400 AIRWAYS AVENUE
SAVANNAH, GA 31408
912.964.0514

TO: All Plan Holders
Dodge Data & Analytics
Construction Market Data Group
ISQFT
Savannah Entrepreneurial Center
Construction Journal

FROM:

James Aiello
Assistant Director of Engineering

DATE: April 18, 2024

SUBJ: SAC 30610
Air Cargo Facility

Savannah Airport Commission

Attached please find Addendum No. 2 to the contract documents. All bidders shall acknowledge the receipt of Addendum No. 2 in the place provided in the bid proposal.

CM
ENCL: SAC 30610 – Addendum No. 2
CC: Engineering Files

SAVANNAH AIRPORT COMMISSION

SAC 30610
Air Cargo Facility
Addendum No. 2

The following amendments, additions, deletions shall be made to the contract documents. In so far as these documents are at variance with this Addendum No. 2 dated April 18, 2024, the addendum shall govern:

Bid Deadline Extension

Pre-Bid Conference No. 2 Minutes and Record of Attendance

Questions & Answers

Revised Bid Schedule

Revised Specifications

Drawing Revisions to Site Package, Building 1, and Building 2

The bid deadline will be extended to Tuesday, April 30, 2024 at 1:30 PM EST. All bids are to be hand delivered or mailed by this time. SAC Office Hours are 9A-5P. Late bids will be considered non-responsive.

The deadline for questions will not be extended.

Pre-Bid Conference No. 2 was held on Tuesday, April 2, 2024 at 1:30 PM EST. There were no new attendees, and the meeting was adjourned. Please refer to Addendum No. 1 for the Pre-Bid Meeting Minutes. The Record of Attendance for the second pre-bid conference is attached in this addendum.

Questions 1 through 11 are from JC Roussel of EE Reed:

1. Building #1 - Architectural Sheet A1-/1A-351
   The published roofing specification calls out 6.5" of extruded polystyrene board, while A1/1a-351 calls out a 5" thickness of some generic insulation. Please specify which item is required.
   Response: GC to provide code minimum R25 roof insulation.

2. Building #1 - Architectural Sheet A1-/1A-351
   The published roofing specification calls out a 5/8" water-resistant cover board, while A1/1a-351 calls out a ½" generic cover board. Please specify which item is required.
   Response: GC to provide 5/8" coverboard per spec.

3. Specification section "075419-13 - Polyvinyl-Chloride (PVC Roofing)", Item (C1,C2)
   The specification calls for the base layer of insulation to be fastened, and all other layers adhered. This is in conflict with the use of the induction-welded plates, which requires fasteners to penetrate through all layers of insulation.
   Response: GC to provide fasteners through all layers of insulation.

4. Specification section "075419-13 - Polyvinyl-Chloride (PVC Roofing)", 2.7 C
   The written specification also calls for a fabric-backed membrane to be adhered to the insulation. This is also in conflict with the induction-welding method, which requires a smooth-backed membrane and no adhesive.
   Response: The bidder should be able to price the PVC roofing system to meet specifications and warranty requirements. The specified roof remains in the contract and the roofing system specified should be installed per the manufacturer's requirements.

5. Civil Sheet CG502
   Please see the attached detail. The Trench Drain body is rated Din C, while the Grate detail 860D is rated Din C and the 876D is rated Din D.
   Can we get some clarification on which grate is to be used? Please see the DIN load rating chart for review.
   Response: Load Class shall be Class C for trench drain. ACO Product data for both 876D and 860D is listed as Class C.
   https://acoswm.com/drain/klassikdrain/k300/#1588738745567-ff850a7f-fd5e.
   Specification 334200 - Stormwater Conveyance specification does not contain any references to fabric-backed membrane adherence.

6. Specifications Section 282000 - Video Surveillance
   After further review of the specs for this RFP. We're not seeing any reference to the total number of cameras needed nor a quantity for each type of camera. Is there a specific manufacture that is required? If so, what are the specific camera models you would like to use and what quantities?
   Response: Some cameras are provided by Tenant Security Vendor and represented by a camera symbol. Cameras are shown on plans in enlargement sheets ES-203 and Site Plans ES-111 - ES114. The specific Manufacture is Pelco as shown on CCTV Equipment Schedule on ES-204 which has related tags on ES-203.

7. Does the Buy American Act apply to this project? We haven't been able to find any reference to it in the specs.
   Response: No, Buy American Act does not apply to this project.

8. Spec sections 260533 (Raceway and Boxes for Electrical Systems) and 260533.13 (Conduits for Electrical Systems)
   Spec sections 260533 (Raceway and Boxes for Electrical Systems) and 260533.13 (Conduits for Electrical Systems) contradict each other in several places. For instance, 260533 – 2.10 – C – 2 – b. requires EMT fittings to be compression but 260533.13 – 2.13 – E – 2 – b. calls for them to be set-screw. Which one of these spec sections takes precedence?
   Response: Spec section 260533 takes precedence.

9. Spec sections 260533 & 260533.13
   Spec sections 260533 & 260533.13 are somewhat unclear as to whether PVC elbows are allowed. 260533 – 3.3 – D – 4. States to "change from ENT to ERMC before rising above floor." 260533.13 – 3.2 – C – 7 – e. states to "change from ENT to IMC before rising above floor." Are PVC elbows allowed in these instances or does the transition have to occur before the elbow? Also, is it acceptable to stub up PVC where concealed in walls to the first box / device?
   Response: Conduit must transition from PVC to RGS prior to rising through the floor slab. Elbows must be coated RGS. Do not provide PVC stub ups through floor slab.

10. Spec section 271323 (Communications Optical Fiber Backbone Cabling
    Spec section 271323 (Communications Optical Fiber Backbone Cabling) is listed on the legend of Volume 2 – Technical Specifications, but is not included in the specs. Will the fiber optic cabling and all voice / data cabling be provided by owner or others since it is not included in the specs?
    Response: To be provided by the contractor.

11. Spec section 260519 (Low-Voltage Electrical Power Conductors and Cables) Spec section 260519 (Low-Voltage Electrical Power Conductors and Cables) mentions Multiconductor Cable but never spells out exactly where MC Cable is allowed. Our assumption is that MC Cable will be allowed for all branch circuits where concealed in walls and above ceilings, as well as in exposed bar joists in the warehouse areas. Please confirm this assumption is correct.
    Response: No MC cable

<u>Questions 12 through 24 are from Mike Winn of CPPI:</u>

12. General Conditions Section 17 - Security and The Supplementary General Conditions describe security requirements when the work is in the terminal or on the active airport property. At the prebid, it was stated that this project is in a segregated area and not subject to badging requirements. We are requesting that security requirements by addendum.
    Response: Badging is not required for this project.

13. General Conditions 13.5.1 states that "The Contractor shall bear all costs of such inspections, tests, unless otherwise provided herein." There are several references to testing in other sections. We need to ask the question as to exactly what testing costs the GC will need to carry in the bid.
    Response: It is the contractor's responsibility to provide all quality control as specified in the specifications. The owner will provide quality assurance testing and special inspection testing.

14. 12.01 of spec 03300 says field sampling and testing shall be performed by an independent testing lab hired and paid for by the Owner. However, 12.02 reads as though the Contractor is responsible for paying for the concrete testing. Should one of these sections of the spec be removed for clarification?
    Response: 12.02 states contractor shall pay for testing for a "proposed material item or mix design" that differs from what is called out in the contract drawings. The contractor is responsible for quality control testing, the owner will perform quality assurance and special inspections testing.

15. The ITB, page 4 references the need to affix a Utility Contractor's License to the bid envelope. As this project includes utlity work but, is not a utllity only scope of work, does the requirement apply?
    Response: The Instructions To Bidders will remain as written in the contract documents and the general contractor needs to comply with current Georgia Law.

16. 1.3B5 of spec 064116 calls for AWI QCP label to be applied to shop drawings. This adds costs and time to get the shop drawings prepared. There are other AWI requirements listed throughout the spec. Are the AWI Quality Certification Program requirements listed really required for this project?
    Response: Yes, AWI QCP labels are required.

17. Reference 2G-002 - Sheet Index. The following sheets in the building 2 drawings are listed in the sheet index but cannot be found in the files that we downloaded. G-001 Cover Sheet, G-002 Sheet Index, 2F-001 Fire Protection General Notes & Legend, 2F-101, Fire Protection Overall Plan, 2F-101A Fire Protection Plan - Area A, 2F-101B Fire Protection Plan - Area B, 2F-101C Fire Protection Plan - Area C, 2FA001 Fire Alarm General Notes & Legend, 2FA101 Fire Alarm Overall Plan, 2FA101A Fire Alarm Plan - Area A, 2FA101B Fire Alarm Plan - Area B, 2FA101C Fire Alarm Plan - Area C, 2FA501 Fire Alarm Riser Diagram & Operational Matrix. Please provide the missing sheets or confirm that these are not needed for this project.
    Response: These drawings have been provided in Addendum No. 1.

18. Per the Contract & Bonds section of the front end, we have 610 calendar days to be substantially complete after NTP. What is the allowable duration of calendar days between Substantial Completion and Final Completion?
    Response: Sheet C-1: The total contract time or final completion is 610 calendar days. Substantial Completion is 580 calendar days.

19. 8.2.5 of General Conditions states "FINAL COMPLETION - 610 calendar days." However, the Contract & Bonds section reads that the duration from Notice-to-Proceed to SUBSTANTIAL COMPLETION is 610 calendar days. Please confirm that 8.2.5 should say Substantial Completion instead of Final Completion.
Response: The total contract time or final completion is 610 calendar days. Substantial Completion is 580 calendar days.

20. 3.7.1 of the General Conditions section of the front end says, "The Contractor shall obtain all permits and pay all fees as required by the City of Savannah or others." Beside plan review and building permit fees from the City of Savannah, are there any other permit fees that we should include in our bid amount? Please advise.
Response: The Contractor must coordinate with the City of Savannah to determine if any other permits or fees are required.

21. There are several references to Federal requirements throughout the front-end documents. However, Section H of the DBE Requirements document states "NOTE: This is a non-federally funded Contract." Do the Federal requirements pertain to this project, in whole or in part? Please clarify.
Response: Yes, this is a non-federally funded project. Yes, the project adheres to other Federal Requirements. The Davis-Bacon Act applies which means the Contractor must adhere to the Davis Bacon Wage Rates included in the specifications.

22. Will a site visit be scheduled? Please advise on date and time.
Response: A site visit must be scheduled prior to bid date. A bidder may propose a time and date to Crystal Mercado, cmercado@flysav.com, and a site visit will be scheduled.

23. Keyed note 4 on sheet ES-101 says the cost for GPCO to provide electrical service to the facility shall be included in the contractor's bid. Will the Owner establish an allowance amount that shall be included? Please advise what amount should be included in contractor's bid.
Response: The Contractor must coordinate with GPCO to determine the cost.

24. Keyed note 3 on sheet ES-101 says the cost for AT&T to provide telephone service to the facility shall be included in the contractor's bid. Will the Owner establish an allowance amount that shall be included? Please advise what amount should be included in contractor's bid.
Response: The Contractor must coordinate with AT&T to determine the cost.

Questions 25 through 65 are from Juan Romero of Johnson-Laux Construction:

25. The specs call for edge of dock levelers but lists under the specs for an electrical/hydraulic operation and mechanical operation with no other info on drawings to indicate what is requested. They do list another spec for the restraints to be integrated with leveler which would only make sense if it was an electric/hydraulic edge of dock leveler. Please advise.
    Response: GC to provide manual hydraulic edge of deck leveler.

26. Can a permit cost amount or allowance be provided for bidding purposes?
    Response: No

27. Will Savannah-Hilton Head Airport be hiring their own vendor to perform the low voltage scopes of work? Structured cabling, access controls, security systems, etc.
    Response: No low voltage is part of the contract.

28. Will be a background check required?
    Response: No

29. Is signage by GC or by Savannah-Hilton Head Airport?
    Response: The GC is responsible for signage as shown in the plans.

30. Being a tilt project, please provide with the crane maximum heights, crane restrictions on hours, flagging, permit, etc.
    Response: In accodance with specification section 010300 - Airport Project Procedures, the contractor is required to follow FAA AC 150/5370-2 which requires submission of a Notice of Proposed Construction or Alteration (Form 7460-1) for equipment such as a crane. The crane shall be below the horizontal surface (Elev: 200) since the site is outside of the transitional surface.

31. Will the 5’ schedule work limit fence on the backsides of the building be for the full duration on the project, or can it be pushed back to access the exterior face of the tilt panels? Please advise.
    Response: The 5' schedule work line is not a fence but divides how work shall be paid for under the contract documents. Unless otherwise noted on sheet G-004 and G-005, all work inside the 5' schedule work line should be bid under Schedule B for Building 1 and Schedule C for Building 2. The 5' schedule work line does not prevent work for Building 1 or Building 2 from extending beyond the 5' schedule work limit. See sheets C-004 and C-005 which illustrate temporary fencing during construction.

32. Are there any project-site specific requirements? For example: noise/working time restrictions, etc. Please advise.
    Response: there are no noise or work restrictions. Typical work hours are between 7:00 AM to 5:00 PM Monday through Friday. The Airport can accommodate additional hours if given advance notice.

33. Do you have an initial timeline to understand construction phases or staggered simultaneous construction, etc.? Please advise.
Response: This is the contractor's responsibility. We will not dictate means and methods to the contractor.

34. Can some of the tilt panels be cast on the building slabs or is 100% off pad casting beds required (effects crane size & reach)? Please Advise.
Response: Sheet 1S-002 and 2S-002 note C.16 addresses this question

35. Would your mason be doing the tiebeams with the block filled cells prior to metal deck installation (see sheet 1S318 typical details)? Please advise.
Response: Construction sequencing is by the General Contractor. Concrete tie beams are supported by the masonry below.

36. There's no sheet metal spec. It's listed in the PVC roofing spec as "Section 076200", but it's missing from the manual, and it's not shown in the Table of Contents. Will it be issued? If not, is there any guidance in what kind of metals we should quote? Please advise.
Response: The sheet metal spec section has been added to the manual per this addendum Specification Section 076200

37. Is any of this project going to take place in the secure areas of the airfield? Please advise.
Response: Yes, the plans show that a temporary fence will be erected. This will allow work to be performed landside. At the end of the project, the temporary fence will be removed.

38. The specs call for edge of dock levelers but lists under the specs for an electrical/hydraulic operation and mechanical operation with no other info on drawings to indicate what is requested. They do list another spec for the restraints to be integrated with leveler which would only make sense if it was an electric/hydraulic edge of dock leveler. Please clarify.
Response: GC to provide manual hydraulic edge of deck leveler.

39. Could you please clarify the discrepancies between the published roofing specification and A1/1a-351 regarding the following elements: the 5/8" Type X unprimed substrate board, the 6 mil poly vapor barrier, the thickness of insulation (6.5" of extruded polystyrene board versus 5" of generic insulation), the water-resistant cover board (5/8" versus ½"), and the absence of a generic protection mat?
Response: GC to provide code minimum R25 roof insulation. GC to provide 5/8" coverboard per spec.

40. The specifications (Volume 2, page 101423.16-3 or page 480) reference Boeing Signage Standards. However, these Signage specs are not included in the job documents. Please advise.
Response: Please refer to response to Question 3 in Addendum No. 1.

41. Due to the sitework bid form being all unit costs can you please confirm we are to bid off of those quantities shown on the bid form only? If there are discrepancies between quanities on the bid form and what is actually on the plans we are to price per bid form correct?
    Response: The contract document proposal form states that quantities shown in the Bid Schedule are approximate only and that increases or decrease in quantities shall be paid for by use of the appropriate unit price if shown on the applicable bid schedule. If discrepancies are found by the contractor during the bidding process, a specific RFI may be submitted to evaluate the quantity for the pay item. See revised bid form.

42. What are we to do if there is schedule A work shown on the plans and not on the schedule A unit cost bid form? Are we to bid schedule A work off of the bid form only?
    Response: No additional payment shall be made for items of work for which a separate pay item is not specified herein per section 011500 Measurement and payment. Contractor may submit RFI for specific project elements during the bidding process for inclusion in the pay items.

43. Please confirm once the temporary fence shown on C-004 is up then all work to the south of the fence line will be considered landside and no longer in the AOA?
    Response: Once the temporary fence is installed on C-004, all work south of the fence will be considered landside and no longer in the AOA.

44. Please confirm if all pavement identified on site package on sheets C001-CP503 (including curb and gutter, sidewalk, loading dock pavement, airfield pavement, and asphalt pavement) related with Bldg 2 will be paid under schedule C, per Note 12 on sheet G-005.
    Response: All pavement illustrated on C-001-CP503 shall be paid for under Schedule A. Please Addendum no. 2 for revised note 12 on sheet G-005.

45. Will be a Geotechnical Report provided? Please advise.
    Response: Please refer to Addendum No. 1

46. Per Civil Set notes #1 on Sheet C-001. and Per Note 14 - Runway and Taxiway Visual AIDS on sheet C-003 barricades will be required. Please indicate where the cost for the barricades (low profile, ligthed) will be located.
    Response: The cost for barricades will be covered under section #010310 - TRAFFIC CONTROL item 010310-1.

47. Per Sheet Notes #4, Contractor shall maintain a sweeper to keep the apron free of debris and FOD at all times. Where this cost be associated? Please advise.
    Response: The cost for the sweeper will be covered under section #010000 MOBILIZATION.

48. Sheet CD102 shows a demolition of an existing gravel road. Please indicate where the cost for this item will be located.
Response: The cost for this item will be covered under SECTION 312000 - EARTH MOVING and shall be included under item 312000-1 Embankment in Place. See Civil Demolition sheets for further information.

49. Please indicate where the Fence warning sign cost, shown on Det.(A1/CS505), will be located? Signage or 8' TALL AOA CHAIN LINK FENCE?
Response: All fencing warning sign cost would be included along with the installation of 8' Tall AOA chain link fence. See Addendum #2 SECTION 323113.53 – CHAIN LINK FENCES AND GATE for clarification that signage will be incidental to the installation of the Chain Link Fence.

50. Key notes #40 on sheet CS104 refers to concrete flume type A. The detail indicated, A1/CG503, does not match with a concrete flume. Please advise.
Response: Please see Addendum#2 detail C2/CG501 for revised. Sheet CS104 Keynote #40 has been revised to reference detail C2/CG501.

51. The gas line will be installed by Atlanta Gas Light. Please indicate if the GC will be dig the gas trench and back fill it.
Response: GC will not be required to dig the gas trench, nor backfill it, per Atlanta Gas Light. Atlanta Gas Light to complete trenching, installation, and backfill from connection point to meter.

52. There is no line item in unit price list provided for locating utilities. Please indicate where this cost will be located.
Response: The cost to locate utilities shall be considered incidental to project.

53. Sheet 5 of the topographic survey shows an existing double 8'x14' box culvert. Sheet CG101 indicates the construction of an extension of that existing box culvert with a double 10'x8' box culvert. Please indicate the correct size of the double culvert extension.
Response: The Box culver is double 10' x 8'.

54. Is the GC responsible for paying TAP and impact fees? If so can the amount to be included in our proposals be provided for bidding purposes?
Response: GC to pay for all City of Savannah Water/Sewer Tap & Impact Fees

55. The specifications and formulas reference "see section 09 6623 for stone mix and matrix color requirements", section 096623 was not provided. Please advise.
Response: Spec section reference will be deleted.

56. Does the Rigid Inclusion design need to account for the new fill load?
Response: The rigid inclusion system (rigid inclusions and the transfer pad) is a deferred submittal / delegated design per the notes on 1S-002, 1S-004, 2S-002, 2S-004, and the specifications. The effects of the new fill on the rigid inclusions and the transfer pad need to be determined and accounted for by the deferred design / delegated design specialty engineer. This needs to be documented in the signed and sealed engineering drawings produced by this engineer.

57. Please provide the slab loading information. If 2.5 ksf is used for a sustained load over an area as large as a slab, it will increase scope and cost severely.
Response: Building 1 Slab loading requirement is shown on 1S-001. Revised foundation notes B.2.C, B.2.D., and B.2.G. on 1S-001 to clarify loading and bearing capacity requirements. Revised slab loading requirements on Note 13 on sheet 1S-111. Building 2 Slab loading requirements are on 2S-001. Revised foundation notes B.2.C and B.2.D on 2S-001 to clarify bearing capacity requirements.

58. The Rigid Inclusion system is a delegated design. Please consider omitting the Grout Mixture requirements in Specification section 2.5-A. These requirements (particularly the water/cement ratio) will force geotechnical contractors to use a mix that is not typical and perhaps unworkable, particularly given the reinforcement requirements.
Response: Specification 316320 Section 2.5 was revised to include the following: 1. Maximum water to cement ratio changed to 0.45; 2. Grout flow requirement was removed: 3. sump requirement was removed.

59. Please confirm you are requiring a 4 ft thick LTP for the slab in Section 3.1-B.
Response: The 4ft minimum shall remain.

60. Regarding Section 3.2-C, can a minimum length for the continuous #6 center bar in the RIs be specified? Since the length of each RI will depend on refusal depth, it will be impossible to know the length of each bar ahead of time. There won't be time in the field to custom cut each bar to length.
Response: Specification 316320 - Rigid Inclusion Soil Improvement, Revise paragraph 3.2C to read: "These elements shall be reinforced as required by the specialty designer but shall at a minimum have one #6 center bar at 30'-0" in length or entire pile length, whichever is less."

61. Please consider eliminating the time constraints in Section 4.3 -C. Rigid Inclusions are not auger cast piles. This constraint will increase schedule and cost.
Response: The time will remain.

62. Given that the RIs will have cutoffs below ground surface, how will the PIT testing be performed?
Response: This is to be determined by the specialty engineer. Options include excavation after curing or having the grade a little lower during installation and forming the top of the rigid inclusion with a Sono tube.

