

ADOT GRANT NUMBER(S):
E2S4V 01C & E3S3K 01C

SHEET OVERVIEW TITLE

CONSTRUCTION SAFETY & PHASING PLAN - PHASE 2 DAILY CLOSURES

SHEET REFERENCE NUMBER:
FIG. 2

SHEET 02 OF 04

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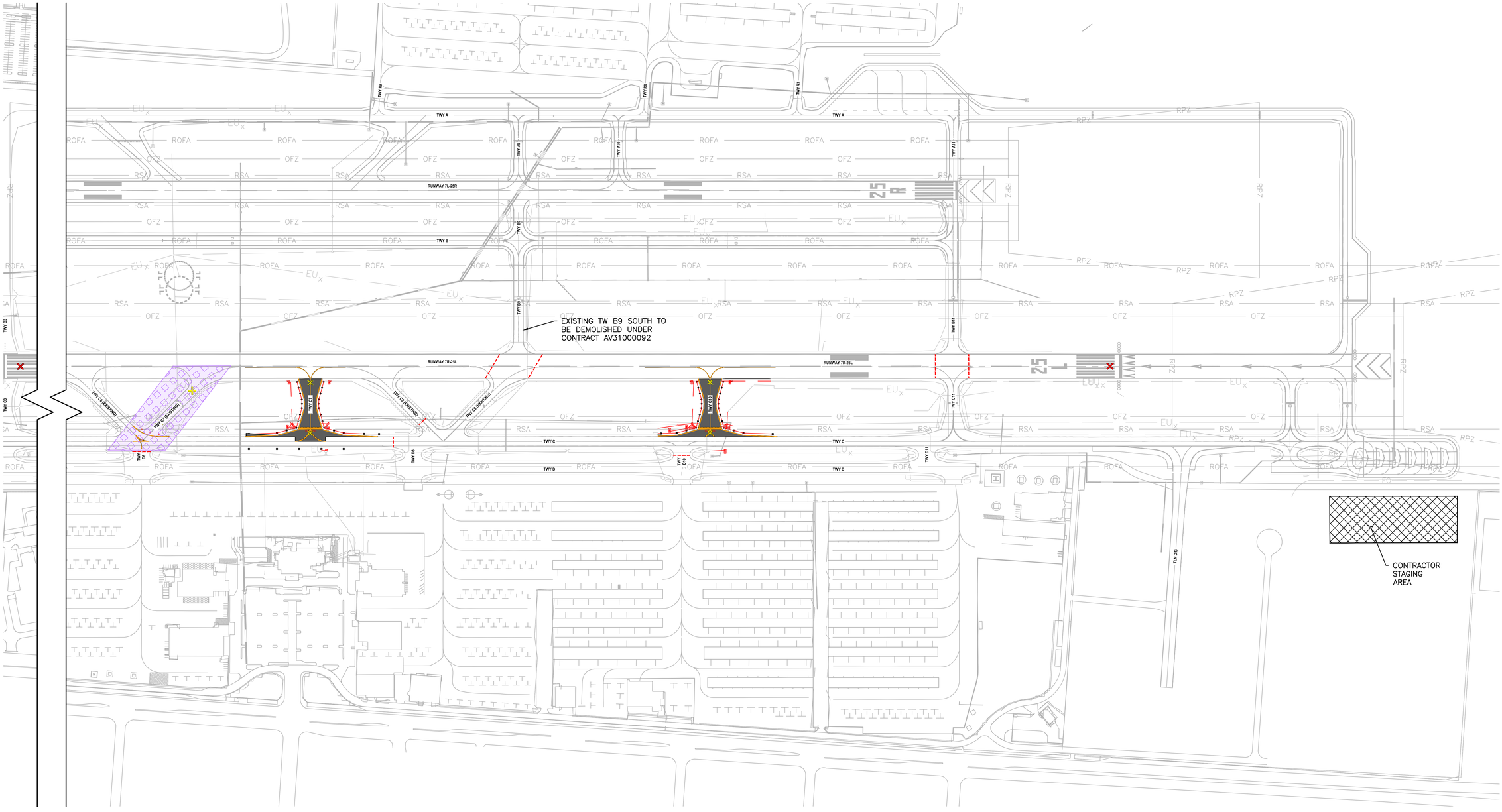

PHASE 3 ELEMENTS:
PHASE 3 ACTIVITIES GENERALLY CONSIST OF AIRFIELD SIGN REMOVAL, TAXIWAY EDGE LIGHT REMOVAL, PAVEMENT MARKING OBLITERATION, AND PAVEMENT MARKING APPLICATION IN THE VICINITY OF TAXIWAY C6.

AREAS CLOSED TO AIRCRAFT OPERATIONS:
RUNWAY 7R–25L CLOSED NIGHTLY.
TAXIWAY C CLOSED BETWEEN C5 AND C8 NIGHTLY.
TAXIWAY C6, C7, C8 AND C10 CLOSED NIGHTLY.