63. Please indicate where the cost for the retaining wall will be added?
Response: Per sheet note 1 on Sheet G-004, all items inside the 5-foot schedule limit line shall be paid for under Schedule B for Building 1. Per sheet note 1 on Sheet G-005, all items inside the 5-foot schedule limit line shall be paid for under Schedule C for Building 2. All Retaining walls are shown within the 5-foot schedule limit line.

64. Please provide the specifications for the temporary trailer.
Response: Refer to Section 015100 - Temporary Facilities. SAV does not require a trailer for its use. However, it is assumed that the GC desires to have a trailer and should specify trailer requirements for their use.

65. Please indicate where the cost of the jersey barriers will be located.
    Response: Cost of jersy barriers will be located under SECTION 010310 - TRAFFIC CONTROL

Questions 66 through 86 are from JC Roussel of EE Reed:

66. Detail D1/S501
    Please clarify if ¾" x 1' 6" long smooth dowels need to be placed at all control joints (saw cutting) or only between existing and new pours. Detail D1/S501.
    Response: Dowels need to be placed at all control joints as currently shown in the structural drawing.

67. Sheet No. 1I-601
    Finish Legend includes "CPT-1A - Recessed carpet (cut into 4" strips)", however, CPT-1A is not shown on the Finish Schedule. Please clarify where CPT-1A is to be installed.
    Response: Please see addendum for clarification on Sheets 1I-601 & 2I-601.

68. Sheet No. 1I-101
    Note 10 states "See also Transition details on sheet I-102", however, there are no Transition details shown on Sheet I-102. Please provide transition details for flooring types.
    Response: Transition details provided on sheet 1A-612.

69. Sheet No. 1I-102, 103
    "Tile" flooring is shown for WC (water-closets), but a product is not specified on Finish Legend. Please specify product.
    Response: GC to base product information for pricing products from finish legend on I-601, please see addendum drawings for clarification. See Sheets 1I-601 & 2I-601

70. Sheet No. 1I-103
    "VCT" shown on plans, however, not specified in Finish Legend on 1I-601. Please specify product.
    Response: GC to provide LVT per spec. Please see addendum for clarification. See Sheets 1I-601 & 2I-601.

71. Sheet No. 1I-601
    Porcelain floor tile "PT-1" noted in Note 9 and Item G in Finish Legend Key, also shown to be installed in M/W restrooms on finish schedule, however, PT-1 not indicated on Finish Legend. Please specify product.
    Response: GC to base product information for pricing products from finish legend on I-601, please see addendum drawings for clarification Sheets 1I-601 & 2I-601.

72. Sheet No. 1I-601
    Porcelain tile base indicated on Finish Legend Key and Finish Schedule, however, not indicated on Finish Legend. Please specify product.
    Response: GC to base product information for pricing products from finish legend on I-601, please see addendum drawings for clarification Sheets 1I-601 & 2I-601.

73. Sheet No. 1I-601
Finish Legend Key - Item E identifies "Special Coating", however, this is not identified to be used on the Finish Schedule, nor listed in the Finish Legend. Please confirm whether this is to be included, and if so, please specify product and include in Finish Schedule.
Response: Special coatings not required.

74. Sealed Concrete
The specification on Sealed Concrete is for a solvent based sealer. However, we can't locate any information on whether the slab needs to be ground prior to application or whether control joints need to be caulked. Please confirm.
Response: Grounding of slab is not required, control joints to be caulked per 3.13 Joint Filling spec 033000

75. Rubber Base
Rubber Base: Finish Legend(I-601), Finish Legend Key(I-601), Specifications all call for a different types/manufactures for base. Need conclusive answer on what to price.
Response: GC to base product information for pricing products from finish legend on I-601, please see addendum drawings for clarification Sheets 1I-601 & 2I-601.

76. LVT or VCT: Finish schedule calls for VCT, but specifications only have LVT. Please provide direction on what to include.
Response: GC to provide LVT per spec.

77. Carpet
Finish schedule (I-601) calls for every room to receive carpet "CPT 1". "CPT-1" appears to be a walk-off mat, not a standard carpet tile. Please clarify.
Response: GC to provide CPT-1 see addendum drawings for clarification

78. Carpet
Drawings 1I-101, 1I-102, 1I-103, 1I-601 reference VCT as a floor finish in numerous rooms. Specification 096519 only specifies an LVT-1 product. Please confirm whether the LVT product is to be installed in lieu of the VCT shown on the floor plans and schedule.
Response: GC to provide LVT per spec.

79. Carpet
Drawings 1I-101, 1I-102, 1I-601 reference CPT-1 as a floor finish in numerous rooms. CPT-1 on the finish legend is the carpet entry mat product. Finish legend refers to CPT-2, CPT-3, and CPT-4. These products are not specified in any room of the finish schedule. Are these products intended to be used in specific rooms?
Response: GC to see addendum drawings for clarification Sheets 1I-601 & 2I-601.

80. Carpet
Specification section 096813-Tile Carpeting does not reference any specific products, please confirm we are to price products listed in Finish Legend on I-601.
Response: GC to base product information for pricing products from finish legend on I-601, please see addendum drawings for clarification Sheets 1I-601 & 2I-601.

81. Carpet
    RB-1 listed in specification 096513 is a different product than RB-1 listed in the Finish Legend on Drawing 1I-601. Which is correct?
    Response: GC to base product information for pricing products from finish legend on I-601, please see addendum drawings for clarification Sheets 1I-601 & 2I-601.

82. Carpet
    RB-2 and RB-3 in specification 096513 are not referenced on the drawings. Are these products to be utilized?
    Response: No, GC to base product information for pricing products from finish legend on I-601, please see addendum drawings for clarification Sheets 1I-601 & 2I-601.

83. Carpet
    Finish Schedule, Base Finish on Drawing 1I-601 refers to #1 in the Base Key. Item 1 references VPI 301 Jet base. VPI 301 Jet is not listed in the Finish Legend or Specification 096513. Is this the base product to be utilized throughout the project?
    Response: GC to base product information for pricing products from finish legend on I-601, please see addendum drawings for clarification Sheets 1I-601 & 2I-601.

84. Carpet
    1I-601 Finish Legend Note 1 refers to 6" straight base and 9" base to be installed at F-2A/F2D fixture toe space. Where is this located?
    Response: This note applies to tenant provided service desk at the customer service area.

85. Carpet
    Specification section 096513.1.2 refers to rubber stair accessories. Details C1/D1/1A-541 do not specify any rubber stair treads. Are stairs to be sealed concrete to match adjacent floor finishes?
    Response: No rubber stair accessories are requiered, GC to follow details on A-541, stairs are sealed concrete.

86. Carpet
    There is no porcelain/ceramic tile called out for the bathroom floors/walls in building 2 on the finish legend 2I-601. The specifications list a manufacturer for PT-1, but not an actual product by the manufacturer. Please specify product.
    Response: PT-1 Atlas Concord Collection Fray

Questions 87 through 95 are from Juan Salcedo of Precision 2000:

87. Could you include a line item for the retaining walls on the loading dock? What is the type of concrete for these walls?
    Response: Should be covered under SECTION 033300

88. What is the purpose of the two concrete bands in the truck parking lot? Is detail CP503 – D1 the one to be used for these bands?
Response: Concrete bands are required per tenant. Detail D1/CP503 is to be used for concrete bands in the truck parking.

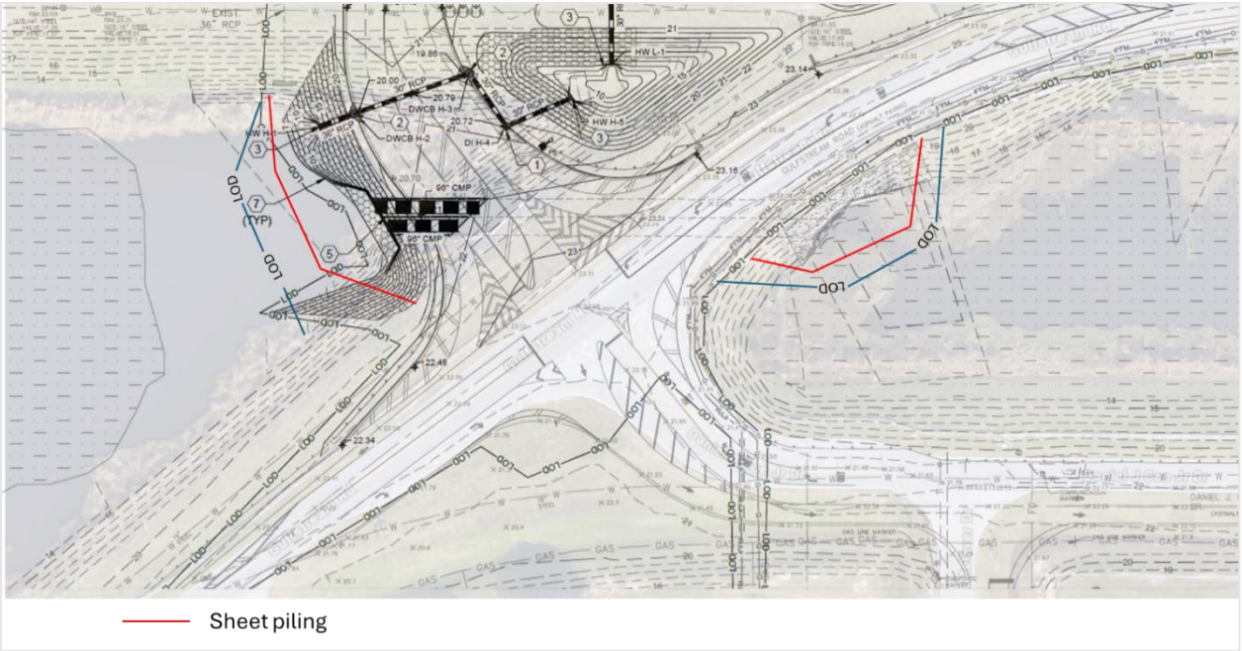
89. Are there any work hour restrictions on this project?
Response: No noise or work restrictions. Typical work hours are between 7:00 AM to 5:00 PM Monday through Friday. The Airport can accommodate additional hours if given advance notice.

90. Do you have any specific plan for dewatering the Box Culvert area?
Response: Please see paragraph DEWATERING 3.15 of SECTION 312000 - EARTH MOVING and additional requirements on CG101.

91. Is there any flow between one side of the pond and the other? What is the average base-flow on the existing Double 10' X 8' box culvert?
Response: The North Aviation Drainage Report prepared in 2011, states the box culverts serves as equalizer pipes between the Ponds. No base-flow was included in the 2011 report, and the seasonally high groundwater elevations are available in the geotech report in Addendum #1.

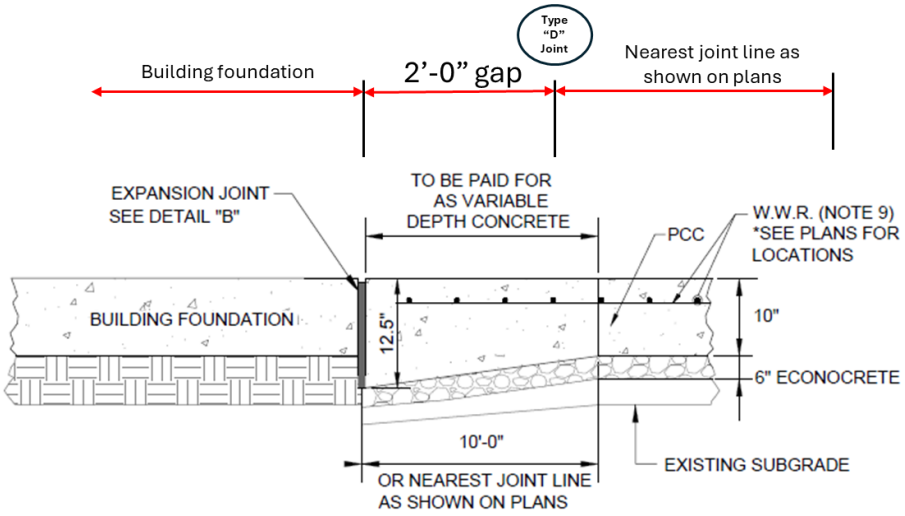
92. Are there any particular animal species we should be aware of when working in the pond?
Response: Wildlife is present in all ponds.

93. If there is no dewatering plan available, we ask for the LOD around the box culvert to be adjusted to be able to install steel sheet piling on both sides of the box culvert as presented in the following sketch.
Response: See Addendum #2 for revised limits of disturbance. See DEWATERING Section 3.15 in Specification 312000 - EARTH MOVING



94. Could you please confirm that the wingwall for the 10’X8’ Box Culvert is to be constructed as a 45° skewed wingwall? If so, could you please provide the dimensions charts, specifications, and reinforced construction drawings necessary for the construction of the wingwall?
Response: See revised sheets CG506 and CG507 for 45-degree skewed headwall.

95. Given the constraints of using paving equipment directly in front of the building, we're exploring an alternative approach. Would it be acceptable to the designer if we create a 2-foot gap in front of the building? This gap would provide space for us to set up paving forms for pouring the slab. After removing the forms, we would manually pour the 2-foot gap. Does this approach align with the project requirements?
Response: A Thickened edge will be required against the building slab. Contractor may submit paving sequencing plans addressing paving lanes, joints, doweling, etc. meeting design intent of the drawings for evaluation during construction.



B THICKENED EDGE EXPANSION JOINT

N.T.S.

Questions 96 through 128 are from Michelle Pearce of Samet Corporation:

96. Per review of the bid documents, there are no callouts on the print for locations of window treatments. Please advise on the requirements.
Response: Provide at all window locations.

97. Please clarify if ¾" x 1' 6" long smooth dowels need to be placed at all control joints (saw cutting) or only between existing and new pours. Detail D1/S501.
Response: For the building, dowels need to be placed at all control joints as currently shown in the structural drawing.

98. Please clarify what type of stone and thickness must be included for the SOG sub-base. Geotech report is calling for 12" underneath the slab (page 4).
Response: SOG supported by rigid inclusion and aggregate transfer pad per drawings and specifications. Rigid inclusions and aggregate transfer pad are delegated design items.

99. Please advise on what material is required to backfill the pour backs. Please confirm if on-site material is acceptable or if #57 stone is preferred.
Response: Similar to answer of question #98, SOG supported by rigid inclusion and aggregate transfer pad (including pour strip around perimeter of SOG). Aggregate transfer pad is a delegated design item.

100. Please advise if the rigid inclusion design need to account for the new fill load.
Response: The rigid inclusion system (rigid inclusions and the transfer pad) is a deferred submittal / delegated design per the notes on 1S-002, 1S-004, 2S-002, 2S-004, and the specifications. The effects of the new fill on the rigid inclusions and the transfer pad need to be determined and accounted for by the deferred design / delegated design specialty engineer. This needs to be documented in the signed and sealed engineering drawings produced by this engineer.

101. Please provide the slab loading information
Response: The slab-on-grade loading is stated on sheets 1S-001 & 2S-001 as 250 psf. Additional specialty slab loadings will be added/modified in an updated bid package.

102. Please consider omitting the Grout Mixture requirements in Specification section 2.5-A for rigid inclusion delegated design. These requirements (particularly the water/cement ratio) will force geotechnical contractors to use a mix that is not typical and perhaps unworkable, particularly given the reinforcement requirements.
Response: To allow for more flex ability the following will be modified: 1. Maximum water to cement ratio changed to 0.45; 2. Grout flow requirement will be removed; 3. sump requirement will be removed.

103. Please advise if soil cement or another form of soil stabilization is required. If so, please provide all requirements in order for accurate cost tracking.
Response: There is no soil cement or soil stabilization specified in the construction documents or in the specifications.

104. Please confirm the thickness associated for the LTP for slab construction. Please advise of any soil modulus' accounted for to ensure constructability can be achieved.
Response: The rigid inclusion system (rigid inclusions and the transfer pad) is a deferred submittal / delegated design per the notes on 1S-002, 1S-004, 2S-002, 2S-004, and the specifications. The specially soil improvement enginer must determine the LTP thickness based on the soil parameters and the spacing of thier rigid inclusion layout. The specification states that this thickness shall be as designed by the specialty designer but shall not be less than 48 inches thick under the slab-on-grade areas. The required subgrade modulus for the slab-on-grade is stated on sheets 1S-001 & 2S-002 (note B.4) as 200pci. Additional specialty slab loadings will be added/modified in an updated bid package. Please review the drawings and specification for additional requirements.

105. Please confirm a minimum length for the continuous #6 center bar in the RIs to be specified. Since the length of each RI will depend on refusal depth, it will be impossible to know the length of each bar ahead of time. There won't be time in the field to custom cut each bar to length.
Response: Specification 316320 - Rigid Inclusion Soil Improvement, Revise paragraph 3.2C to read: "These elements shall be reinforced as required by the specialty designer but shall at a minimum have one #6 center bar at 30'-0" in length or entire pile length, whichever is less."

106. Please consider eliminating the time constraints in Section 4.3 -C. As these are quite different from precast auger piles, this constraint will increase schedule and cost.
Response: The time constraint will remain.

107. Please advise on how the PIT testing will be performed. This is due to the rigid inclusions having cutoffs performed underground.
Response: This is to be determined by the specialty engineer. Options include excavation after curing or having the grade a little lower during installation and forming the top of the rigid inclusion with a Sono tube (which is what I have experienced in the past).

108. Please advise in lieu of Sargent and Corbin-Russwin, please advise on the acceptance of Allegion Products.
Response: GC to provide substitution form and to show product is of equal for architect to review and approve.

109. Per the bid documents, there is a discrepancy with the civil grading items. Th trench drain body is rated Din C, while the Grate detail 860D is rated Din C and the 876D is rated Din D. Please review rating document and advise on the clarification of what grating type to use.
Response: See the response to Question 5 in Addendum 2.

110. Due to lead time issues associated with the specified generator, in lieu of the 1500KW item which has had many items pressing on it increasing its lead times, here are two options to save time and cost. A 1250kW because the SE ATS is rated 2000A and the 1250kW provides 1875A. The 1500kW would be wasting 250A due to the ATS size of 2000A. Additionally, a pair of 750kW units with on-board paralleling in case the 1500kW is actually required. Please review both options and advise if acceptable.
Response: Please bid as shown.

111. Please advise if the project is slated to be a BAA (Buy American Act) Compliant project as done previously.
Response: No, The Buy American Act does not apply to this project.

112. Per bid drawings 1I-101, 1I-102, 1I-103, 1I-601 they reference VCT as a floor finish in numerous rooms. Specification 096519 only specifies an LVT-1 product. Please confirm the LVT product to be installed in lieu of the VCT shown on the floor plans and schedule.
Response: GC to provide LVT per spec.

113. Per bid drawings 1I-101, 1I-102, 1I-601 reference CPT-1 as a floor finish in numerous rooms. CPT-1 on the finish legend is the carpet entry mat product. Finish legend refers to CPT-2, CPT-3, and CPT-4. These products are not specified in any room of the finish schedule. Please confirm the specific products intended to be used in specific rooms.
Response: GC to base product information for pricing products from finish legend on I-601, please see addendum drawings for clarification. See Sheets 1I-601 & 2I-601.

114. Please confirm that 096813-Tile Carpeting does not reference any specific products. Please confirm if this is to be revised or omitted.
Response: GC to base product information for pricing products from finish legend on I-601, please see addendum drawings for clarification. See Sheets 1I-601 & 2I-601.

115. Per the bid documents, RB-1 listed in specification 096513 is a different product than RB-1 listed in the Finish Legend on Drawing 1I-601. Please confirm the product to be followed.
Response: GC to base product information for pricing products from finish legend on I-601, please see addendum drawings for clarification. See Sheets 1I-601 & 2I-601.

116. Per the bid documents, RB-2 and RB-3 in specification 096513 are not referenced on the drawings. Please confirm if this is to be revised or omitted.
Response: GC to base product information for pricing products from finish legend on I-601, please see addendum drawings for clarification. See Sheets 1I-601 & 2I-601.

117. Per bid documents and the specification section 096513.1.2, this is referring to rubber stair accessories. Details C1/D1/1A-541 do not specify any rubber stair treads. Please confirm if stairs are to be sealed concrete to match adjacent floor finishes.
Response: No rubber stair accessories are required, GC to follow details on A-541, stairs are sealed concrete.

118. Per the bid documents, 1I-601 Finish Legend Note 1 refers to 6" straight base and 9" base to be installed at F-2A/F2D fixture toe space. Please advise on the location of this item.
Response: This note applies to tenant provided service desk at the customer service area.

119. Per the bid documents, the finish schedule, base finish on Drawing 1I-601 refers to #1 in the Base Key. Item 1 references VPI 301 Jet base. VPI 301 Jet is not listed in the Finish Legend or Specification 096513. Is this the base product to be utilized throughout the project? Please advise.
Response: GC to base product information for pricing products from finish legend on I-601, please see addendum drawings for clarification.

120. Per the bid documents, hardware sets in the specs go from Set #1.0 to #28.0 and the openings listed in those HW Sets are for Building 1 only. The scheduled HW Sets for Building 2 go from HW Sets #36.0 through 48.0 but are NOT provided in the Specs. We do not have hardware sets for Building 2. Please advise if sets will be provided or if we should create sets using Building 1 and the Building 2 Tenant A through D notes on the Door Schedule as guides. (Preferable that hardware sets are provided)
Response: HW sets for building 2 will be provided in addendum. See Sheet 2A-601.

121. "Per the bid documents, there are no Wood Door Specs. Please advise the required veneer/cut, and finish as well as core construction and if any 'extras' are required like AWI Quality Certification Program, Urea Free, or FSC Certification.
Response: Wood door spec 081416 is be provided in addendum Please see Sheet 1A-601.

122. Per the bid documents, there are no wood doors scheduled for Building #1. This may be correct but there are several offices, a meeting room, etc.… that could have Wood Doors and since Building #2 has Wood Doors, we were wondering if Building #1 is incorrectly scheduled. Please confirm that Building #1 Door Schedule is correct as provided. For the wood doors in Building #2 see Note #3 above.
Response: Wood door spec 081416 is be provided in addendum Please see Sheet 1A-601.

123. Per the bid documents, there are no wood doors scheduled for Building #1. This may be correct but there are several offices, a meeting room, etc.… that could have Wood Doors and since Building #2 has Wood Doors, we were wondering if Building #1 is incorrectly scheduled. Please confirm that Building #1 Door Schedule is correct as provided. For the wood doors in Building #2 see Note #3 above.
Response: Wood door spec 081416 is be provided in addendum Please see Sheet 1A-601.

124. Per the bid documents, the HW Spec says to "match Facility standards" for keying. The Building 1 hardware sets have "SFIC 7-pin Housing" for cylinders and "SFIC 7pin, A Keyway and cam as required" for cores; however, the manufacturer is specified as "OT" (other). Does that mean these items will be provided by the Client to provide the cylinders and cores? If bidders are to include in our pricing, what series/manufacturer is required?
Response: GC to provide all cylinders and cores. SFIC 7 Housing, A Keyway and cam required to be installed by contractor. SAV will pin and install contractor provided core.

125. Per the bid documents, Building #1 Mezzanine shows a 45-minute rated 3'6 x 8'0 "Access" opening with no door tag. Should this be excluded as an Access opening by others, or included as a HM Door x HM Frame with hardware?
Response: GC to provide this door. Please see addendum drawings for clarification See Sheets 1A-105 & 1A-601.

126. Per the wall types, we have found two openings (#103A and 109 in Building #1) that occur in an STC42 acoustic rated partition. The Hollow Metal Door specs call for Ceco's Trio-E door series and states minimum STC38 for "Interior Doors". Reference: 81113-5,D-2B. Are ALL Interior Doors to be sound-rated or just the two in STC42 walls? If any need to be sound-rated, the specified Trio-E door is not available with a tested sound rating. Should we include Trio-E doors at #103A and 109 to match the balance of the doors and have the acoustic requirements achieved by wall construction only? Please advise.
Response: GC to provide STC rating at walls and doors as specified.

127. Per the bid documents, the Hollow Metal Specs suggest Storm Shelter Openings may occur on this project. Reference: 081113-2 E. If this is relevant to the job, please advise which openings are required to be storm shelter openings.
Response: No storm shelter openings are part of this job.

128. Per the bid documents, Hollow Metal Specs call for kerfed profile frames (integral gasketing included with frame). However, Building #1 hardware sets include gasketing separately. Please confirm that exterior frames would be approved with standard profiles and specified gasketing.
Response: GC to provide per hardware specifications.

Questions 129 through 164 are Juan Romero of Johnson-Laux Construction:

129. Please advise what the anticipated start date is for the project.
Response: July 2024

130. Could the crane access the north side of the buildings to mount tilt panels as shown on Sheet C-004?
Response: A crane can access the north side of the budlings. Sheet C-004 shows approximately 35'-55' between the building and the existing concrete ramp. Contractor shall coordinate with Airport, prior to placing any heavy weight equipment on the concrete ramp on the landside of the security fencing. The crane will need to be airspaced through the FAA and approved prior to being raised.

131. Is the security system by GC or by others? Is the GC to only include necessary conduit with pull strings?
Response: Contractor to provide conduit and pull strings.

132. Please advise on what low voltage related scopes of work are to be included in the GC bids.
Response: See Plans

133. Will GC be responsible for pulling any fiber optic cabling or are the GC's to only include conduit with innerduct per the site electrical plans?
Response: GC pulls cable and conduit.

134. Please confirm the access control scope of work will be handled by the tenant's vendor and not to be included in GC pricing. This would include gate operators, card swipes, card pedistals, building access controls, etc. GC will provide conduit with pullstrings only.
Response: Include in GC Pricing

135. Are precast site light pole bases acceptable or do the bases need to be poured in place?
Response: Precast light pole bases are acceptable

136. Is CCTV system by GC or owner vendor?
Response: The Airport Security will install the CCTV system for their cameras and the Tenant will install the CCTV system for their Cameras. The GC will install all the infrastructure (Conduits, Handholes, Cabinets) to each camera's location. See Sheets ES-111 - ES-113 for Tenant Camera locations and See Sheet ES-203 for Airport Security Camera Locations. Model numbers are referenced on Sheet ES-204.

137. Is network equipment by GC or owner vendor?
Response: By GC

138. Please confirm that the owner will hire an inspection agent firm to perform the special inspections services.
Response: Yes, SAC will contract out and perform Special Inspections for this project.

139. Please advise if background checks will be required since badging is not required.
Response: No

140. Carpet entry mat CPT-1, Carpet Recessed CPT-1A, Carpet - Queue Line CPT-2 and Carpet-General CPT-3 are all discontinued products. Please provide alternate products.
Response: Please see addendum for clarification. See Sheets 1I-601 & 2I-601

141. Section 075419 PVC Roofing conflicts with the Roof assembly listed on A1/1A-35. Please confirm the intended roofing assembly.
Response: Refer to roof assembly as specified.

142. Section 075419 PVC roofing calls out substrate board and vapor barrier. Please confirm this is requested for this project.
Response: **Yes, substrate and vapor barrier are required as part of PVC roof assembly.**

143. Section 075419 PVC roofing calls for a 6mil thick vapor barrier, which varies from manufacturer to manufacturer. Please confirm the intent that the manufacturer's vapor barrier be included with the requested system warranty.
Response: GC to provide vapor barrier per manufacturer system warranty.

144. Section 075419 PVC roofing requires the testing agency to perform four tests. Please confirm whether all four are needed or if that is at the agency's discretion.
Response: Yes, all four tests are required.

145. Reference is made to section 076200 Sheet Metal Flashing and Trim, yet project documentation does not include that section. Please advise.
Response: Sheet metal spec 076200 has been included in this addendum.

146. Please confirm if the roof expansion joint needs to be fire-rated.
Response: Fire rating not required at roof expansion joint.

147. Standing seam metal roof panels are mentioned on A3/1A-552+ C1 2A501. Please indicate if that is the intent, and if so, provide a specification section to coincide with the reference.
Response: These are pre-fab metal roof awnings; standing seam roof panels are by manufacturer.

148. Please confirm that roofing details, as shown on 1A-551 + 1A-552 and 2A-501+2A-502, are for reference, and manufacturers' warrantable details will supersede.
Response: Yes, roof details are shown for reference purposes.

149. Please provide Volume 1 of the Specifications- including Bid Instructions, Davis-Bacon requirements etc.
Response: The Plans and Specifications were sent as a full bid package via link to download. Please refer to email sent to Johnson Laux on February 28, 2024.

150. Please provide a schedule including all trades.
Response: This is the general contractor's responsibility to procure all trades necessary to complete this project.

151. Will the two buildings be constructed concurrently, end to end or phased? Multiple mobilizations? Please advise.
Response: Means and methods are the responsibility of the contractor. The General contractor will have the entire site.

152. Are there Liquidated Damages for this Project? Please advise.
Response: Please refer to the Contract & Bonds section Page C-2.

153. Are there any work hour restrictions on the Project? Please advise.
Response: No noise or work restrictions. Typical work hours are between 7:00 AM to 5:00 PM Monday thru Friday. The Airport can accommodate additional hours if given advance notice.

154. Are concrete washout bins required? Please advise.
Response: Yes, concrete washouts are required per the erosion control plan.

155. Will forming footings be required? Please advise.
Response: General Contractor to determine based on site conditions and geotechnical information.

156. Please identify the broomed finish interior slabs.
Response: There are no interior broom finished interior slabs.

157. For the roof assembly: Sheet 1A-352 indicates 1/2" cover board's thicnkess. 2.4 Substrate board in 075419-7 of the specs indicates a 5/8" thickness. Please clarify it.
Response: GC to provide 5/8" coverboard per spec.

158. Please provide the door hardware specifications for Bldg. 02.
Response: HW sets for building 2 will be provided in addendum. See Sheet 2A-601 and Spec section 087100.

159. DWG 1A-102, Note 044 calls for recess walk-off mats in Vestibule 100, Employee Entrance 104, & lobby 109. There are not details for these areas being recessed. Please indicate the depth of the recess in these areas.
Response: Recess not required for walk off carpets.

160. Please provide clarification on the installation procedure specified in the Finish Legend regarding the walk-off mat for recessed areas. Specifically, understanding the directive to cut the 19”x19” interface carpet tile into 4” strips.
Response: GC to base product information for pricing products from finish legend on I-601, please see addendum drawings for clarification. **See Sheets 1I-601 & 2I-601.**

161. Please advise what the starting height is for tilt wall rigid insulation.
Response: Rigid insulation should begin at slab level 0'-0" in warehouse and continue to the height at the bottom of roof deck. At the truck life alcoves, the rigid insulation should begin at the slab level negative 4'-0" and continue up to the bottom of roof deck.

162. In Drawing 2A-603 detail B-4 notes that there should be a terrazzo alternate. However, there is not information on a terrazzo alternate in the finish schedule or specs, or notes. Please advise.
Response: Note to terrazzo alternate will be removed.

163. Finish legend shows VCT and LVT. Finish schedule does not show a VCT. Please clarify these area flooring needs and specifications.
Response: GC to provide LVT per spec.

164. Please provide us with the specifications for the hard tile.
Response: GC to provide ceramic tile as specified.

Questions 165 through 193 are from Parker Golz of EE Reed:

165. Detail A3/1A-561
Detail states, "see finish legend for countertop". No countertop is shown on Finish Legend. Please specify product for support counter.
Response: GC to provide solid surface countertops and backsplash as indication on interior elevations & spec.

166. Detail C2/1A-561 & C2/1A-561

Detail states, "Backsplash, countertop & removeable skirt panel; see finish legend and interior elevations". No information is provided on elevations or Finish Legend. Please specify product for Woman's Restroom 116 and Men's Restroom 117.

Response: GC to provide solid surface countertops and backsplash as indication on interior elevations & spec.

167. Detail A2/1A-561

"Backsplash; See interior finish elevations and finish legend. No backsplash where tile backsplash is used" and "Countertop; See interior finish elevations and finish legend". No backsplash or countertop is specified in Finish Legend for Breakroom 118. Please specify products.

Response: GC to provide solid surface countertops and backsplash as indication on interior elevations & spec.

168. Detail A1/1A-561

Note on detail A1/1A-561 states, "See cabinetry notes for all interior finish and contruction req." No cabinetry notes found in drawings. Please clarify.

Response: Please see addendum for clarification. See sheet 1A-561.

169. 1I-G104

There is a "?" for WC signage on 1I-G104 Signage Plan. Please clarify.

Response: Please see addendum for clarification. See sheet 1IG104.

170. Sheet No. 1A-401

Item "038 ADA compliant water cooler" on Keynote. Water line on plumbing drawings not shown to this location. Please clarify.

Response: GC to provide where indicated on Arch drawings.

171. Toilet Accessories

Toilet accessories: Specs identify GB-4, however, GB-4 is not indicated on drawings, Please clarify.

Response: GB-4 is not applicable.

172. Sheet 1A-002

Sheet 1A-002 shows FHD Feminine Hygiene Dispenser. FHD not shown on lavatory elevations and is not listed as item in specifications. Confirm whether to include.

Response: Provide as indicated on accessory schedule shown on drawings. Please see addendum for clarification. Sheets 1A-401 & 1A-402.

173. 102800 Toilet, Bath, and Laundry Accessories

The specifications call for Bradley grab bars, while the drawings call for BOBRICK. Please confirm desired product.

Response: GC to provide BOBRICK accessories as shown on drawings. Accessory schedule shown on Sheet 1A-402.

174. 122413 Roller Window Shades

"RS-1" Roller Shades specified in specifications - locations are not shown on plans. Please clarify.

Response: GC to provide roller shades as specified on window types A, D, E, F & G on drawings. See Sheet 1A-621.

175. 122413 Roller Window Shades

Motor-operated roller shades with rollers listed in specifications, but not found in drawings. Please clarify.

Response: GC to provide roller shades as specified on window types A, D, E, F & G on drawings. See Sheet 1A-621.

176. Sheet No. 2A-571.

Countertop shown on Lavatory detail on Sheet No. 2A-571. No information is provided on Finish Legend. Please clarify.

Response: GC to provide solid surface countertops and backsplash as indication on interior elevations & spec section 123661.

177. B4/21-401

Note regarding countertop on Detail B4/21-401 states "see interior elevations and finish legend for clarification. There is no information provided on the Finish Legend or elevations for countertop. Please clarify.

Response: GC to provide solid surface countertops as indication on interior elevations & spec section 123661.

178. Detail B2/2A-401

Note on Detail B2/2A-401 states "Door pull; see cabinetry notes". There are not cabinetty notes provided. Please clarify.

Response: Please see addendum for clarification. Same note as shown on Sheet 1A-561.

179. Detail B4/2A-401

Note on detail B4/2A-401 states "Backsplash; see interior elevations and finish legend for clarification. No backsplash where tile backsplash is used". There is no information provided on elevations or Finish Legend. Please clarify.

Response: GC to provide ceramic tile as specified.

180. Sheet No. CG101

Note 14 is referenced at JB A-1. This note references detail C4/CG502 “PVC Rubber Boot Detail”. This connection appears to be RCP to pre-cast structure, what is the intent of Note 14 at this location?

Response: C4/CG502 PVC Rubber Boot Detail shall only be applied where PVC pipes connection to Pre-cast structures. See revised Grading Plan Sheets.

181. Sheet No. CG102

Note 4 on CG101 calls for all Roof and Trench-drain pipes to be 8" PVC unless otherwise noted and Detail A3/CG502 shows the roof drain connection but no routing is shown for the building 1 roof-drain/downspouts piping after leaving the building. Please advise.

Response: Downspout connection to underground roof drain piping is required on the south side of the administrative wing of Building 1 and the south side of Building 2 as shown on CG101 and CG102. The remainder of the downspouts discharge at grade.

182. Sheet No. CG103

Note 4 on CG103 calls for all Roof and Trench-drain pipes to be 8" PVC unless otherwise noted and Detail A3/CG502 shows the roof drain connection. Routing is shown for the roof-drains on the South side of building 2, but nothing is shown for the roof drains on the North side. Please advise.

Response: Downspout connection to underground roof drain piping is required on the south side of the administrative wing of Building 1 and the south side of Building 2 as shown on CG101 and CG102. The remainder of the downspouts discharge at grade.

183. Sheet No. 1A-591

Detail A1 shows the downspouts being piped to a lateral that is to "Daylight at retaining wall above pavement." What retaining wall is being referenced and does this apply to all roof drain connections?

Response: Please refer to Civil drawings for downspout connection to storm sewer. Reference to daylighting of pipes will be removed.

184. Sheet No. CG101

Sheet CG101 shows an existing 36" RCP line that appears to tie into JB A-1. Please confirm the currently installed conditions at either end of this pipe.

Response: See survey sheets for existing condition information.

185. Architectural - Can you confirm that the exposed ceiling on building #2 is supposed to be painted the same as in building #1"

Response: In building 2, exposed structure will be painted. Exposed structure in other tenant locations will not be painted.

186. Civil - Will the owner allow type 1L Cement which is approved for P-501 FAA pavements in the production of both the apron and lean base pavements?

Response: See revised specifications for inclusion of Type 1L cement. See spec 321313 section 2.2

187. 30601-6.6.B.4

Is profilograph testing necessary for this application or will straight edge testing be acceptable?

Response: Profilograph is not required. See revised specifications.

188. Civil - Can the apron and loading dock pavement joint directions/types be changed to accommodate field conditions during construction?
Response: Contractor may submit a paving plan for evaluation during construction illustrating the proposed paving lanes, directions, jointing, etc. The paving plan shall meet the original design intent of the construction documents.

189. Access Control / Video Surveillance
What manufacturer is the owner specifying for access control and video surveillance? If so, what are the specific camera models to use and what quantities?
Response: Johnson Controls P2000 is the current Airport access control system. Cameras are specified by Pelco as quantities are shown on the plans. Model numbers on indicated on Sheet ES-204.

190. Access Control / Video Surveillance
Is there going to be a map detailing desired camera positions and a camera schedule?
Response: Plan sheets have symbols for desired locations and general aiming

191. Is pricing to be based solely on BOD manufacturers/products? Or can equal alternates be priced?
Response: Unless otherwise specified equal alternatives can be priced.

192. Are there any access requirements for UPS to continue using the Air Cargo Apron during the construction process?
Response: UPS will continue operating during the construction process. This will not affect the project site.

193. Sheet 1E-111C
On the electrical drawings (Building 1) page 1E-111C Keynote 3. It states provide 120V Power for trailer fan and light arm assembly. They don't have a notation of what the fans and lights are in the specification.
Response: This is a standard fan/light arm that is used for illuminating the inside of the trailer/vehicle for loading/unloading. The trailer is a tenant item that needs the 120V power connection.

<u>Questions 194 through 209 are from Mike Winn of CPPI:</u>

194. Contract - General Conditions
Reference Mutual Waiver of Consequential Damages. The Contract includes a provision for liquidated damages but does not include a corresponding mutual waiver of consequential damages. Can a standard mutual waiver of consequential damages be added to the contract following the form used in the AIA A201 General Conditions?
Response: The section will remain as written in the contract documents.

195. Contract - General Conditions

"Reference Section 11.2.10. This section conflicts with the other indemnity provisions and does not appear to apply in the construction contract as it specifically references the use or occupancy of "leased premises." Additionally, it is overbroad as it is not tied only to the extent of the negligence of the Contractor. Can this conflicting indemnity be deleted?"

Response: The section will remain as written in the contract documents.

196. Contract - General Conditions - "Reference Section 9.11.

This conflicts with the notion of substantial completion. If work is occupied by the Owner, then by definition it cannot be incomplete. Please clarify the intent of this provision and how it is intended to work in practice."

Response: The section will remain as written in the contract documents.

197. Contract - General Conditions - "Reference Section 9.3.1(b0.

This section conflicts with O.C.G.A 13-10-80(2)(A) which only permits 5% retainage for all public works contracts after July 1, 2022. Will this be revised in the final contract?"

Response: The final contract will comply with current Georgia law as to retainage.

198. Contract - General Conditions - "Reference Section 8.4.

This section is unclear. Will the Contractor be entitled to a change order compensating it for acceleration measures required by the Owner or Engineer to recover delays that are not caused by the Contractor?"

Response: The section will remain as written in the contract documents.

199. Contract - General Conditions - "Reference Section 8.3.6.

Is this going to be a multi-prime project? What other work is will be performed by separate contractors? Is the intent of this provision to allow Owner to suspend Contractor's work in its discretion at any time for 60 days?"

Response: This work will be completed by a single general contractor.

200. Contract - General Conditions - "Reference Section 8.3.1 and Sections 9.12.

These sections appear to be duplicative and are conflicting. Which is intended to govern? What is the method for dispute resolution in the event Owner or Contractor disagree with the Engineer's decision?"

Response: The section will remain as written in the contract documents.

201. Contract - General Conditions - "Reference Section 8.2.5.

This conflicts with the schedule provisions in the Contract on C-1 and C-2, which states that the substantial (not final) completion must be achieved within 610 days from the notice to proceed. Should this section read "substantial completion" instead of "final completion?"

Response: The total contract time or final completion is 610 calendar days, so substantial completion would be 580 calendar days.

202. Contract - General Conditions -"Reference Section 4.4.4.
The contract does not appear to provide a method of dispute resolution (litigation or arbitration). If either the Owner or the Contractor disputes a decision by the Engineer, what is the intended dispute resolution mechanism under the contract?"
Response: The section will remain as written in the contract documents.

203. Contract - General Conditions - Reference Section 3.18.
Why is the Contractor required to indemnify the Engineer and its consultants with whom the Contractor has not entered a contract? Section 3.18.1 is duplicative and conflicts with 3.18.1(c). Can 3.18.1(c) be deleted?"
Response: The section will remain as written in the contract documents.

204. Contract - General Conditions - Reference Section 3.10.5.
What is the intent behind restricting the Contractor's ability to control the schedule and sequence of the work without the Owner's prior written approval? Is this provision really intended to state that Contractor cannot revise the schedule to extend the Substantial Completion Date without Owner's prior written approval?"
Response: The airport requires the ability to review the schedule due to aircraft operation and airfield safety concerns that could arise. This project is located next to an active airfield and the airport needs to understand the contractor's schedule to understand how it may conflict with airport operations. The schedule is used to coordinate resources and is typically approved with no issues.

205. Contract - General Conditions -Reference Sections 3.3.4, 6.2.2.
Is it the intent of these contract provisions to shift the risk of latent or concealed defects or deficiencies in work performed by others to the Contractor?
Response: The section will remain as written in the contract documents.

206. Allowances Reference Bid Form Line Item #16 - Allowances, for Building 1 and Building 2. Will a list of Allowance items, or Unit Cost items be provided before bid time? What is to be included in line #16?
Response: Removed from bid form. Please see Revised Bid Schedule.

207. This question applies to Bid Form Lines Items #1 through #193. Reference Bid Form Line Item #78 as an example, which shows 18" Diameter Reinforced Concrete Pipe with a quantity of 460 linear feet. The actual quantity shown on the site drawings is 656 linear feet. There are many examples of the bid form quantity being either higher or lower than the quantity on the plans. Please advise if pricing is to be based upon the line item quantity provided on the bid form, or quantities based on the drawings themselves.
Response: The contract document proposal form states that quantities shown in the Bid Schedule are approximate only and that increases or decrease in quantities shall be paid for by use of the appropriate unit price if shown on the applicable bid schedule. If discrepancies are found by the contractor during the bidding process, a specific RFI may be submitted to evaluate the quantity for the pay item. See revised bid form as 18" RCP line item has been revised to 675 linear feet.