DURATION OF CLOSURES:
RUNWAY AND TAXIWAY RESTRICTIONS AND CLOSURES ARE EXPECTED NIGHTLY BETWEEN 2100 AND 0600 HOURS FOR THE ENTIRE PHASE DURATION.

ARFF ACCESS ROUTES:
ARFF ACCESS ROUTES ARE TO BE MAINTAINED EXCEPT IN AREAS OF PAVEMENT DEMOLITION.

CONSTRUCTION STAGING AND STOCKPILE AREAS:
CONTRACTOR STAGING AND STOCKPILE AREAS ARE SHOWN.

IMPACTS TO NAVAIDS:
THERE IS NO ANTICIPATED IMPACT TO NAVAIDS DURING THIS PHASE OF CONSTRUCTION.

AVAILABLE RUNWAY LENGTH:
EXISTING AVAILABLE RUNWAY LENGTHS WILL BE MAINTAINED. NO REDUCTIONS TO THE EXISTING ADG ARE ANTICIPATED.

WORK ZONE LIGHTING FOR NIGHTTIME CONSTRUCTION:
LIGHTING EQUIPMENT MUST ADEQUATELY ILLUMINATE THE WORK AREA AND SHALL BE DIRECTED AWAY FROM THE ATCT. ALL SUPPORT EQUIPMENT, EXCEPT HAUL TRUCKS, SHALL BE EQUIPPED WITH ARTIFICIAL ILLUMINATION.

LEAD TIMES REQUIRED FOR NOTIFICATIONS:
THE CONTRACTOR IS REQUIRED TO NOTIFY AIRPORT OPERATIONS A MINIMUM OF 72 HOURS IN ADVANCE TO PROVIDE REQUIRED NOTIFICATIONS.

LEGEND

- PHASE 3
- LOW PROFILE BARRICADES AT 10 FT SPACING
- RUNWAY CLOSURE MARKER
- TAXIWAY CLOSURE MARKER

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SCALE:1"=200'

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DVT TAXIWAY C CONNECTORS C4-C10 (GMP 1 - C7 AND C10)

AV31000096 FAA/ADOT

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Date: 01/2024
Dwg scale: AS SHOWN

ADOT GRANT NUMBER(S):
E2S4V 01C & E3S3K 01C

SHEET OVERVIEW TITLE

CONSTRUCTION SAFETY & PHASING PLAN - PHASE 3

SHEET REFERENCE NUMBER:
FIG. 3

SHEET 03 OF 04

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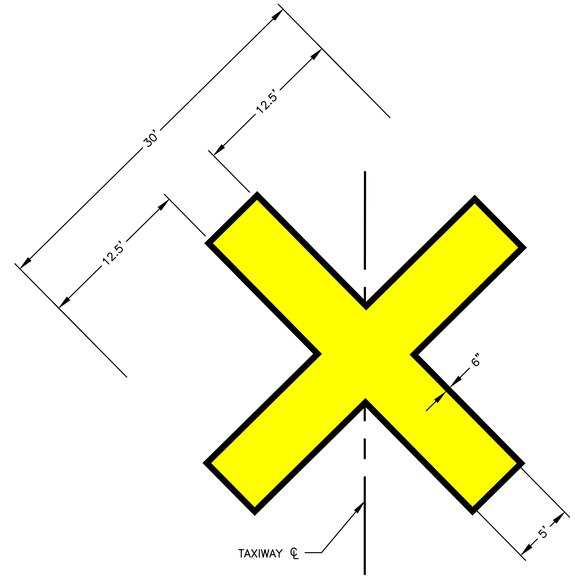
APPENDIX B
BARRICADE EXAMPLES

NOTE: BARRICADES AND THEIR PLACEMENT SHALL MEET THE REQUIREMENTS OF FAA AC 150/5370-2G OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION.

A
–
LOW PROFILE BARRICADE - TYPE 1 (TWO FLASHING RED LIGHTS)
N.T.S.

NOTE: BARRICADES AND THEIR PLACEMENT SHALL MEET THE REQUIREMENTS OF FAA AC 150/5370-2G OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION.

B
–
VERTICAL PANEL BARRICADE (FLASHING RED LIGHT)
N.T.S.



NOTES:

1. CLOSED TAXIWAY MARKINGS SHALL BE YELLOW PAINT. YELLOW MARKINGS SHALL HAVE RETROREFLECTIVE MEDIA.
2. PLACE 50' FROM RUNWAY EDGE WHERE APPLICABLE.

C
–
CLOSED TAXIWAY X
N.T.S.

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CONSTRUCTION PHASING DETAILS

SHEET REFERENCE NUMBER:
FIG. 4

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