208. Reference Specification Section 31 63 20 - Rigid Inclusion Paragraph 1.1D which lists Auger-Cast Piles (ACP)and Vibrated Probe as (2) possible methods for soil improvement, however Full Displacement installaion is not listed. Please confirm if Full Displacement system can be used in lieu of ACP or Vibrated Probe.
Response: Displacement Auger Cast Piles may be used in lieu of Auger Cast Piles

209. OH Doors - Operability Under Wind Load Reference Specification Section 08 33 23 - Overhead Coiling Doors Paragraph 2.2B3 which indicates all OH doors in this section shall remain operable under design wind load. Please confirm, as there is only (1) product on the market that meets this requirement. That product is McKeon Dynamic 110 which does not seem to be listed an approved manufacturer.
Response: GC to provide submittals for architect review and approval that meet wind loading criteria per drawings.

SAVANNAH AIRPORT COMMISSION
SAVANNAH / HILTON HEAD INTERNATIONAL AIRPORT

RECORD OF MEETING ATTENDANCE

SUBJECT: SAC 30610 Air Cargo Facility Pre-Bid #2 **DATE – TIME:** April 2, 2024 - 1:30pm

NAME & TITLE	ORGANIZATION & ADDRESS	TELEPHONE NUMBER	EMAIL ADDRESS
Jim Aiello, E.I.T., Assistant Director of Engineering	SAC, 400 Airways Ave, Savannah, GA 31408	Ext. 3352	jaiello@flySAV.com
Crystal Mercado, Engineering Administrator	SAC, 400 Airways Ave, Savannah, GA 31408	Ext. 4478	cmercado@flySAV.com
Jerry McLean, Senior Engineering Inspector	SAC, 400 Airways Ave, Savannah, GA 31408	Ext. 3377	jmclean@flySAV.com
Chris Jenkins, Associate Vice President	Pond, 3500 Parkway Lane, Peachtree Corners, GA 30092	404-748-4768	jenkinsc@pondco.com
DAVID HUNTER, VICE PRESIDENT REGIONAL MGR	CPPI of GA 1464 E VICTORY		
THOMAS J. WILSON VP Aviation	POND, 3500 PARKWAY LANE, PEACHTREE CORNERS 30092	4045020125	thomas.wilson@pondco.com
Ricky Rushing, Director of Operations, SAC			rrushing@flysav.com
Jason Edenfield	SAC		jedenfield@flysav.com

SAC 102 (12-03-19)
SUPERSEDES SAC 102 (3-22-06)

SAC 30610 AIR CARGO FACILITY REVISED BID SCHEDULE

REVISED BID SCHEDULE A - SITE WORK

Schedule A - Site Work includes providing access to an existing airside aircraft apron and construction of two new cargo facilities, vehicle and delivery parking, and a signalized driveway intersection into the air cargo campus.

NUM.	ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	010000-1	MOBILIZATION	1	LS		
2	014100-1	CONTRACTOR QUALITY CONTROL PROGRAM	1	LS		
3	010310-1	TRAFFIC CONTROL	1	LS		
4	015723-1	TEMPORARY SEEDING AND MULCHING	29	AC		
5	015723-2	FILTER FABRIC INLET PROTECTION INSTALLATION AND REMOVAL	65	EA		
6	015723-3	CURB INLET PROTECTION INSTALLATION AND REMOVAL	48	EA		
7	015723-4	SEDIMENT BASINS AND TRAPS	3	LS		
8	015723-5	CONSTRUCTION EXIT INSTALLATION AND REMOVAL	2	EA		
9	015723-6	SLOPE STABILIZATION	***6000***	SY		
10	015723-7	INSTALLATION AND REMOVAL OF SILT FENCE	10400	LF		
11	015723-8	FIBRIFORM REVETMENT	11250	SF		
12	015723-9	STORM OUTLET PROTECTION	7	EA		
13	015723-10	TURBIDITY CURTAIN	230	LF		
14	015723-11	FILTER RING	5	EA		
15	017300-1	PROJECT SUVERY AND STAKEOUT	1	LS		
16	024119-1	REMOVE EXISTING DRAINAGE STRUCTURES	2	EA		
17	024119-2	REMOVE CHAIN LINK FENCE	***1500***	LF		
18	024119-3	REMOVE GUARDRAIL	550	LF		
19	024119-4	REMOVE SIGNS	2	EA		
20	024119-5	REMOVE PAVEMENT MARKINGS	500	SF		
21	311000-1	***STRIPPING***	29	AC		
22	312000-1	EMBANKMENT IN PLACE	***47500***	CY		
23	312000-2	UNSUITABLE EXCAVATION	1600	CY		
24	312000-3	SELECT SANDS	2000	CY		
25	312010-1	CRUSHED AGGREGATE BASE COURSE	10750	CY		
26	321216-1	TYPE SP 9.5 ASPHALT COURSE	3400	TN		

27	321216-2	TYPE SP 12.5 ASPHALT COURSE	60	TN		
28	321216-3	TYPE SP 19 ASPHALT COURSE	6250	TN		
29	321313-1	10” UNREINFORCED PCC PAVEMENT	6750	SY		
30	321313-2	10” REINFORCED PCC PAVEMENT	375	SY		
31	321313-3	10” TO 12.5” THICKENED EDGE PCC PAVEMENT	100	SY		
32	321313-4	10” TO 12.5” REINFORCED THICKENED EDGE PCC PAVEMENT	1175	SY		
33	321313-5	10" TO 14" THICKENED EDGE PCC PAVEMENT	600	SY		
34	321313-5	8” UNREINFORCED PCC PAVEMENT	***6850***	SY		
35	321313-6	8” REINFORCED PCC PAVEMENT	***1375***	SY		
36	321314-1	CURB AND GUTTER	13750	LF		
37	321314-2	CONCRETE SIDEWALK	1000	SY		
38	321315-1	LEAN CONCRETE BASE COURSE	9000	SY		
39	321713-1	CONCRETE WHEEL STOPS	25	EA		
40	321723-1	5” WIDE YELLOW THERMOPLASTIC TRAFFIC PAINT	8250	LF		
41	321723-2	10” WIDE YELLOW THERMOPLASTIC TRAFFIC PAINT	115	LF		
42	321723-3	12" WIDE YELLOW THERMOPLASTIC TRAFFIC PAINT	60	LF		
43	321723-4	24” WIDE YELLOW THERMOPLASTIC TRAFFIC PAINT	390	LF		
44	321723-5	4” WIDE WHITE TRAFFIC PAINT	5700	LF		
45	321723-6	5” WIDE WHITE THERMOPLASTIC TRAFFIC PAINT	1750	LF		
46	321723-7	6” WIDE WHITE TRAFFIC PAINT	4500	LF		
47	321723-8	10” WIDE WHITE THERMOPLASTIC TRAFFIC PAINT	2400	LF		
48	321723-9	12” WIDE WHITE THERMOPLASTIC TRAFFIC PAINT	1275	LF		
49	321723-10	24” WIDE WHITE THERMOPLASTIC TRAFFIC PAINT	1075	LF		
50	321723-11	6” WIDE NON-REFLECTIVE BLACK PAINT	9000	LF		
51	321723-12	4” WIDE BLUE STRIPE ADA ACCESS AISLE STRIPING	800	LF		
52	321723-13	ADA INTERNATIONAL BLUE SYMBOL WITH WHITE SQUARE BACKGROUND	10	EA		
53	321723-14	TYPE “3” PAINTED THERMOPLASTIC TRAFFIC ARROW	8	EA		
54	321723-15	TYPE “2” PAINTED THERMOPLASTIC TRAFFIC ARROW	15	EA		
55	321723-16	TYPE “1” PAINTED THERMOPLASTIC TRAFFIC ARROW	8	EA		

56	321723-17	PAINTED TRUCK PARKING SPOT NUMBERS	50	EA		
57	321723-18	WHITE THERMOPLASTIC PAINTED MESSAGE "ONLY"	12	EA		
58	321723-19	WHITE THERMOPLASTIC PAINTED MESSAGE "KEEP MOVING"	1	EA		
59	323113-1	8' TALL AOA CHAIN LINK FENCE	1025	LF		
60	323113-2	TEMPORARY SECURITY FENCE	1275	LF		
61	323113-3	6' TALL LOADING DOCK CHAIN LINK FENCE	2700	LF		
62	323113-4	30' WIDE SLIDE GATE	1	EA		
63	323113-5	20 WIDE SLIDE GATE	8	EA		
64	323113-6	3' WIDE PEDESTRIANG GATE	1	EA		
65	323113-7	ARM GATE	2	EA		
66	323330-1	PIPE BOLLARDS	80	EA		
67	323330-2	SIGNAGE	30	EA		
68	323330-3	GUARDRAIL	***1400***	LF		
69	334200-1	15" DIAMETER REINFORCED CONCRETE PIPE, CLASS III	950	LF		
70	334200-2	18" DIAMETER REINFORCED CONCRETE PIPE, CLASS III	***675***	LF		
71	334200-3	24" DIAMETER REINFORCED CONCRETE PIPE, CLASS III	1700	LF		
72	334200-4	30" DIAMETER REINFORCED CONCRETE PIPE, CLASS III	1000	LF		
73	334200-5	36" DIAMETER REINFORCED CONCRETE PIPE, CLASS III	375	LF		
74	334200-6	8" DIAMETER SDR 35 PVC	1325	LF		
75	334200-7	10" DIAMETER SDR 35 PVC	***400***	LF		
76	334200-8	12" DIAMETER SDR 35 PVC	170	LF		
77	334200-9	6' DEEP OR LESS STORM SEWER CURB INLET	21	EA		
78	334200-10	6' TO 8' DEEP STORM SEWER CURB INLET	4	EA		
79	334200-11	8' TO 10' DEEP STORM SEWER CURB INLET	5	EA		
80	334200-12	10' DEEP OR MORE STORM SEWER CURB INLET	1	EA		
81	334200-13	6' DEEP OR LESS STORM SEWER DROP INLET	***8***	EA		
82	334200-14	6' TO 8' DEEP STORM SEWER DROP INLET	***2***	EA		
83	334200-15	8' TO 10' DEEP STORM SEWER DROP INLET	3	EA		
84	334200-16	10' DEEP OR MORE DROP INLET	1	EA		

85	334200-17	6’ DEEP OR LESS STORM SEWER PRECAST MANHOLE	8	EA		
86	334200-18	6’ TO 8’ DEEP STORM SEWER PRECAST MANHOLE	1	EA		
87	334200-19	8’ TO 10’ DEEP STORM SEWER PRECAST MANHOLE	1	EA		
88	334200-20	10' DEEP OR MORE STORM SEWER PRECAST MANHOLE	1	EA		
89	334200-21	6' DEEP OR LESS STORM SEWER YARD INLET	5	EA		
90	334200-22	6’ TO 8’ DEEP STORM SEWER YARD INLET	1	EA		
91	334200-23	TRENCH DRAIN	440	LF		
92	334200-24	STORM SEWER CLEANOUT	19	EA		
93	334200-25	DOUBLE 10' X 8' BOX CULVERT	60	LF		
94	334200-26	DOUBLE 10' X 8' BOX CULVERT HEADWALL	1	EA		
95	334200-27	18" DIAMETER OPENING - CONCRETE HEADWALL	3	EA		
96	334200-28	24" DIAMETER OPENING - CONCRETE HEADWALL	1	EA		
97	334200-29	30" DIAMETER OPENING - CONCRETE HEADWALL	3	EA		
98	334200-30	36" DIAMETER OPENING - CONCRETE HEADWALL	1	EA		
99	334200-31	CONCRETE FLUME	60	LF		
100	260010-01	ELECTRICAL UTILITY SERVICE CONNECTION	1	LS		
101	260010-02	ELECTRICAL EQUIPMENT CONNECTION	1	LS		
102	260010-03	ELECTRICAL EQUIPMENT FOR ACCESS GATE	11	EA		
103	260519-01	LOW VOLTAGE ELECTRICAL POWER CONDUCTOR, NO. 12 AWG	900	LF		
104	260519-02	LOW VOLTAGE ELECTRICAL POWER CONDUCTOR, NO. 10 AWG	8000	LF		
105	260519-03	LOW VOLTAGE ELECTRICAL POWER CONDUCTOR, NO. 8 AWG	38600	LF		
106	260519-04	LOW VOLTAGE ELECTRICAL POWER CONDUCTOR, NO. 2 AWG	15400	LF		
107	260533.13-01	ELECTRICAL CONDUIT, PVC-40, 1-INCH	9200	LF		
108	260533.13-02	ELECTRICAL CONDUIT, PVC-40, 1-1/2-INCH	7600	LF		
109	260533.13-03	ELECTRICAL CONDUIT, PVC-40, 2-INCH	***5900***	LF		
110	260533.13-04	ELECTRICAL CONDUIT, PVC-40, 4-INCH	8850	LF		
111	260533.13-05	ELECTRICAL CONDUIT, PVC-80, 5-INCH	12700	LF		
112	260533.13-06	ELECTRICAL PRECAST HANDHOLE, TYPE A (24"X36")	5	EA		
113	260533.13-07	ELECTRICAL PRECAST HANDHOLE, TYPE B (13"X24")	***39***	EA		

114	260533.13-08	ELECTRICAL UTILITY MANHOLE	4	EA		
115	260533.13-09	ELECTRICAL UTILITY PAD MOUNT SWITCH WITH CONCRETE PAD, COMPLETE	1	EA		
116	262729-01	ELECTRICAL VEHICLE CHARGING STATION, COMPLETE WITH MOUNTING RACK AND CONCRETE PAD	13	EA		
117	263213.13-01	EMERGENCY GENERATOR, 240/120V, 1PH, 3W, COMPLETE W/ CONCRETE PAD, FUEL TANK & FUEL FOR LIFT STATION	1	EA		
118	263600-01	AUTOMATIC TRANSFER SWITCH, 240V, 1PH, 3W, NEMA 4X S/S FOR LIFT STATION, COMPLETE W/ MOUNTING RACK AND CONCRETE PAD	1	EA		
119	265613-01	1-HEAD POLE LUMINAIRE, COMPLETE WITH (1) LIGHT FIXTURE, BRACKET, CONCRETE POLE, WIRING, GROUNDING, HAND HOLE, CONCRETE FOUNDATION	11	EA		
120	265613-02	2-HEAD POLE LUMINAIRE, COMPLETE WITH (2) LIGHT FIXTURES, BRACKET, CONCRETE POLE, WIRING, GROUNDING, HAND HOLE, CONCRETE FOUNDATION	***12***	EA		
121	270010-01	COMMUNICATIONS UTILITY SERVICE CONNECTION	1	LS		
122	270010-02	COMMUNICATIONS CONNECTION AT TERMINAL BUILDING, COMPLETE	1	LS		
123	271523-01	AIRPORT OPTICAL FIBER CABLING, 48F-SM-OSP, COMPLETE	5500	LF		
124	271523-02	AIRPORT OPTICAL FIBER CABLING, 288F-SM-OSP, COMPLETE	***750***	LF		
125	270543-01	COMMUNICATIONS CONDUIT, PVC-40, 4-INCH	13330	LF		
126	270543-02	COMMUNICATIONS CONDUIT, DIRECTIONAL BORE	540	LF		
127	270543-03	COMMUNICATIONS UTILITY MANHOLE	6	EA		
128	282000-01	CCTV CAMERA, COMPLETE WITH MOUNTING HARDWARE, AT ENTRY/EXIT GATES, COMPLETE	11	EA		
129	282000-02	CCTV CAMERA POLE, 15'-0", STRAIGHT SQUARE STEEL, CONCRETE BASE, COMPLETE	7	EA		
130	282000-03	GATE ACCESS DEVICES, COMPLETE WITH MOUNTING HARDWARE, AND DATA CABLING, PER LANE	***11***	EA		
131	282000-04	GATE EQUIPMENT CABINET, 24"X36"X12", COMPLETE WITH DATA CABLING & TERMINATION EQUIPMENT, AT GATES	8	EA		
CITY OF SAVANNAH						
132	02000-1	OIL/WATER SEPARATOR AS SPECIFIED, COMPLETE	2	EA		
133	02550-1	4-INCH PVC WATER LINE	2,650	LF		
134	02550-2	4-INCH DI WATER LINE	10	LF		
135	02550-3	6-INCH PVC WATER LINE	280	LF		
136	02550-4	8-INCH PVC WATER LINE	4040	LF		
137	02550-5	8-INCH DI WATER LINE	10	LF		
138	02550-6	4-INCH PRECAST AIR RELEASE VALVE AND PRECAST VAULT	1	EA		
139	02550-7	16-INCH X 4-INCH TAPPING SLEEVE & VALVE WITH MANHOLE	2	EA		
140	02550-8	16-INCH X 8-INCH TAPPING SLEEVE & VALVE WITH MANHOLE	1	EA		
141	02550-9	FIRE HYDRANT ASSEMBLY INCLUDING TEES AND VALVES, COMPLETE	7	EA		

142	02550-10	8-INCH DOUBLE DETECTOR CHECK VALVE & METER ASSEMBLY IN VAULT	1	EA		
143	02550-11	4-INCH DOUBLE CHECK VALVE ASSEMBLY IN VAULT	2	EA		
144	02550-12	FIRE DEPARTMENT CONNECTION	2	EA		
145	02550-13	WATER METER AND 4' X 7' VAULT	3	EA		
146	02550-14	WATER VALVE AND VALVE BOX	4	EA		
147	02550-15	FUSIBLE PVC CASING	170	LF		
148	02554-1	8-INCH PVC SANITARY SEWER PIPE	1,660	LF		
149	02554-2	6-INCH PVC SANITARY SEWER PIPE	210	LF		
150	02554-3	6-INCH DI SANITARY SEWER PIPE	10	LF		
151	02554-4	4-INCH PVC SANITARY SEWER PIPE	610	LF		
152	02554-5	4-INCH PVC SANITARY FORCE MAIN PIPE	860	LF		
153	02554-6	48-INCH DIA SANITARY MANHOLE	5	EA		
154	02554-7	SANITARY SEWER CLEAN OUT	10	EA		
155	02554-8	SANITARY FORCE MAIN CONNECTION TO EXISTING MANHOLE	1	EA		
156	02554-9	SANITARY WYE CONNECTION	3	EA		
157	02558-1	SANITARY LIFT STATION, COMPLETE, INCLUDING PUMPS, CONTROL PANEL, INSTRUMENTATION & DEWATERING	1	LS		
158	PLAN	GAS LINE INSTALATION / COORDINATION WITH ATLANTA GAS LIGHT	1	LS		
GEORGIA DEPARTMENT OF TRANSPORTATION						
159	344113-1	HIGHWAY SIGNS, TP 2 MAT REFLECTIVE SHEETING, TP 9 (GDOT 636-1041)	68	SF		
160	344113-2	STEEL STRAIN POLE, TP IV IW/55 FT MAST ARM: (SAVANNAH GREEN FINISH POWDER-COA) (GDOT 639-3004)	2	EA		
161	344113-3	STEEL STRAIN POLE, TP IV IW/65 FT MAST ARM: (SAVANNAH GREEN FINISH POWDER-COAT) (GDOT 639-3004)	2	EA		
162	344113-4	TRAFFIC SIGNAL INSTALLATION NO. 1 - GULFSTREAM RD AT DAN COE JR. DRIVE (GDOT 647-1000)	1	LS		
163	344113-5	LUMINAIRE BRACKET ARM, 15 FT (GDOT 680-5275)	2	EA		
164	344113-6	CIONDUIT, NONMETAL, TP 2, 1 IN (GDOT 682-6219)	50	LF		
165	344113-7	CONDUIT, NONMETAL, TP 2, 2 IN (GDOT 682-6222)	100	LF		
166	344113-8	CONDUIT, NONMETAL, TP 3, 2 IN (GDOT 682-6233)	1220	LF		
167	344113-9	DIRECTIONAL BORE, 7 IN (GDOT 682-9950)	400	LF		
168	344113-10	MICROWAVE RADAR DETECTION SYSTEM NO. 1 (GDOT 937-6010)	1	LS		
169	344113-11	ELECTRICAL POWER SERVICE ASSEMBLY (AERIAL SERVICE POINT) (GDOT 939-5010)	1	EA		

LANDSCAPE						
170	328400-1	IRRIGATION SYSTEM	1	LS		
171	329200-1	SEEDING - AREGENTINE BAHIA GRASS	246894	SF		
172	329200-2	SODDING- ST. AUGUSTINE GRASS	299472	SF		
173	329200-3	MULCHING	9768	SY		
173	329300-1	ACER BARBATUM	4	EA		
174	329300-2	CERCIS CANADENSIS	19	EA		
175	329300-3	ILEX OPACA 'AIKEN RED'	6	EA		
176	329300-4	ILEX X 'NELLIE R. STEVENS'	14	EA		
177	329300-5	MAGNOLIA GRANDIFLORA 'D.D. BLANCHARD'	3	EA		
178	329300-6	PARROTIA PERSICA 'VANESSA'	14	EA		
179	329300-7	QUERCUS PHELLOS	17	EA		
180	329300-8	QUERCUS VIRGINIANA 'SDLN' TM	8	EA		
181	329300-9	ULMUS PARVIFOLIA	9	EA		
182	329300-10	DISTYLIUM X 'PIIDIST-IV'	228	EA		
183	329300-11	HYDRANGEA PANICULATA `LIMELIGHT`	46	EA		
184	329300-12	ILEX VOMITORIA 'SCHILLINGS DWARF'	1336	EA		
185	329300-13	ITEA VIRGINICA 'HENRY'S GARNET'	317	EA		
186	329300-14	RHODODENDRON X 'RED RUFFLES'	838	EA		
187	329300-15	RHODODENDRON X 'ROBLEZA'	6	EA		
188	329300-16	VIBURNUM OBOVATUM	199	EA		
189	329300-17	VIBURNUM SUSPENSUM	321	EA		
190	329300-18	GERANIUM SANGUINEUM	608	EA		
191	329300-19	LIRIOPE MUSCARI	2332	EA		
192	329300-20	TRACHELOSPERMUM ASIATICUM `HOSNS`	2122	EA		
				SCHEDULE A - TOTAL $		
SCHEDULE A - TOTAL WRITTEN IN WORDS:						

REVISED BID SCHEDULE B - BUILDING 1

Schedule B - Building No. 1 includes the construction of a single-tenant ground and air cargo sort facility of approximately 63,800 square feet to include a package/sortation warehouse, maintenance, and office/operation areas.

NUM.	ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	DIV 01	SUBSTRUCTURE	1	LS		
2	DIV 01-A	SUBSTRUCTURE (RIGID INCLUSION)	1	LS		
3	DIV 03	SLAB ON GRADE	1	LS		
4	DIV 04	MASONRY	1	LS		
5	DIV 05	SHELL	1	LS		
6	DIV 06	WOOD PLASTICS & COMPOSITES	1	LS		
7	DIV 07	THERMAL, MOISTURE PROTECTION, AND ROOFING	1	LS		
8	DIV 08	DOORS/WINDOWS/LOUVERS	1	LS		
9	DIV 09	FINISHES	1	LS		
10	DIV 10	SPECIALTIES	1	LS		
11	DIV 11	EQUIPMENT	1	LS		
12	DIV 21	FIRE PROTECTION	1	LS		
13	DIV 22	PLUMBING	1	LS		
14	DIV 23	HEATING VENTILATION AND AIR CONDITIONING	1	LS		
15	DIV 26 - 28	ELECTRICAL, LIGHTING, SAFETY AND SECURITY	1	LS		
				SCHEDULE B - TOTAL $		

SCHEDULE B - TOTAL WRITTEN IN WORDS:

REVISED BID SCHEDULE C - BUILDING 2

Schedule C - Building No. 2 includes the construction of a multi-tenant ground and air cargo facility of approximately 60,000 square feet with tenant separation walls defining each of the four proposed tenant areas, which are to be constructed based on tenant requirements for their office and warehouse space within their area.

NUM.	ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	DIV 01	SUBSTRUCTURE	1	LS		
2	DIV 01-A	SUBSTRUCTURE (RIGID INCLUSION)	1	LS		
3	DIV 03	SLAB ON GRADE	1	LS		
4	DIV 04	MASONRY	1	LS		
5	DIV 05	SHELL	1	LS		
6	DIV 06	WOOD PLASTICS & COMPOSITES	1	LS		
7	DIV 07	THERMAL, MOISTURE PROTECTION, AND ROOFING	1	LS		
8	DIV 08	DOORS/WINDOWS/LOUVERS	1	LS		
9	DIV 09	FINISHES	1	LS		
10	DIV 10	SPECIALTIES	1	LS		
11	DIV 11	EQUIPMENT	1	LS		
12	DIV 21	FIRE PROTECTION	1	LS		
13	DIV 22	PLUMBING	1	LS		
14	DIV 23	HEATING VENTILATION AND AIR CONDITIONING	1	LS		
15	DIV 26 - 28	ELECTRICAL, LIGHTING, SAFETY AND SECURITY	1	LS		
				SCHEDULE C - TOTAL $		

SCHEDULE C - TOTAL WRITTEN IN WORDS:

SAVANNAH AIRPORT COMMISSION

SAC 30610 – Air Cargo Facility

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TECHNICAL SPECIFICATIONS – ADDENDUM #2

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SECTION 010000 MOBILIZATION

PART 1 - GENERAL

1.1 DESCRIPTION. The work covered by this section consists of preparatory work and operations, including but not limited to those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; for providing the items required by the General Provisions and Supplementary Conditions and the General Requirements including but not limited to: for the establishment of all offices, buildings, and other facilities necessary for work on the project, construction surveying and staking, and for all other work and operations which must be performed or costs incurred prior to beginning work on the various items on the project site.

1.2 Mobilization shall be limited to **10** percent of the total project cost.

1.3 The costs of bonds and any required insurance and other preconstruction expense necessary for the start of work, excluding the cost of construction materials, shall be included in this Item

1.4 This item of work will also include any other item or items of work shown, implied or required for the completion of the project that are not directly paid for under any other items.

1.5 All costs associated will the required weekly meetings and coordination with the Project Manager and Engineer during construction. In addition, all costs associated with the contractor badging as well as preparation and maintenance of the project schedule, shall be included in this item.

1.6 Demobilization. The contractor shall completely demobilize and remove from the project site all equipment, vehicles, materials, offices, and waste within 10 days of final acceptance. Retainage will not be released for the project until the Contractor has completely demobilized from the project site.

1.7 Engineer/RPR field office. Field Engineer/RPR Office is not required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

PART 4 – METHOD OF MEASUREMENT

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, ***5%*** ~~25%.~~

b. When 10% or more of the original contract is earned, and additional 20%.

c. When 25% or more of the original contract is earned, an additional 25%.

d. When 50% or more of the original contract is earned, an additional ~~40~~***25%.***

e. When 75% or more of the original contract is earned, an additional 15%.

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

5 PAYMENT.

a. All work covered by this section will be paid for at the contract lump sum price for "Mobilization".

~~**b.** Partial payments for the item of "Mobilization" will be made with the first and second partial pay estimates paid on the contract and will be made at the rate of 50 percent of the lump sum price for "Mobilization" on each of these partial pay estimates, less the retainage provided for in the Contract, provided the amount bid for "Mobilization" does not exceed 5 percent of the total amount bid for the contract. Where the amount bid for the item of "Mobilization" exceeds 5 percent of the total amount bid pay estimates, and that portion exceeding 5 percent will be paid on the last partial pay estimate. All such payments will be made less the retainage provided for in the Contract.~~

1. Payment will be made under:

Item 010000-01 Mobilization - Lump Sum

END OF SECTION 010000

SECTION 024119- SITE DEMOLITION

PART 1 - GENERAL

1.1 General Requirements.

a. Drawings, General Provisions, Supplementary Conditions, General Requirements, and other Specification sections apply to work of this section.

b. Do not begin demolition work until authorized by Owner.

1.2 Description of Work.

a. Demolition work includes complete or partial removal of existing construction as indicated on drawings. It also includes coordination and scheduling of demolition work by other contractors and utility companies.

b. Types of demolition work include but are not limited to:

1. Guardrail
2. Chain linkfences with barbed wire.
3. Miscellaneous small structures encountered during excavation, earthwork, storm drainage, paving, and other operations.

1.3 Submittals. Demolition Plan. Submit a demolition plan indicating proposed methods, sequence of operations, and schedule for demolition and removal work to Engineer for review prior to commencement of work. Include coordination for shut-off, capping, and continuation of utility services as required; details for phasing; erosion control protection; removal methods and disposition of materials specified to be salvaged; coordination of other work in progress; and disconnection schedule of airfield lighting.

1.4 Job Conditions.

a. Condition of Structures. Owner assumes no responsibility for actual condition of items or structures to be demolished.

b. Demolition and Salvage. Except where materials are designated to be incorporated into new work, items indicated to be removed but of salvable value to Contractor may be removed as work progresses. Transport salvaged items from site as they are removed.

c. Sales. Storage or sale of removed items on site will not be permitted.

d. Protection. Provide temporary barricades and other forms of protection as required to protect public from injury due to demolition work.

1. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to and from occupied portions of site.

2. Provide shoring, bracing, or support to prevent movement, settlement, or collapse of structures or elements to be demolished, and of adjacent facilities or work to remain.

3. Protect from damage existing work that is to remain in place. Do not overload structural elements or pavements to remain.

e. Damages. Promptly repair damages caused to adjacent or other facilities by demolition work at no cost to Owner. All such repairs must have Engineer's approval.

f. Traffic. Conduct demolition operations and debris removal in a manner to ensure minimum interference with roads, and aircraft operation areas.

g. Explosives. Use of explosives will not be permitted.

h. Environmental Controls. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Do not use water if it results in hazardous or objectional conditions such as ice, flooding, or pollution.

i. Fencing. Except where indicated to be demolished, existing fencing shall remain in place. However, when fencing interferes with construction, it shall be temporarily removed to facilitate construction and restored to it original condition upon completion of construction. There will be no separate payment for this temporary removal and replacement; this work is incidental to the construction that it interferes with.

1.5 Regulatory and Safety Requirement. Comply with all federal, state, and local safety, hauling, disposal, and environmental protection regulations.

1.6 Foreign Object Damage (FOD). Aircraft and aircraft engines are subject to FOD from debris and waste material lying on airfield pavements. Remove all materials that may appear on operational aircraft pavements due to the Contractor's operations. If necessary, the Engineer may require the Contractor to install a temporary barricade at the Contractor's expense to control the spread of FOD potential debris. The barricade shall consist of a fence covered with a fabric designed to stop the spread of debris; anchor the fence and fabric to prevent displacement by winds or jet/prop blasts. Remove barricade when no longer required.

1.07 Staging. Certain items cannot be demolished until after work in other phases is complete. Coordinate work with Owner and approved phasing plan.

PART 2 - PRODUCTS (Not Used.)

PART 3 - EXECUTION

3.1 Inspection. Prior to commencement of demolition work, inspect areas in which demolition will be performed. Photograph or video tape existing condition of structure surfaces, equipment or surrounding properties which could be misconstrued as damage resulting from demolition work; file photographs or tapes with Engineer prior to starting work.

3.2 Preparation.

a. Provide shoring, bracing, or support to prevent movement, settlement or collapse of structure to be demolished and adjacent facilities to remain.

b. Cease operations and notify the Engineer immediately if safety of structure or surrounding area appears to be endangered. Take precautions to support structure until determination is made for continuing operations.

3.3 Demolition.

a. Perform demolition work in a systematic manner. Use such methods as approved to complete work indicated on drawings in accordance with demolition schedule and governing regulations.

b. Demolish concrete (excluding pavements) and masonry construction in small sections; cut concrete and masonry at junctions with construction to remain using power-driven saw or hand tools;do not use power-driven impact tools.

c. Completely fill below-grade areas and voids resulting from demolition work. Provide fill consisting of approved soil, gravel or sand, free of trash and debris, stones over 6" diameter, roots or other organic matter. Place fill in accordance with Item 312000.

d. Remove existing utilities and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Engineer.

3.7 Reuse of Materials.

a. Materials and equipment indicated to be reused or relocated shall be removed and stored to prevent damage and re-installed as the work progresses.

b. Subject to Engineer's approval, the following items designated for removal may be incorporated into new construction:

1. Undamaged chain link fence fabric, post tops, braces and accessory items in new fencing per Item 323113

3.8 Items to be Salvaged. Materials and equipment to be removed that are indicated to remain the property of the Owner shall be removed, protected and delivered to a storage site on airport property as designated by the Engineer.C

3.9 Dust and Debris Control. Contractor shall prevent the spread of dust and debris on airfield pavements and elsewhere and shall avoid creation of a nuisance or hazard in the surrounding area. Vacuum and sweep pavements as often as necessary to control the spread of debris that may result in FOD potential to aircraft. Dust and debris control is incidental to the construction and will not be paid for separately.

3.10 Disposal of Demolished Materials.

a. Transport and legally dispose of all debris, rubbish and other demolished materials, daily, off airport property. Do not allow accumulations on airfield pavements or elsewhere on site. Store materials that cannot be removed daily in areas designated by the Engineer.

b. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution.

c. Burning will not be permitted on airport property.

3.11 Clean-up Repair.

Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave areas clean and free of dust and debris.

3.12 Measurement and Payment.

a. Removal of existing drainage structures, headwalls, and signs will be measured and paid per each, and includes excavation and backfilling.

b. Removal of guard rail and chain link fence shall be paid per linear foot and includes excavation, and backfilling as required. ***No measurement or payment shall be made for removal of temporary fencing installed due to construction phases.***

c. Removal of pavement markings shall be measured and paid by the square foot.

d. General: The contract unit prices shall cover the cost of removing the items, labor, tools, equipment, handling, hauling, stockpiling, placing materials in new embankment construction, offsite disposal, and all incidental work required to complete the item.

e. Payment will be made under:

024119-1	Remove Existing Drainage Structures- per each
024119-2	Remove Chain Link Fence - per linear foot
024119-3	Remove Guardrail – Per linear foot
024119-4	Remove Signs – Per each
024119-5	Remove Pavement Markings – Per square foot

END OF ITEM 0241119

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Formed roof-drainage sheet metal fabrications.
2. Formed low-slope roof sheet metal fabrications.
3. Formed wall sheet metal fabrications.
4. Formed equipment support flashing.

B. Related Requirements:

1. Section 061000" Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, and other manufactured roof accessory units.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following

1. Underlayment materials.
2. Elastomeric sealant.
3. Butyl sealant.
4. Epoxy seam sealer.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.

C. Samples: For each exposed product and for each color and texture specified, 12 inches long by actual width.

D. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

E. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested.

C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

D. Evaluation Reports: For copings and roof edge flashing, from an agency acceptable to authority having jurisdiction showing compliance with ANSI/SPRI/FM 4435/ES-1.

E. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

B. Special warranty.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling,

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:

1. Design Pressure: As indicated on Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Colors: As selected by Architect from manufacturer's full range. Sheet metal color may vary between items.

3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, dead soft, fully annealed; with smooth, flat surface.

1. Finish: ASTM A480/A480M, No. 2D (dull, cold rolled).

a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

2.3 UNDERLAYMENT MATERIALS

A. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg F; and complying with physical requirements of ASTM D226/D226M for Type I and Type II felts.

B. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.

1. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

4. Fasteners for Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.

C. Solder:

1. For Stainless Steel: ASTM B32, Grade Sn60 or Grade Sn96, with acid flux of type recommended by stainless steel sheet manufacturer.
2. For Zinc-Coated (Galvanized) Steel: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead with maximum lead content of 0.2 percent.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C920, elastomeric polyurethane or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

I. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

G. Seams:

1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
2. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
3. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

H. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Downspouts: Fabricate rectangular downspouts to dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows. See section 074113.16

1. Fabricate from the following materials:

a. Aluminum: 0.024 inch thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Aluminum: 0.040 inch thick.

B. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.

C. Flashing Receivers: Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.

D. Roof-Penetration Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

2.8 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot-long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch-high, end dams. Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick.

B. Opening Flashings in Frame Construction: Fabricate head, sill, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

A. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, in accordance with manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

1. Lap horizontal joints not less than 4 inches.
2. Lap end joints not less than 12 inches.

B. Self-Adhering, High-Temperature Sheet Underlayment:

1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
2. Prime substrate if recommended by underlayment manufacturer.
3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
5. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller.
6. Roll laps and edges with roller.
7. Cover underlayment within 14 days.

C. Install slip sheet, wrinkle free, directly on substrate before installing sheet metal flashing and trim.

1. Install in shingle fashion to shed water.
2. Lap joints not less than 4 inches.

3.3 INSTALLATION, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder or sealant.
3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
6. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.

7. Do not field cut sheet metal flashing and trim by torch.
8. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

E. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated.

a. Embed hooked flanges of joint members not less than 1 inch into sealant.
b. Form joints to completely conceal sealant.
c. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
d. Adjust setting proportionately for installation at higher ambient temperatures.

1) Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.

1. Pretin edges of sheets with solder to width of 1-1/2 inches; however, reduce pretinning where pretinned surface would show in completed Work.
2. Do not solder metallic-coated steel and aluminum sheet.
3. Do not use torches for soldering.
4. Heat surfaces to receive solder, and flow solder into joint.

a. Fill joint completely.
b. Completely remove flux and spatter from exposed surfaces.

5. Stainless Steel Soldering:

    a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
    b. Promptly remove acid-flux residue from metal after tinning and soldering.
    c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.4 INSTALLATION OF ROOF FLASHINGS

A. Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard.

1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.

C. Copings:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.

1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
2. Extend counterflashing 4 inches over base flashing.
3. Lap counterflashing joints minimum of 4 inches.
4. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.5 INSTALLATION OF WALL FLASHINGS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, and similar flashings to extend 4 inches beyond wall openings.

3.6 INSTALLATION OF MISCELLANEOUS FLASHING

A. Equipment Support Flashing:

1. Coordinate installation of equipment support flashing with installation of roofing and equipment.
2. Weld or seal flashing with elastomeric sealant to equipment support member.

B. Overhead-Piping Safety Pans:

1. Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings.
2. Pipe and install drain line to plumbing waste or drainage system.

3.7 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

3.9 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 076200

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Five-ply flush wood veneer-faced doors for transparent finish.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Door core materials and construction.
2. Door edge construction
3. Door face type and characteristics.
4. Door louvers.
5. Door trim for openings.
6. Door frame construction.
7. Factory-machining criteria.
8. Factory- finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door and frame location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
3. Details of frame for each frame type, including dimensions and profile.
4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
5. Dimensions and locations of blocking for hardware attachment.
6. Dimensions and locations of mortises and holes for hardware.
7. Clearances and undercuts.
8. Requirements for veneer matching.
9. Doors to be factory finished and application requirements.

C. Samples for Initial Selection: For factory-finished doors.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
3. Louver blade and frame sections, 6 inches long, for each material and finish specified.
4. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For door inspector.

1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
2. Submit copy of DHI's Fire and Egress Door Assembly Inspector (FDAI) certificate.

B. Field quality-control reports.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Special warranties.

B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

C. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.6 QUALITY ASSURANCE

A. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.

B. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies shall comply with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

C. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies shall comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:

1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons, and wrap bundles of doors in plastic sheeting.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.

B. Environmental Limitations: Do not deliver or install doors until building is enclosed and weathertight, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of veneer.
b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Wood Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with ANSI/WDMA I.S. 1A.

2.3 SOLID-CORE FIVE-PLY FLUSH WOOD VENEER-FACED DOORS AND TRANSOM PANELS FOR TRANSPARENT FINISH

A. Interior Doors:

1. Performance Grade: ANSI/WDMA I.S. 1A Heavy Duty.
2. ANSI/WDMA I.S. 1A Grade: Custom.
3. Faces: Single-ply wood veneer not less than 1/50 inch thick.

    a. Species: Select white birch.
    b. Cut: Plain sliced (flat sliced).
    c. Match between Veneer Leaves: Book match.
    d. Manufacture prefinished

4. Exposed Vertical Edges: Same species as faces or a compatible species - Architectural Woodwork Standards edge Type A.

    a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
    b. Fire-Rated Pairs of Doors: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
    c. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

        1) Screw-Holding Capability: 475 lbf in accordance with WDMA T.M. 10.

5. Core for Non-Fire-Rated Doors:

    a. Either glued wood stave or WDMA I.S. 10 structural composite lumber.

6. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.

    a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as follows:

        1) 5-inch top-rail blocking.
        2) 5-inch bottom-rail blocking, in doors indicated to have protection plates.
        3) 5-inch midrail blocking, in doors indicated to have armor plates.
        4) 4-1/2-by-10-inch lock blocks or 5-inch midrail blocking, in doors indicated to have exit devices.

7. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.4 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated.

1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
2. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.

1. Locate hardware to comply with DHI-WDHS-3.
2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
5. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Transom and Side Panels:

1. Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors.
2. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
3. Fabricate door and transom panels with full-width, solid-lumber meeting rails.
4. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

D. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of matching wood material and square profile.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.5 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.

1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
2. Finish faces, all four edges, edges of cutouts, and mortises.
3. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Transparent Finish:

1. ANSI/WDMA I.S. 1A Grade: Custom.
2. Finish: ANSI/WDMA I.S. 1A TR-4 Conversion Varnish or TR-6 Catalyzed Polyurethane.
3. Staining: As required to match other wood millwork, paneling, and furniture systems for the project. Obtain representative samples of the wood stain and finish from other subcontractors and furniture vendors from their portions of work to provide acceptable matching.
4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."

B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Install frames level, plumb, true, and straight.

1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
2. Anchor frames to anchors or blocking built in or directly attached to substrates.

a. Secure with countersunk, concealed fasteners and blind nailing.
b. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.

1) For factory-finished items, use filler matching finish of items being installed.

3. Install fire-rated doors and frames in accordance with NFPA 80.
4. Install smoke- and draft-control doors in accordance with NFPA 105.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:

1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

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SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Sliding doors.
3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.

5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.

c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01,

Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

   a. Two Hinges: For doors with heights up to 60 inches
   b. Three Hinges: For doors with heights 61 to 90 inches
   c. Four Hinges: For doors with heights 91 to 120 inches
   d. For doors with heights more than 120 inchesprovide 4 hinges, plus 1 hinge for every 30 inchesof door height greater than 120 inches

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

   a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
   b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

   a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

   a. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.3 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

   a. Pemko (PE).

2.4 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

    a. Pemko (PE) - EL-CEPT Series.
    b. Securitron (SU) - EL-CEPT Series.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

    a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
    b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

    a. McKinney (MK) - QC-C Series.

2.5 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:

    a. Rockwood (RO).

B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Manufacturers:

    a. Rockwood (RO).

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inchthick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
6. Manufacturers:

    a. Rockwood (RO).

2.6 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Match Facility Standard.

C. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).
4. Construction Control Keys (where required): Two (2).
5. Permanent Control Keys (where required): Two (2).

E. Construction Keying: Provide temporary keyed construction cores.

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.7 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

2.8 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - ML2000 Series.
b. Sargent Manufacturing (SA) - 8200 Series.
c. Schlage (SC) - L9000 Series.

2.9 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.10 ELECTRIC STRIKES

A. Surface Mounted Rim Electric Strikes: Surface mounted rim exit device electric strikes conforming to ANSI/BHMA A156.31, Grade 1, and UL Listed for both Burglary Resistance and for use on fire rated door assemblies. Construction includes internally mounted solenoid with two heavy-duty, stainless steel locking mechanisms operating independently to provide tamper resistance. Strikes tested for a minimum of 500,000 operating cycles. Provide strikes with 12 or 24 VDC capability supplied standard as fail-secure unless otherwise specified. Option available for latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike. Strike requires no cutting to the jamb prior to installation.

1. Manufacturers:

a. HES (HS) - 9400/9500/9600/9700/9800 Series.

B. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.11 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Flush End Caps: Provide flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.
7. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

8. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
10. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
11. Rail Sizing: Provide exit device rails factory sized for proper door width application.
12. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Electromechanical exit devices shall have the following functions and features:

    a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
    b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
    c. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
    d. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.
    e. Five-year limited warranty for electromechanical features.

2. Manufacturers:

    a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
    b. Sargent Manufacturing (SA) - 80 Series.

2.12 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Large body cast iron surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:

    a. Corbin Russwin Hardware (RU) - DC8000 Series.
    b. Norton Rixson (NO) - 9500 Series.
    c. Sargent Manufacturing (SA) - 281 Series.

2.13 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

    a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:

    a. Rockwood (RO).

2.14 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

    a. Rockwood (RO).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

    a. Norton Rixson (RF).
    b. Rockwood (RO).
    c. Sargent Manufacturing (SA).

2.15 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko (PE).

2.16 ELECTRONIC ACCESSORIES

A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

a. Securitron (SU) - DPS Series.

2.17 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.18 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

Building #1 Hardware Sets

Set: 1.0

Doors: 104
Description: EXT ALUM PAIR - CARD READER - CVR ELR RIM EXIT DEVICES

2	Continuous Hinge	CFM_SLF-HD1 EL-CEPTx32D		PE	087100
1	Concealed Vert Rod Exit, Nightlatch	43 55 56 AD8410 106 x Less Pull	US32D	SA	087100
1	Concealed Vert Rod Exit, Exit Only	43 55 56 AD8410 EO	US32D	SA	087100
1	Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100
1	Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
2	Door Pull	RM3310-24 Mtg-Type 12XHD	US32D	RO	087100
2	Conc Overhead Stop	6-X36	630	RF	087100
2	Surface Closer	281 O (Top Jamb Mounted)	EN	SA	087100
1	Gasketing	By Aluminum Door / Frame Supplier			
2	Sweep	18061CNB		PE	087100
1	Threshold	273x292AFGPK MSES25SS		PE	087100
1	Card Reader	Card Reader by Others		OT	
2	ElectroLynx Harness	QC-C1500P		MK	087100
2	ElectroLynx Harness	QC-CX06P		MK	087100
2	Position Switch	DPS-M - BK		SU	087100
1	Power Supply	AQD (Amperage as Required)		SU	087100

Notes:
Operational Description: Doors are normally closed and locked. Presenting a valid credential to the reader will momentarily retract the latchbolts. Entry also via mechanical key override. Free egress at all times. Request to exit switch shunts alarm upon exiting. Door position switch reports position of door to access

control system. Devices are fail secure, upon power failure the doors will remain locked.

Set: 2.0

Doors: 200D, 200E, 200Q
Description: EXT HMD - NL EXIT DEVICE X PULL - 3070

3 Hinge, Full Mortise, Hvy Wt	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK	087100	
1 Rim Exit Device, Storeroom	LD 43 8804 Less Pull	US32D	SA	087100	
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100	
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100	
1 Pull	RM201 Mtg-Type 1XHD	US32D	RO	087100	
1 Door Closer	281 CPS	EN	SA	087100	
1 Kick Plate	K1050 WS 10" X 2" LDW 4BE CSK	US32D	RO	087100	
1 Gasketing (Head)	2891APK		PE	087100	
2 Gasketing (Jamb)	290APK		PE	087100	
1 Rain Guard	346C x (Width of Frame Head)		PE	087100	
1 Sweep	3452APK TKSP		PE	087100	
1 Threshold	273x292AFGPK MSES25SS		PE	087100	
1 Position Switch	DPS-M - BK		SU	087100	

Notes:

Set: 3.0

Doors: 200P
Description: EXT HMD - NL EXIT DEVICE X PULL - 3080

4 Hinge, Full Mortise, Hvy Wt	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK	087100
1 Rim Exit Device, Storeroom	LD 43 8804 Less Pull	US32D	SA	087100
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
1 Pull	RM201 Mtg-Type 1XHD	US32D	RO	087100
1 Door Closer	281 CPS	EN	SA	087100
1 Kick Plate	K1050 WS 10" X 2" LDW 4BE CSK	US32D	RO	087100
1 Gasketing (Head)	2891APK		PE	087100
2 Gasketing (Jamb)	290APK		PE	087100

1 Rain Guard	346C x (Width of Frame Head)		PE	087100	
1 Sweep	3452APK TKSP		PE	087100	
1 Threshold	273x292AFGPK MSES25SS		PE	087100	
1 Position Switch	DPS-M - BK		SU	087100	⚡

Notes:

Set: 4.0

Doors: 125A, 126A

Description: EXT HMD - CARD READER - ELR EXIT DEVICE X PULL - 3680

4 Hinge, Full Mortise, Hvy Wt	T4A3386 NRP 5" x 4-1/2"	US32D	MK	087100	
1 Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1 Rim Exit Device, Storeroom	43 55 56 8804 Less Pull	US32D	SA	087100	⚡
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100	
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100	
1 Pull	RM201 Mtg-Type 1XHD	US32D	RO	087100	
1 Door Closer	281 CPS	EN	SA	087100	
1 Kick Plate	K1050 WS 10" X 2" LDW 4BE CSK	US32D	RO	087100	
1 Gasketing (Head)	2891APK		PE	087100	
2 Gasketing (Jamb)	290APK		PE	087100	
1 Rain Guard	346C x (Width of Frame Head)		PE	087100	
1 Sweep	3452APK TKSP		PE	087100	
1 Threshold	273x292AFGPK MSES25SS		PE	087100	
1 Card Reader	Card Reader by Others		OT		
1 ElectroLynx Harness	QC-C1500P		MK	087100	⚡
1 ElectroLynx Harness	QC-CX06P		MK	087100	⚡
1 Position Switch	DPS-M - BK		SU	087100	⚡
1 Power Supply	AQD (Amperage as Required)		SU	087100	⚡

Notes:
Operational Description: Door is normally closed and locked. Presenting a valid credential to the reader will momentarily retract the latchbolt. Entry also via mechanical key override. Free egress at all times. Request to exit switch shunts alarm upon exiting. Door position switch reports position of door to access control system. Device is fail secure, upon power failure the door will remain locked.

Set: 5.0

Doors: 200S, 200W

Description: EXT HMD - CARD READER X 2 - ELECTRIC STRIKE X DELAYED EGRESS EXIT DEVICE - 3070

3 Hinge, Full Mortise, Hvy Wt	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK	087100	
1 Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1 Rim Exit Device, Storeroom	43 59 8804 Less Pull	US32D	SA	087100	⚡
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100	
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100	
1 Electric Strike	9600-LBSM	630	HS	087100	⚡
1 SMART Pac Bridge Rectifier	2005M3		HS	087100	⚡
1 Pull	RM201 Mtg-Type 1XHD	US32D	RO	087100	
1 Door Closer	281 CPS	EN	SA	087100	
1 Kick Plate	K1050 WS 10" X 2" LDW 4BE CSK	US32D	RO	087100	
1 Gasketing (Head)	2891APK		PE	087100	
2 Gasketing (Jamb)	290APK		PE	087100	
1 Rain Guard	346C x (Width of Frame Head)		PE	087100	
1 Sweep	3452APK TKSP		PE	087100	
1 Threshold	273x292AFGPK MSES25SS		PE	087100	
2 Card Reader	Card Reader by Others		OT		
2 ElectroLynx Harness	QC-C1500P		MK	087100	⚡
1 ElectroLynx Harness	QC-CX06P		MK	087100	⚡
1 Position Switch	DPS-M - BK		SU	087100	⚡
1 Power Supply	AQD (Amperage as Required)		SU	087100	⚡

Notes:
Operational Description: Door is normally closed and locked in both directions. From the pull side, presenting a valid credential to the reader will momentarily release the electric strike. Entry also via mechanical key override. From the push side, presenting a valid credential to the reader to override the delayed egress feature allowing immediate egress. Pressing the rail of the exit device will initiate an irrevocable audible alarm for 15 seconds, after that duration the device will release allowing egress. Door position switch reports position of door to access control system. From the pull side, device is fail secure, upon power failure the door will remain locked. From the push side, device is fail safe, upon power failure immediate egress is available.

Set: 6.0

Doors: 002, 121C, 124A, 129A, 200Y

Description: EXT HMD - CARD READER X 2 - ELECTRIC STRIKE X DELAYED EGRESS EXIT

DEVICE - 3080

4 Hinge, Full Mortise, Hvy Wt	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK	087100	
1 Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1 Rim Exit Device, Storeroom	43 59 8804 Less Pull	US32D	SA	087100	⚡
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100	
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100	
1 Electric Strike	9600-LBSM	630	HS	087100	⚡
1 SMART Pac Bridge Rectifier	2005M3		HS	087100	⚡
1 Pull	RM201 Mtg-Type 1XHD	US32D	RO	087100	
1 Door Closer	281 CPS	EN	SA	087100	
1 Kick Plate	K1050 WS 10" X 2" LDW 4BE CSK	US32D	RO	087100	
1 Gasketing (Head)	2891APK		PE	087100	
2 Gasketing (Jamb)	290APK		PE	087100	
1 Rain Guard	346C x (Width of Frame Head)		PE	087100	
1 Sweep	3452APK TKSP		PE	087100	
1 Threshold	273x292AFGPK MSES25SS		PE	087100	
2 Card Reader	Card Reader by Others		OT		
2 ElectroLynx Harness	QC-C1500P		MK	087100	⚡
1 ElectroLynx Harness	QC-CX06P		MK	087100	⚡
1 Position Switch	DPS-M - BK		SU	087100	⚡
1 Power Supply	AQD (Amperage as Required)		SU	087100	⚡

Notes:
Operational Description: Door is normally closed and locked in both directions. From the pull side, presenting a valid credential to the reader will momentarily release the electric strike. Entry also via mechanical key override. From the push side, presenting a valid credential to the reader to override the delayed egress feature allowing immediate egress. Pressing the rail of the exit device will initiate an irrevocable audible alarm for 15 seconds, after that duration the device will release allowing egress. Door position switch reports position of door to access control system. From the pull side, device is fail secure, upon power failure the door will remain locked. From the push side, device is fail safe, upon power failure immediate egress is available.

Set: 7.0

Doors: 116, 116A, 117, 117A
Description: PUSH / PULLS - CLOSER - KP - MP - WS - SG

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100	

1 Pull Plate	BF 110 x 70C	US32D	RO	087100
1 Push Plate	70C	US32D	RO	087100
1 Door Closer	281 O10 / P10 (Mounting Type as Required)	EN	SA	087100
1 Mop Plate	K1050 4" X 1" LDW 4BE CSK	US32D	RO	087100
1 Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
1 Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100
1 Gasketing	S88BL		PE	087100

Set: 8.0

Doors: 106, 118

Description: PASSAGE SET - CLOSER - KP - WS - SI

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Passage Latch	L9010 .03A	.626	SC	087100
1 Door Closer	281 O10 / P10 (Mounting Type as Required)	EN	SA	087100
1 Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
1 Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100
3 Silencer	608		RO	087100

Set: 9.0

Doors: 204

Description: PASSAGE SET - PA CLOSER X STOP ARM - KP - SI

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Passage Latch	L9010 .03A	.626	SC	087100
1 Door Closer	281 CPS	EN	SA	087100
1 Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
3 Silencer	608		RO	087100

Set: 10.0

Doors:205A, 204AA, 204BB

Description: PRIVACY SET - CLOSER - KP - MP - WS - SG - CH

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Privacy Lock	L9040 .03A .09-509x.L583-363	.626	SC	087100
1 Door Closer	281 O10 / P10 (Mounting Type as Required)	EN	SA	087100
1 Mop Plate	K1050 4" X 1" LDW 4BE CSK	US32D	RO	087100

1 Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
1 Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100
1 Gasketing	S88BL		PE	087100
1 Coat Hook	RM811	US26D	RO	087100

Set: 11.0

Doors: 002A, 119, 122
Description: STOREROOM LOCK - CLOSER - KP - WS - SI

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Storeroom Lock	L9080 .03A	.626	SC	087100
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
1 Door Closer	281 O10 / P10 (Mounting Type as Required)	EN	SA	087100
1 Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
1 Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100
3 Silencer	608		RO	087100

Set: 12.0

Doors: 110, 111, 112, 113, 114, 120
Description: OFFICE LOCK - WS - ALUM DOOR

1 Continuous Hinge	CFM_SLF-HD1		PE	087100
1 Entrance/Office	L9050 .03A	.626	SC	087100
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
1 Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100
1 Gasketing	By Aluminum Door / Frame Supplier			

Set: 13.0

Doors: 103, 104A
Description: CARD READER - ELECTRIFIED LOCK - TJ CLOSER X COHS - ALUM DOOR

1 Continuous Hinge	CFM_SLF-HD1 EL-CEPTx32D		PE	087100	⚡
1 Electrified Mortise Lock	L9092EU .03A .RX	.626	SC	087100	⚡

1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100	
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100	
1 Conc Overhead Stop	6-X36	630	RF	087100	
1 Surface Closer	281 O (Top Jamb Mounted)	EN	SA	087100	
1 Gasketing	By Aluminum Door / Frame Supplier				
1 Card Reader	Card Reader by Others		OT		
1 ElectroLynx Harness	QC-C1500P		MK	087100	⚡
1 ElectroLynx Harness	QC-CX06P		MK	087100	⚡
1 Position Switch	DPS-M - BK		SU	087100	⚡
1 Power Supply	AQD (Amperage as Required)		SU	087100	⚡

Notes:
Operational Description: Door is normally closed and locked. Presenting a valid credential to the reader will momentarily unlock the outside lever. Entry also via mechanical key override. Free egress at all times. Request to exit switch shunts alarm upon exiting. Door position switch reports position of door to access control system. Device is fail secure, upon power failure the door will remain locked.

Set: 14.0

Doors: 125

Description: OFFICE LOCK - WS - SI - CH

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100	
1 Entrance/Office	L9050 .03A	.626	SC	087100	
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100	
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100	
1 Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100	
3 Silencer	608		RO	087100	
1 Coat Hook	RM811	US26D	RO	087100	

Set: 15.0

Doors: 121A

Description: OFFICE LOCK - COHS - SI - CH

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100	
1 Entrance/Office	L9050 .03A	.626	SC	087100	
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing		OT	087100	

	(Type, Size, Cam as Required)			
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
1 Conc Overhead Stop	2-X36	630	RF	087100
3 Silencer	608		RO	087100
1 Coat Hook	RM811	US26D	RO	087100

Set: 16.0

Doors: 109

Description: OFFICE LOCK - CLOSER - KP - WS - SI

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Entrance/Office	L9050 .03A	.626	SC	087100
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
1 Door Closer	281 O10 / P10 (Mounting Type as Required)	EN	SA	087100
1 Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
1 Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100
3 Silencer	608		RO	087100

Set: 17.0

Doors: 115

Description: CLASSROOM LOCK - CLOSER - KP - WS - SI

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Classroom Lock	L9070 .03A	.626	SC	087100
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
1 Door Closer	281 O10 / P10 (Mounting Type as Required)	EN	SA	087100
1 Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
1 Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100
3 Silencer	608		RO	087100

Set: 18.0

Doors: 103A

Description: CLASSROOM LOCK - CLOSER - KP - WS- SI - 3680

4 Hinge, Full Mortise, Hvy Wt	T4A3786 5" x 4-1/2"	US26D	MK	087100
1 Classroom Lock	L9070 .03A	.626	SC	087100
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
1 Door Closer	281 O10 / P10 (Mounting Type as Required)	EN	SA	087100
1 Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
1 Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100
3 Silencer	608		RO	087100

Set: 19.0

Doors: 118A, 118B
Description: CLASSROOM LOCK - RA CLOSER X COHS - KP - SG

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Classroom Lock	L9070 .03A	.626	SC	087100
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
1 Conc Overhead Stop	2-X36	630	RF	087100
1 Door Closer	281 O10	EN	SA	087100
1 Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
1 Gasketing	S88BL		PE	087100
1 Sweep	18061CNB		PE	087100

Set: 20.0

Doors: 003, 005A, 206, 124, 205
Description: CARD READER - ELECTRIFIED LOCK - CLOSER - KP - WS - SI

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100	
1 Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1 Electrified Mortise Lock	L9092EU .03A .RX	.626	SC	087100	⚡
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100	
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100	

1 Door Closer	281 O10 / P10 (Mounting Type as Required)	EN	SA	087100	
1 Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100	
1 Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100	
3 Silencer	608		RO	087100	
1 Card Reader	Card Reader by Others		OT		
1 ElectroLynx Harness	QC-C1500P		MK	087100	⚡
1 ElectroLynx Harness	QC-CX06P		MK	087100	⚡
1 Position Switch	DPS-M - BK		SU	087100	⚡
1 Power Supply	AQD (Amperage as Required)		SU	087100	⚡

Notes:
Operational Description: Door is normally closed and locked. Presenting a valid credential to the reader will momentarily unlock the outside lever. Entry also via mechanical key override. Free egress at all times. Request to exit switch shunts alarm upon exiting. Door position switch reports position of door to access control system. Device is fail secure, upon power failure the door will remain locked.

Set: 21.0

Doors: 102A, 102B, 102C
Description: CARD READER - ELECTRIFIED LOCK - CLOSER - KP - WS - SI - 3680

4 Hinge, Full Mortise, Hvy Wt	T4A3786 5" x 4-1/2"	US26D	MK	087100	
1 Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1 Electrified Mortise Lock	L9092EU .03A .RX	.626	SC	087100	⚡
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100	
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100	
1 Door Closer	281 O10 / P10 (Mounting Type as Required)	EN	SA	087100	
1 Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100	
1 Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100	
3 Silencer	608		RO	087100	
1 Card Reader	Card Reader by Others		OT		
1 ElectroLynx Harness	QC-C1500P		MK	087100	⚡
1 ElectroLynx Harness	QC-CX06P		MK	087100	⚡
1 Position Switch	DPS-M - BK		SU	087100	⚡
1 Power Supply	AQD (Amperage as Required)		SU	087100	⚡

Notes:

Operational Description: Door is normally closed and locked. Presenting a valid credential to the reader will momentarily unlock the outside lever. Entry also via mechanical key override. Free egress at all times. Request to exit switch shunts alarm upon exiting. Door position switch reports position of door to access control system. Device is fail secure, upon power failure the door will remain locked.

Set: 22.0

Doors: 107, 123

Description: CARD READER - ELECTRIFIED LOCK - RA CLOSER X COHS - KP - WS - SI

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100	
1 Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1 Electrified Mortise Lock	L9092EU .03A .RX	.626	SC	087100	⚡
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100	
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100	
1 Conc Overhead Stop	2-X36	630	RF	087100	
1 Door Closer	281 O10	EN	SA	087100	
1 Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100	
3 Silencer	608		RO	087100	
1 Card Reader	Card Reader by Others		OT		
1 ElectroLynx Harness	QC-C1500P		MK	087100	⚡
1 ElectroLynx Harness	QC-CX06P		MK	087100	⚡
1 Position Switch	DPS-M - BK		SU	087100	⚡
1 Power Supply	AQD (Amperage as Required)		SU	087100	⚡

Notes:
Operational Description: Door is normally closed and locked. Presenting a valid credential to the reader will momentarily unlock the outside lever. Entry also via mechanical key override. Free egress at all times. Request to exit switch shunts alarm upon exiting. Door position switch reports position of door to access control system. Device is fail secure, upon power failure the door will remain locked.

Set: 23.0

Doors: 203B

Description: NL RIM EXIT DEVICE - CLOSER - KP - WS - SG

3 Hinge, Full Mortise, Hvy Wt	T4A3786 4-1/2" x 4-1/2"	US26D	MK	087100	
1 Rim Exit Device, Storeroom	12 43 8804 ETJ	US32D	SA	087100	
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100	
1 Final Core	SFIC 7-Pin "A" Keyway - Match		OT	087100	

	Owner Requirements			
1 Door Closer	281 O10 / P10 (Mounting Type as Required)	EN	SA	087100
1 Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
1 Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100
1 Gasketing	S88BL		PE	087100

Set: 24.0

Doors: 001A

Description: PAIR - CLASSROOM LOCK- RA CLOSERS X COHS - CRD - AFB - KP - SG - AST

6 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Dust Proof Strike	570	US26D	RO	087100
1 Automatic Flush Bolt	2842 / 2942 (Type as Required)	US26D	RO	087100
1 Classroom Lock	L9070 .03A	.626	SC	087100
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
1 Coordinator	2600 (Length as Required)	US28	RO	087100
2 Conc Overhead Stop	2-X36	630	RF	087100
2 Door Closer	281 O10	EN	SA	087100
2 Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
2 Astragal	18041CNB TKSP		PE	087100
1 Gasketing	S88BL		PE	087100

Set: 25.0

Doors: 202, 203A

Description: PAIR - NL RIM EXIT DEVICE X KRM X EO RIM EXIT DEVICE - PA CLOSERS X STOP ARMS - KP - SG - AST

6 Hinge, Full Mortise, Hvy Wt	T4A3786 4-1/2" x 4-1/2"	US26D	MK	087100
1 Keyed Removable Mullion	12-L980S	PC	SA	087100
1 Rim Exit Device, Storeroom	12 43 8804 ETJ	US32D	SA	087100
1 Rim Exit Device, Exit Only	12 43 8810 EO	US32D	SA	087100
2 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100
2 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
2 Door Closer	281 CPS	EN	SA	087100
2 Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100

2 Astragal	18041CNB TKSP		PE	087100
1 Gasketing	S88BL		PE	087100

Set: 26.0

Doors: 121B, 127

Description: PAIR - STOREROOM LOCK - PA CLOSERS X STOP ARMS - CRD - AFB - KP - SI

6 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1 Dust Proof Strike	570	US26D	RO	087100
1 Automatic Flush Bolt	2842 / 2942 (Type as Required)	US26D	RO	087100
1 Storeroom Lock	L9080 .03A	.626	SC	087100
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
2 Mounting Bracket	2601AB / C (Type as Required)	US28	RO	087100
1 Coordinator	2600 (Length as Required)	US28	RO	087100
2 Door Closer	281 CPS	EN	SA	087100
2 Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
2 Silencer	608		RO	087100

Set: 27.0

Doors: 121D, 126B, 129B, 200A, 200B, 200C, 200G, 200H, 200J, 200K, 200L, 200M, 200N, 200R, 200T, 200U, 200V, 200X, 200Z, 201A, 201B, 204A, 204B

Description: OVERHEAD DOORS

1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)	OT	087100
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements	OT	087100
1 Hardware	Balance of Hardware by Others		

Notes:
Provide cylinder as required.

Set: 28.0

Doors: 100, 101

Description: AUTOMATIC SLIDING DOORS

2 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)	OT	087100

2 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
1 Hardware	All Hardware by Door Manufacturer		OT	

Notes:
Provide cylinder as required.

Building #2 Hardware Sets

Set: 38.0

Doors: 101B, 103D, 106D, 108F

Description: EXTERIOR ALUMINUM - TENANT WAREHOUSE / ADMIN / LOBBY - CARD READER - ELR EXIT DEVICE X PULL

1 Continuous Hinge	CFM_SLF-HD1 EL-CEPTx32D		PE	087100	
1 Rim Exit Device, Storeroom	LC 55 56 WS 8804 Less Pull	US32D	SA	087100	
1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100	
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100	
1 Door Pull	RM3310-24 Mtg-Type 12XHD	US32D	RO	087100	
1 Conc Overhead Stop	6-X36	630	RF	087100	
1 Surface Closer	281 O (Top Jamb Mounted)	EN	SA	087100	
1 Threshold	273x292AFGPK MSES25SS		PE	087100	
1 Gasketing	By Aluminum Door / Frame Supplier				
1 Sweep	3452CNB		PE	087100	
1 Card Reader	Card Reader by Others		OT		
1 ElectroLynx Harness	QC-C1500P		MK	087100	
1 ElectroLynx Harness	QC-C306P		MK	087100	
1 Position Switch	DPS-M - BK		SU	087100	
1 Power Supply	AQD (Amperage as Required)		SU	087100	

Notes:
Operational Description: Door is normally closed and locked. Presenting a valid credential to the reader will momentarily retract the latchbolt. Entry also via mechanical key override. Free egress at all times. Request to exit switch shunts alarm upon exiting. Door position switch reports position of door to access control system. Device is fail secure, upon power failure the door will remain locked.

Set: 39.0

Doors: 101K, 101L, 101M, 101N, 101P, 101S, 103A, 103E, 104, 106A, 106E, 106H, 108G, 108K, 120, 122

Description: EXTERIOR HOLLOW METAL - TENANT WAREHOUSE / ADMIN / LOBBY - CARD READER - ELR EXIT DEVICE X PULL

3	Hinge, Full Mortise, Hvy Wt	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK	087100	
1	Rim Exit Device, Storeroom	LC 55 56 WS 8804 Less Pull	US32D	SA	087100	⚡
1	Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100	
1	Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100	
1	Pull	RM201 Mtg-Type 1XHD	US32D	RO	087100	
1	Door Closer	281 CPS	EN	SA	087100	
1	Kick Plate	K1050 WS 10" X 2" LDW 4BE CSK	US32D	RO	087100	
1	Threshold	273x292AFGPK MSES25SS		PE	087100	
1	Gasketing (Head)	2891APK		PE	087100	
1	Gasketing (Jamb)	290APK		PE	087100	
1	Rain Guard	346C x (Width of Frame Head)		PE	087100	
1	Sweep	3452CNB		PE	087100	
1	Card Reader	Card Reader by Others		OT		
1	ElectroLynx Harness	QC-C1500P		MK	087100	⚡
1	ElectroLynx Harness	QC-C306P		MK	087100	⚡
1	Position Switch	DPS-M - BK		SU	087100	⚡
1	Power Supply	AQD (Amperage as Required)		SU	087100	⚡
1	Electric Power Transfer	EL-CEPT	630	SU	087100	⚡

Notes:
Operational Description: Door is normally closed and locked. Presenting a valid credential to the reader will momentarily retract the latchbolt. Entry also via mechanical key override. Free egress at all times. Request to exit switch shunts alarm upon exiting. Door position switch reports position of door to access control system. Device is fail secure, upon power failure the door will remain locked.

Set: 40.0

Doors: 105

Description: EXTERIOR HOLLOW METAL - RISER ROOM - CARD READER - ELECTRIFIED LOCK

3	Hinge, Full Mortise, Hvy Wt	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK	087100	
1	Electrified Mortise Lock	L9092EU .03A .RX	.630	SC	087100	⚡
1	Final Core	SFIC 7-Pin "A" Keyway - Match		OT	087100	

		Owner Requirements				
1	Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100	
1	Door Closer	281 CPS	EN	SA	087100	
1	Kick Plate	K1050 WS 10" X 2" LDW 4BE CSK	US32D	RO	087100	
1	Threshold	273x292AFGPK MSES25SS		PE	087100	
1	Gasketing (Head)	2891APK		PE	087100	
2	Gasketing (Jamb)	290APK		PE	087100	
1	Rain Guard	346C x (Width of Frame Head)		PE	087100	
1	Sweep	3452APK TKSP		PE	087100	
1	Card Reader	Card Reader by Others		OT		
1	Position Switch	DPS-M - BK		SU	087100	
1	Power Supply	AQD (Amperage as Required)		SU	087100	
1	Electric Power Transfer	CEPT-10	630	SU	087100	

Notes:
Operational Description: Door is normally closed and locked. Presenting a valid credential to the reader will momentarily unlock the outside lever. Entry also via mechanical key override. Free egress at all times. Request to exit switch shunts alarm upon exiting. Door position switch reports position of door to access control system. Device is fail secure, upon power failure the door will remain locked.

Set: 41.0

Doors: 109A

Description: LOBBY / OPERATIONS

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100	
1	Entrance/Office	L9050 .03A	.626	SC	087100	
1	Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100	
1	Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100	
1	Door Closer	281 CPS	EN	SA	087100	
1	Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100	
1	Gasketing	S88BL		PE	087100	

Set: 42.0

Doors: 113, 117A, 117B

Description: COPY ROOM / BREAK ROOM

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100	

1	Passage Latch	L9010 .03A	.626	SC	087100
1	Door Closer	281 O10 / P10 (Mounting Type as Required)	EN	SA	087100
1	Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
1	Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100
3	Silencer	608		RO	087100

Set: 43.0

Doors: 118, 119

Description: SINGLE STALL TOILETS

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1	Privacy Lock	L9040 .03A .09-509x.L583-363	.626	SC	087100
1	Door Closer	281 O10 / P10 (Mounting Type as Required)	EN	SA	087100
1	Mop Plate	K1050 4" X 1" LDW 4BE CSK	US32D	RO	087100
1	Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
1	Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100
1	Gasketing	S88BL		PE	087100
1	Coat Hook	RM811	US26D	RO	087100

Set: 44.0

Doors: 111

Description: STORAGE CLOSET

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1	Storeroom Lock	L9080 .03A	.626	SC	087100
1	Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
1	Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100
1	Door Closer	281 O10 / P10 (Mounting Type as Required)	EN	SA	087100
1	Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
1	Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100
3	Silencer	608		RO	087100

Set: 45.0

Doors: 114

Description: IT / COMM

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1	Storeroom Lock	L9080 .03A	.626	SC	087100
1	Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
1	Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100
1	Conc Overhead Stop	2-X36	630	RF	087100
1	Door Closer	281 O10	EN	SA	087100
1	Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
3	Silencer	608		RO	087100

Set: 46.0

Doors: 121
Description: ELECTRICAL

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100	
1	Rim Exit Device, Storeroom	LC 55 56 8804 ETJ	US32D	SA	087100	⚡
1	Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100	
1	Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100	
1	Door Closer	281 CPS	EN	SA	087100	
1	Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100	
1	Gasketing	S88BL		PE	087100	

Set: 47.0

Doors: 102, 107
Description: ELECTRICAL - CARD READER - ELR EXIT DEVICE

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100	
1	Rim Exit Device, Storeroom	LC 55 56 8804 ETJ	US32D	SA	087100	⚡
1	Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100	
1	Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100	
1	Door Closer	281 CPS	EN	SA	087100	
1	Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100	
1	Gasketing	S88BL		PE	087100	
1	Card Reader	Card Reader by Others		OT		
1	ElectroLynx Harness	QC-C1500P		MK	087100	⚡

1	ElectroLynx Harness	QC-C306P		MK	087100	
1	Position Switch	DPS-M - BK		SU	087100	
1	Power Supply	AQD (Amperage as Required)		SU	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	

Notes:
Operational Description: Door is normally closed and locked. Presenting a valid credential to the reader will momentarily retract the latchbolt. Entry also via mechanical key override. Free egress at all times. Request to exit switch shunts alarm upon exiting. Door position switch reports position of door to access control system. Device is fail secure, upon power failure the door will remain locked.

Set: 48.0

Doors: 110, 115
Description: OFFICES

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1	Entrance/Office	L9050 .03A	.626	SC	087100
1	Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
1	Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100
1	Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100
3	Silencer	608		RO	087100
1	Coat Hook	RM811	US26D	RO	087100

Set: 49.0

Doors: 112
Description: LOBBY / OPERATIONS

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1	Entrance/Office	L9050 .03A	.626	SC	087100
1	Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
1	Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100
1	Door Closer	281 O10 / P10 (Mounting Type as Required)	EN	SA	087100
1	Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
1	Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100
1	Gasketing	S88BL		PE	087100

Set: 50.0

Doors: 109B

Description: LOBBY / OPERATIONS - CARD READER - ELECTRIFIED LOCK

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100	
1	Electrified Mortise Lock	L9092EU .03A .RX	.630	SC	087100	⚡
1	Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100	
1	Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100	
1	Door Closer	281 O10 / P10 (Mounting Type as Required)	EN	SA	087100	
1	Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100	
1	Door Stop	400 / 403 / 441 (Type as Required)	US26D	RO	087100	
1	Gasketing	S88BL		PE	087100	
1	Card Reader	Card Reader by Others		OT		
1	Position Switch	DPS-M - BK		SU	087100	⚡
1	Power Supply	AQD (Amperage as Required)		SU	087100	⚡
1	Electric Power Transfer	CEPT-10	630	SU	087100	⚡

Notes:
Operational Description: Door is normally closed and locked. Presenting a valid credential to the reader will momentarily unlock the outside lever. Entry also via mechanical key override. Free egress at all times. Request to exit switch shunts alarm upon exiting. Door position switch reports position of door to access control system. Device is fail secure, upon power failure the door will remain locked.

Set: 51.0

Doors: 116

Description: CORRIDOR

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	087100
1	Entrance/Office	L9050 .03A	.626	SC	087100
1	Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements		OT	087100
1	Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)		OT	087100
1	Door Closer	281 CPS	EN	SA	087100
1	Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO	087100
1	Gasketing	S88BL		PE	087100
1	Sweep	18061CNB		PE	087100

Set: 52.0

Doors: 101A, 101C, 101D, 101E, 101F, 101G, 101H, 101J, 101Q, 101R, 103B, 103C, 103F, 103G, 106B, 106C, 106F, 106G, 108A, 108B, 108C, 108D, 108H, 108J

Description: OVERHEAD DOORS

1 Final Core	SFIC 7-Pin "A" Keyway - Match Owner Requirements	OT	087100
1 Cylinder Housing	Rim or Mortise SFIC 7-Pin Housing (Type, Size, Cam as Required)	OT	087100
1 Card Reader	Card Reader by Others	OT	
1 Hardware	Balance of Hardware by Others		

Notes: *Provide cylinder as required.*

END OF SECTION 087100

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Stripping and stockpiling topsoil.
2. Removing above- and below-grade site improvements.
3. Disconnecting, capping or sealing, and removing site utilities or abandoning site utilities in place.
4. Temporary erosion and sedimentation control.

B. Related Requirements:

1. Section 015723 Temporary Air Water and Water Pollution Control, Soil Erosion, and Siltation Control for temporary erosion- and sedimentation-control measures.

2. Section 329113 Soil Preparation

1.3 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

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

F. 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.

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

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1.5 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.

B. Topsoil stripping and stockpiling program.

C. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

D. Burning: Will not be permitted on the site.

1.7 QUALITY ASSURANCE

A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.8 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify Call Before You Dig for area where Project is located before site clearing.

C. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.

D. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

E. No direct payment will be made for temporary erosion and sedimentation control under this specification.

3.3 EXISTING UTILITIES

1. Arrange with utility companies to shut off indicated utilities.
2. Owner will arrange to shut off indicated utilities when requested by Contractor.

B. Locate, identify, and disconnect utilities indicated to be abandoned in place.

C. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

D. Excavate for and remove underground utilities indicated to be removed.

E. No direct payment will be made for utility work under this specification.

3.4 CLEARING

A. 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.

3.5 CLEARING AND GRUBBING

A. ***Project site has been previously cleared and grubbed.*** 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. Fill depressions caused by

clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

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.

3.6 TOPSOIL STRIPPING

A. When topsoil is specified or required as shown on the plans or under specification 329113, it shall be salvaged from strippings or other grading operations. The topsoil shall meet the requirements of specification 329113. No direct payment for stripping topsoil is paid for under this specification.

B. Strip topsoil to depth ~~four~~ ***2*** **inches** in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches .
2. Do not stockpile topsoil within protection zones.
3. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

PART 4 - METHOD OF MEASUREMENT

4.1 The quantities of clearing and grubbing as shown by the limits on the plans shall be the number of acres or fractions thereof of land specifically cleared and grubbed.

PART 5 - BASIS OF PAYMENT

5.1 Payment shall be made at the contract unit price per acre for ~~clearing and grubbing~~ ***stripping topsoil.*** This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, disposal, and incidentals necessary to complete the item.

Payment will be made under:

Item 311000-1 ~~Clearing and grubbing~~ ***Stripping*** - per acre or fractions thereof

END OF SECTION 311000

SECTION 316320 - RIGID INCLUSION SOIL IMPROVEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This specification is for Rigid Inclusion Soil Improvements. This includes (at cost to the general contractor) the additional geotechnical investigations required for, the design of, the furnishing of, the installing of, the monitoring of, and the testing for Rigid Inclusion Soil Improvements.

B. The rigid inclusion soil improvement designer and installer shall have a minimum of 7 years of documented successful/satisfactory rigid inclusion soil improvement experience. Documentation shall be submitted for review prior to construction and fabrication.

C. This soil improvement shall consist of a grid of rigid vertical elements installed below a foundation, slab-on-grade, or other structure. These rigid elements are installed to sufficient depths (as determined by a specialty engineer) to reduce the settlement and increase the bearing capacity below the foundation, slab-on-grade, or other structure. The rigid vertical elements shall not be structurally connected to the foundation, slab-on-grade, or other structure that they are supporting. Only flexible tension rebar or straps are permitted, when required for uplift forces. The rigid vertical elements are separated from the structure above by a load transfer pad.

D. Rigid Vertical Elements: Rigid vertical elements consist of grout columns that extend into the soil sufficient depths (as determined by a specialty engineer) and are of sufficient quantity to reduce the settlement and increase the bearing capacity below the foundation, slab-on-grade, or other structure. The grout columns shall be installed by one of the following methods.
    1. Auger Cast Method: These rigid vertical elements are installed similar to auger cast in-place grout piles. The construction of this type of element consists of a hollow stem auger being drilled into the soil to the required bearing strata. Once this stratum is reached, the grout is pumped through the hollow stem of the auger. The grout and center rebar are placed as the auger is removed, which creates a grout column. Standard or displacement augers may be used. These elements shall contain a continuous center rebar as stated in this specification.
    2. Vibrated Probe Method: These rigid vertical elements are constructed by the use of a bottom-feed, down-hole vibratory probe. The construction of this type of element consists of the probe being vibrated into the soil to the required bearing strata. Once this stratum is reached, the grout and rebar are placed through the probe (which contains a tremie tube). The grout is placed as the probe is removed, which creates a grout column. These elements shall contain a continuous center rebar as stated in this specification.

E. The general contractor is responsible for all costs associated with the Rigid Inclusion Soil Improvements. These costs include (but are not limited to) the following:
    1. The storing, hauling, removal, and disposal of all excavated spoils.
    2. The storing, hauling, removal, and disposal of all unsuitable materials in the area of this soil improvement.

3. The storing, hauling, and purchasing of additional suitable fill as required in the area of this soil improvement.
4. The required load transfer pad.
5. Additional geotechnical explorations as required for design and verification of this soil improvement.
6. Testing of the rigid vertical elements as stated in the specification and as stated in the special inspection schedule.
7. The removal of nonproduction test elements.
8. Testing of the load transfer pad as stated in the specification and as stated in the special inspection schedule.
9. All materials required for this rigid inclusion soil improvement system.
10. All installation requirements for this rigid inclusion soil improvement system.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at project site prior to installation.

1.3 ACTION SUBMITTALS

A. Documented Experience for Designer and Installer.

B. Product Data: For each type of product and for geotextiles.

C. Transfer Pad Material Submittal: For each type of material.

D. Design Mixtures: For each concrete and grout mixture.

E. Shop Drawings: For rigid inclusion soil improvements, the submittal shall be prepared by or under the supervision of a qualified professional engineer. These shop drawings shall include (but not limited to):
   1. Rigid vertical element and transfer pad plans (signed and sealed by a professional engineer (PE) registered in the project's state) that show:
      a. Rigid vertical element spacing, diameter, type, reinforcing, sequence of construction, top elevation, and bottom elevation.
      b. Nonproduction rigid vertical element diameter, type, reinforcing, sequence of construction, locations, top elevation, and bottom elevation.
      c. The load transfer pad's extents, thickness, transitions, and type.
   2. Sections and elevations of the rigid vertical elements and load transfer pads to be used.
   3. Signed and sealed calculations (by a professional engineer (PE) registered in the project's state) demonstrating the rigid inclusion soil improvement system's capacity.

F. Rigid Vertical Element Static Load Testing Procedure:
   1. A detailed testing procedure shall be included.

G. Rigid Vertical Element PIT Testing Procedure:
   1. A detailed testing procedure shall be included.

1.4 INFORMATIONAL SUBMITTALS

A. Material certificates.

B. Equipment Data: Description of drilling/driving and grout-pumping equipment.

C. Pile inspection reports.

D. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Rigid Inclusion Soil Improvements is a delegated design. Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements", as stated in the structural drawings, and as stated in this specification to design rigid vertical elements and the required transfer pads. Include a comprehensive engineering analysis with calculations that are signed and sealed by a qualified professional engineer, using performance requirements and design criteria indicated.

1. Design Loads: As indicated on Drawings; See the structural drawings for additional requirements.

2. Settlement Requirements: As indicated on Drawings; See the structural drawings for additional requirements.

3. Slab-on-Grade Minimum Subgrade Modulus Requirements: As indicated on Drawings; See the structural drawings for additional requirements.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60 (Grade 420), deformed.

2.3 CONCRETE MATERIALS USED IN GROUT

A. Portland Cement: ASTM C150/C150M, Type I/II with the following optional supplement:

1. Fly Ash: ASTM C618, Class F.

B. Fine Aggregate: ASTM C33/C33M with 100 percent passing a No. 8 (2.36-mm) sieve, free of materials with deleterious reactivity to alkali in cement. Provide aggregate from single source.

C. Water: ASTM C94/C94M and potable.

D. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
3. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
4. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

E. Fluidifier: ASTM C937, with expansion of less than 4 percent.

2.4 RELATED MATERIALS

A. Pile-Top Forms: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes.

2.5 GROUT MIXTURES

A. Proportion grout mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days; ASTM C109/C109M with cube specimens restrained from expansion according to ASTM C942.
2. Maximum Water-Cementitious Materials Ratio: ~~0.40~~ ***0.45***
3. ~~Grout Flow: 10 to 25 seconds; ASTM C939 and ASTM C109/C109M using a flow cone with 0.75-inch (19-mm) opening.~~
4. ~~6-inch to 8-inch slump~~
5. Grout shall be a ready-mixed grout with a furnished batch ticket that states measure, batch, mix, and delivery in according to ASTM C94/C94M.

2.6 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - DESIGNED ELEMENTS

3.1 LOAD TRANSFER PAD

A. The Load Transfer Pad shall be designed based on a geotechnical investigation by the specialty designer (at cost to the general contractor).

B. For slabs-on-grade, this pad occurs between the rigid inclusion soil improvement and the bottom of the slab-on-grade. This design shall be by the specialty designer but shall not be less than 4’-0” thick. This pad must be of adequate thickness and material type to provide the uniform subgrade modulus, strength capacity, and settlement requirements stated on the structural drawings. The slab-on-grade shall not be used to transfer vertical loads between rigid vertical elements.

C. For foundations, this pad occurs between the rigid inclusion soil improvement and the bottom of the foundations, specified thickness shall be by the specialty designer but shall not be less than 1’-0” thick. The foundations on the structural drawings are designed based on an assumed uniform bearing pressure as stated on the structural drawings. When the specialty designer

relies on the foundation to transfer all or part of the vertical load to the rigid vertical elements, the specialty designer is responsible for verifying that the design of the foundation stated on the structural drawings meets the requirements of the rigid inclusion soil improvement system in regards to one-way shear, punching shear, moment capacity, and other design considerations. If the foundation does not meet the requirements, the designer shall submit a new proposed foundation design with calculations for review. If the foundations must be increased or changed from those shown in the structural drawings, all costs associated with this change shall be paid by the general contractor with no cost to the owner.

D. Geotextile reinforcement may be used in the load transfer pads as required by the specialty designer.

E. The material used for the load transfer pads shall be determined by the specialty designer.

3.2 RIGID VERTICAL ELEMENTS

A. Rigid Vertical Elements shall be designed based on an additional geotechnical investigation by the general contractor (at cost to the general contractor).

B. The specialty engineer shall determine the diameter, spacing, and depth of the Rigid Vertical Elements. Diameters shall not be less than 10-inhes and shall not be larger than 20-inches.

C. These elements shall be reinforced as required by the specialty designer but shall at a minimum have one continuous #6 center bar ***at 30'-0" length or entire pile length, whichever is less***.

PART 4 - EXECUTION

4.1 DRILLING AND PUMPING EQUIPMENT

A. Drilling Rig: Capable of advancing hollow-stem, continuous-flight augers of design diameters to depths 20 percent greater than stated design depths; with stabilizing arm at bottom of leads to prevent rotation, and middle guide for augers greater than 40 feet (12 m) in length.

B. Vibrated Probe Rig: Capable of advancing the hollow probe to depths 20 percent greater than stated design depths; with stabilizing arm at bottom of leads to prevent rotation, and middle guide for augers greater than 40 feet (12 m) in length.

C. Hollow-Stem Auger: Continuous auger flighting without gaps or breaks, of diameter no more than 3 percent less than pile diameter; with grout pumping hole at bottom of auger head below cutting teeth. Seal grout-pumping hole with temporary tip plug to be fully opened by grout pressure or reinforcing bar during grout installation.

    1. Hollow Shaft Diameter: Minimum 1-1/4-inch (32-mm) clear ID.

D. Vibrated Probe: As required by the specialty engineer and installer. This probe shall contain a hole at the bottom of the probe head. Seal grout-pumping hole with temporary tip plug to be fully opened by grout pressure or reinforcing bar during grout installation.

    1. Hollow Probe Diameter: Minimum 1-1/4-inch (32-mm) clear ID.

E. Grout Pump: Positive-displacement pump with a known volume per stroke. Pressure as required by the specialty designer and installer but not less than 350 lbf/sq. in. (2.4 MPa).

F. Automated Monitoring Equipment: Capable of measuring auger/probe depth, penetration rate, and grout volume pumped per unit depth increment and of printing results.

4.2 EXCAVATION

A. Excavate vertical rigid elements to elevations indicated by the specialty designer and as shown in the Rigid Inclusion Soil Improvement Shop Drawings. Establish and maintain axial alignment of leads and shaft before and during excavation.

1. Auger/Probe Refusal: Shall be as determined by the specialty designer and shall be listed in the Rigid Inclusion Soil Improvement Shop Drawings. The specialty designer shall state the required course of action required if refusal is met in the Rigid Inclusion Soil Improvement Shop Drawings.

B. Vertical Rigid Element Tolerances:

1. Location: Pile centers maximum 3 inches (75 mm) from locations indicated.
2. Plumb: Within 2 percent from vertical.
3. Batter Angle: Within 4 percent from required angle.
4. Completed Diameter: Within 5% of the specified diameter.
5. Top of Inclusion Elevation: Within 1” of stated drawings
6. Tip of Inclusion Elevation: Not less than stated in the approved shop drawings.

4.3 INSTALLATION

A. Grout Placement: Place grout in continuous operation.

1. Lift auger/probe 6 to 12 inches (152 to 305 mm) at start of grout pumping to facilitate tip plug removal, then return to previously established tip elevation.
2. Develop an initial grout head of 60 inches (1500 mm) before start of auger/probe withdrawal and maintain during extraction.
3. Monitor pumped grout volumes using automated monitoring equipment.
4. Volume of placed grout is at least 115 percent of theoretical volume. If less than required volume is placed for any given 60-inch (1500-mm) segment, lower auger a minimum of 60 inches (1500 mm), or to bottom of pile if less than 60 inches (1500 mm) available, and restart withdrawal.
5. If grout pumping is interrupted during placement, lower auger a minimum of 60 inches (1500 mm), or to bottom of pile if less than 60 inches (1500 mm) available, and restart withdrawal.

B. Steel Reinforcement Installation, General: Comply with recommendations in CRSI's "Manual of Standard Practice."

C. Adjacent Vertical Rigid Elements: Do not install vertical elements within 6 element diameters of elements grouted within the previous 12 hours.

D. If location or out-of-plumb tolerances are exceeded, provide corrective construction. Submit corrective construction proposals for review before proceeding. Corrective construction shall be at contractor's expense.

4.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

1. Vertical rigid element excavation, placement, and testing.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections, including but not limited to:

1. Grout Tests: Testing of samples of fresh grout obtained according to ASTM C172/C172M shall be performed according to the following requirements:
   a. Flow Rate: ASTM C939 and ASTM C109/C109M using a flow cone with 0.75-inch (19-mm) opening.
   b. Compressive Strength: ASTM C109/C109M with cube specimens restrained from expansion according to ASTM C942.
      1) Testing Frequency: Obtain six 2-inch (101-mm) cubes for each 50 cu. yd. (38 cu. m) or fraction thereof of grout placed, but not less than one set for each day's pour. Obtain an additional set of cubes from each truck during test pile placement.
      2) Strength of each grout mixture is satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
2. Rigid Vertical Element Test Requirements: These tests shall occur on non-production rigid vertical elements that are near the location of production elements. This testing shall occur prior to the construction and installation of production elements.
   a. Installation Testing:
      1) Installation tests showing that the element can be placed and constructed as required in the contract drawing requirements and the delegated design requirements.
      2) A minimum of one successful nonproduction rigid vertical element shall be tested in installation.
   b. Static Compression Testing:
      1) Static compression tests shall be performed showing that the element meets the compressive requirements stated in the contract drawing requirements and the delegated design requirements.
      2) A minimum of one successful nonproduction rigid vertical element shall be tested in compression. The compression requirements shall be determined by the specialty designer based on the required bearing capacities stated on the structural drawing.
      3) Static compression testing shall be in accordance with section 1810.3.3.1.2 and section 1810.3.3.1.3 of the International Building Code (IBC) 2018, with the following additions/modifications.
   c. Static Tension Testing:

1) Static tension tests shall be performed showing that the element meets the compressive requirements stated in the contract drawing requirements and the delegated design requirements.
2) A minimum of one successful nonproduction rigid vertical element shall be tested in tension (if tension occurs). The tension requirements shall be determined by the specialty designer based on the required bearing capacities stated on the structural drawing.
3) Static tension testing shall be in accordance with section 1810.3.3.1.5 of the International Building Code (IBC) 2018.

3. Rigid Vertical Element PIT Testing
   a. A minimum of 25% of the installed production rigid vertical elements shall have a Pile Integrity Test (PIT) performed. This 25% shall be randomly selected at various positions within the soil improvement area.
   b. If any rigid element fails a Pile Integrity Test (PIT). The element shall be abandoned and replaced (at cost to the general contractor). Additionally, all remaining production rigid vertical elements shall have a Pile Integrity Test (PIT) preformed.

C. Rigid Vertical Element Rejection:
   1. Rigid vertical elements shall be abandoned and replaced (at cost to the General Contractor) if the element is:
      a. Mislocated
      b. Out of tolerance
      c. Installed Incorrectly
      d. Element receives less grout than calculated.
      e. Failure of a PIT Test

D. Rigid Vertical Element Inspection Reports: Prepare inspection reports for each Rigid Vertical Element.

E. Rigid Inclusion Contractor shall provide a comprehensive testing plan to be approved by the Geotechnical Engineer before testing begins.

END OF SECTION 316320

SECTION 321313 – LOADING DOCK AND APRON CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes concrete paving including the following:

1. Concrete Airfield Apron.
2. Concrete Loading Dock.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for general building applications of concrete.
2. Section 321373 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.
3. Section 321314 Curbs and Walk Concrete Paving
4. Section 321723 "Pavement Markings."

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1. Review methods and procedures related to concrete paving, including but not limited to, the following:

   a. Concrete mixture design.
   b. Quality control of concrete materials and concrete paving construction practices.

2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:

   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete paving Subcontractor.
   e. Manufacturer's representative of stamped concrete paving system used for stamped detectable warnings.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified concrete mix laboratory and testing agency.

B. Material Certificates: For the following, from manufacturer:

1. Cement
2. Cementitious materials.
3. Steel reinforcement and reinforcement accessories.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

C. Material Test Reports: For each of the following:

1. Aggregate:
   a. Reactivity
   b. Fine Aggregate
   c. Coarse Aggregate
   d. Combined Aggregate Gradation

2. Concrete Mix Design**:**
   a. Combined Aggregate Gradation
   b. Reactivity
   c. Fine Aggregate Material Requirements
   d. Coarse Aggregate Material Requirements
   e. Mill Certificates for cement and supplement cementitious material
   f. Certified test results for all admixtures, including Lithium Nitrate is applicable
   g. Flexural strength, slump, and air content
   h. Recommended proportions/volumes for proposed mixture and trial water-cementitious materials ratio, including actual slump and air content
   i. Flexural and Compressive strength summaries and plots, including all individual
   j. Correlation ratios for acceptance testing and contractor QC testing, when applicable.
   k. Historical Record of test results documenting production standard deviation, when applicable.

D. Quality Assurance Acceptance Testing Results

1.6 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

B. Testing Agency Qualifications: Qualified according to ASTM C1077 for testing indicated.

1. Personnel conducting field tests must be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

1.8 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 Aggregates.

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

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

(2) The combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If the expansion does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

(3) If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) Concrete Research Division (CRD) C662 in lieu of ASTM C1567. If lithium nitrate admixture is used, it shall be

nominal 30% ±0.5% weight lithium nitrate in water. If the expansion does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

b. Fine aggregate. Grading of the fine aggregate, as delivered to the mixer, shall conform to the requirements of ASTM C33 and the parameters identified in the fine aggregate material requirements below. Fine aggregate material requirements and deleterious limits are shown in the table below.

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

c. Coarse aggregate. The maximum size coarse aggregate shall be **1.5"**.

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

Coarse Aggregate Material Requirements

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

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

[2] Only required if slag is specified.

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

Limits for Deleterious Substances in Coarse Aggregate

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

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

[2] Chert and aggregates with less than 2.4 specific gravity.

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

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

(1) The materials selected and the proportions used shall be such that when the Coarseness Factor (CF) and the Workability Factor (WF) are plotted on a diagram as described in paragraph 2.1d(4) below, the point thus determined shall fall within the parallelogram described therein.

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

CF = (cumulative percent retained on the 3/8 in. (9.5 mm) sieve)(100) / (cumulative percent retained on the No. 8 (2.36 mm) sieve)

(3) The WF is defined as the percent passing the No. 8 (2.36 mm) sieve based on the combined gradation. However, WF shall be adjusted, upwards only, by 2.5 percentage points for each 94 pounds (42 kg) of cementitious material per cubic meter yard greater than 564 pounds per cubic yard (335 kg per cubic meter).

(4) A diagram shall be plotted using a rectangular scale with WF on the Y-axis with units from 20 (bottom) to 45 (top), and with CF on the X-axis with units from 80 (left side) to 30 (right side). On this diagram a parallelogram shall be plotted with corners at the following coordinates (CF-75, WF-28), (CF-75, WF-40), (CF-45, WF-32.5), and (CF-45, WF-44.5). If the point determined by the intersection of the computed CF and WF does not fall within the above parallelogram, the grading of each size of aggregate used and the proportions selected shall be changed as necessary. The point determined by the plotting of the CF and WF may be adjusted during production ±3 WF and ±5 CF. Adjustments to gradation may not take the point outside of the parallelogram.

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

Contractor's Combined Aggregate Gradation

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

2.2 Cement. Cement shall conform to the requirements of ASTM C150 Type I or II Cement supplied shall be low-alkali cement with total alkali content less than 0.6% ***or Type IL per ASTM C595***.

2.3 Cementitious materials.

a. Fly ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash shall have a Calcium Oxide (CaO) content of less than 15% and a total alkali content less than 3% per ASTM C311. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the concrete mix, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the Resident Project Representative (RPR).

b. Slag cement (ground granulated blast furnace (GGBF)). Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.

c. Raw or calcined natural pozzolan. Natural pozzolan shall be raw or calcined and conform to ASTM C618, Class N, including the optional requirements for uniformity and effectiveness in controlling Alkali-Silica reaction and shall have a loss on ignition not exceeding 6%. Class N pozzolan for use in mitigating Alkali-Silica Reactivity shall have a total available alkali content less than 3%.

d. Ultrafine fly ash and ultrafine pozzolan. UltraFine Fly Ash (UFFA) and UltraFine Pozzolan (UFP) shall conform to ASTM C618, Class F or N, and the following additional requirements:

(1) The strength activity index at 28 days of age shall be at least 95% of the control specimens.

(2) The average particle size shall not exceed 6 microns.

2.4 Joint seal. The joint seal for the joints in the concrete pavement shall meet the requirements of Item 321373 and shall be of the type specified in the plans.

2.5 Isolation joint filler. Premolded joint filler for isolation joints shall conform to the requirements of ASTM D1751 or ASTM D1752 and shall be where shown on the plans. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint, unless otherwise specified by the RPR. When the use of more than one piece is required for a joint, the abutting ends shall be fastened securely and held accurately to shape by stapling or other positive fastening means satisfactory to the RPR.

2.6 Steel reinforcement. Reinforcing shall be provided as shown on the plans.

2.7 Dowel and tie bars. Dowel bars shall be plain steel bars conforming to ASTM A615 and shall be free from burring or other deformation restricting slippage in the concrete.

a. Dowel Bars. Before delivery to the construction site each dowel bar shall be epoxy coated per ASTM A1078, Type 1, with a coating thickness after curing greater than 10 mils. Patched ends are not required for Type 1 coated dowels. The dowels shall be coated with a bond-breaker recommended by the manufacturer. Dowel sleeves or inserts are not permitted. Grout retention rings shall be fully circular metal or plastic devices capable of supporting the dowel until the grout hardens.

b. Tie Bars. Tie bars shall be deformed steel bars and conform to the requirements of ASTM A615. Tie bars designated as Grade 60 in ASTM A615 or ASTM A706 shall be used for construction requiring bent bars.

2.8 Water. Water used in mixing or curing shall be potable. If water is taken from other sources considered non-potable, it shall meet the requirements of ASTM C1602.

2.9 Material for curing concrete. Curing materials shall conform to one of the following specifications:

a. Liquid membrane-forming compounds for curing concrete shall conform to the requirements of ASTM C309, Type 2, Class A, or Class B.

b. White polyethylene film for curing concrete shall conform to the requirements of ASTM C171.

c. White burlap-polyethylene sheeting for curing concrete shall conform to the requirements of ASTM C171.

d. Waterproof paper for curing concrete shall conform to the requirements of ASTM C171.

2.10 Admixtures. Admixtures shall conform to the following specifications:

a. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entraining agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D.

c. Other admixtures. The use of set retarding and set-accelerating admixtures shall be approved by the RPR prior to developing the concrete mix. Retarding admixtures shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating admixtures shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

d. Lithium Nitrate. The lithium admixture shall be a nominal 30% aqueous solution of Lithium Nitrate, with a density of 10 pounds/gallon (1.2 kg/L), and shall have the approximate chemical form as shown below:

Lithium Admixture

Constituent	Limit (Percent by Mass)
LiNO3 (Lithium Nitrate)	30 ±0.5
SO4 (Sulfate Ion)	0.1 (max)
Cl (Chloride Ion)	0.2 (max)
Na (Sodium Ion)	0.1 (max)
K (Potassium Ion)	0.1 (max)

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

2.11 Epoxy-resin. All epoxy-resin materials shall be two-component materials conforming to the requirements of ASTM C881, Class as appropriate for each application temperature to be encountered, except that in addition, the materials shall meet the following requirements:

a. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.

b. Material for use as patching materials for complete filling of spalls and other voids and for use in preparing epoxy resin mortar shall be Type III, Grade as approved.

c. Material for use for injecting cracks shall be Type IV, Grade 1.

d. Material for bonding freshly mixed Portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete shall be Type V, Grade as approved.

2.12 Bond Breaker. Liquid membrane forming compound shall be in accordance with paragraph 2.9.

CONCRETE MIX

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

3.2 Concrete Mix Laboratory. The laboratory used to develop the concrete mix shall be accredited in accordance with ASTM C1077. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the concrete mix must be included in the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the RPR prior to start of construction.

3.3 Concrete Mix Proportions. Develop the mix using the procedures contained in Portland Cement Association (PCA) publication, "Design and Control of Concrete Mixtures." Concrete shall be proportioned to achieve a 28-day flexural strength that meets or exceeds the acceptance criteria contained in paragraph 6.6 for a flexural strength of **650** psi per ASTM C78.

The minimum cementitious material shall be adequate to ensure a workable, durable mix. The minimum cementitious material (cement plus fly ash, or slag cement) shall be **470** pounds per cubic yard. The ratio of water to cementitious material, including free surface moisture on the aggregates but not including moisture absorbed by the aggregates shall be between 0.38 – 0.45 by weight.

Flexural strength test specimens shall be prepared in accordance with ASTM C192 and tested in accordance with ASTM C78. At the start of the project, the Contractor shall determine an allowable slump as determined by ASTM C143 not to exceed 2 inches for slip-form placement. For fixed-form placement, the slump shall not exceed 3 inches. For hand placement, the slump shall not exceed 4 inches.
The results of the concrete mix shall include a statement giving the maximum nominal coarse aggregate size and the weights and volumes of each ingredient proportioned on a one cubic yard basis. Aggregate quantities shall be based on the mass in a saturated surface dry condition.

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

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

3.4 Concrete Mix submittal. The concrete mix shall be submitted to the RPR at least 30 days prior to the start of operations. The submitted concrete mix shall not be more than 180 days old and must use the materials to be used for production for the project. Production shall not begin until the concrete mix is approved in writing by the RPR.
Each of the submitted concrete mixes (i.e, slip form, side form machine finish and side form hand finish) shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items and quantities as a minimum:

- Certified material test reports for aggregate in accordance with paragraph 2.1. Certified reports must include all tests required; reporting each test, test method, test result, and requirement specified (criteria).

- Combined aggregate gradations and analysis; and including plots of the fine aggregate fineness modulus.

- Reactivity Test Results.

- Coarse aggregate quality test results, including deleterious materials.

- Fine aggregate quality test results, including deleterious materials.

- Mill certificates for cement and supplemental cementitious materials.

- Certified test results for all admixtures, including Lithium Nitrate if applicable.

- Specified flexural strength, slump, and air content.

- Recommended proportions/volumes for proposed mixture and trial water-cementitious materials ratio, including actual slump and air content.

- Flexural and compressive strength summaries and plots, including all individual beam and cylinder breaks.

- Correlation ratios for acceptance testing and Contractor QC testing, when applicable.

- Historical record of test results documenting production standard deviation, when applicable.

3.5 Cementitious materials.

a. Fly ash. When fly ash is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If fly ash is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

b. Slag cement (ground granulated blast furnace (GGBF)). Slag cement may be used. The slag cement, or slag cement plus fly ash if both are used, may constitute between 25 to 55% of the total cementitious material by weight.

c. Raw or calcined natural pozzolan. Natural pozzolan may be used in the concrete mix. When pozzolan is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If pozzolan is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

d. Ultrafine fly ash (UFFA) and ultrafine pozzolan (UFP). UFFA and UFP may be used in the concrete mix with the RPR's approval. When UFFA and UFP is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 7% and 16% by weight of the total cementitious material.

3.6 Admixtures.

a. Air-entraining admixtures. Air-entraining admixture are to be added in such a manner that will ensure uniform distribution of the agent throughout the batch. The air content of freshly mixed air-entrained concrete shall be based upon trial mixes with the materials to be used in the work adjusted to produce concrete of the required plasticity and workability. The percentage of air in the mix shall be **3 to 5%**. Air content shall be determined by testing in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag and other highly porous coarse aggregate.

b. Water-reducing admixtures. Water-reducing admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted with the materials to be used in the work, in accordance with ASTM C494.

c. Other admixtures. Set controlling, and other approved admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted with the materials to be used in the work, in accordance with ASTM C494.

d. Lithium nitrate. Lithium nitrate shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements in accordance with paragraph 2.10d.

EXECUTION

4.1 Control Strip. The control strip(s) shall be to the next planned joint after the initial 250 feet of each type of pavement construction (slip-form pilot lane, slip-form fill-in lane, or fixed form). The Contractor shall demonstrate, in the presence of the RPR, that the materials, concrete mix, equipment, construction processes, and quality control processes meet the requirements of the specifications. The concrete mixture shall be extruded from the paver meeting the edge slump tolerance and with little or no finishing. Pilot, fill-in, and fixed-form control strips will be accepted separately. Minor adjustments to the mix design may be required to place an acceptable control strip. The production mix will be the adjusted mix design used to place the acceptable control strip. Upon acceptance of the control strip by the RPR, the Contractor must use the same equipment, materials, and construction methods for the remainder of concrete paving. Any adjustments to processes or materials must be approved in advance by the RPR. The acceptable control strip shall be paid for in accordance with paragraph 6.6.

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

a. Plant and equipment. The plant and mixing equipment shall conform to the requirements of ASTM C94 and/or ASTM C685. Each truck mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades. The truck mixers shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades. The pickup and throwover blades shall be replaced when they have worn down 3/4 inch or more. The Contractor shall have a copy of the manufacturer's design on hand showing dimensions and arrangement of blades in reference to original height and depth.

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

spread it evenly across the paving lane in front of the paver and strike off the surface evenly to a depth which permits the paver to operate efficiently.

b. Finishing equipment.

(1) Slip-form. The standard method of constructing concrete pavements shall be with an approved slip-form paving equipment designed and operated to spread, consolidate, screed, and finish the freshly placed concrete in one complete pass of the machine so that the end result is a dense and homogeneous pavement which is achieved with a minimum of hand finishing. The paver-finisher shall be a heavy duty, self-propelled machine designed specifically for paving and finishing high quality concrete pavements.

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

c. Vibrators. Vibrator shall be the internal type. The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without segregation or voids. The number, spacing, and frequency shall be as necessary to provide a dense and homogeneous pavement and meet the recommendations of American Concrete Institute (ACI) 309R, Guide for Consolidation of Concrete. Adequate power to operate all vibrators shall be available on the paver. The vibrators shall be automatically controlled so that they shall be stopped as forward motion ceases. The Contractor shall provide an electronic or mechanical means to monitor vibrator status. The checks on vibrator status shall occur a minimum of two times per day or when requested by the RPR.

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

d. Concrete saws. The Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions. The Contractor shall provide at least one standby saw in good working order and a supply of saw blades at the site of the work at all times during sawing operations.

e. Fixed forms. Straight side fixed forms shall be made of steel and shall be furnished in sections not less than 10 feet in length. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms with battered top surfaces and bent, twisted or broken forms shall not be used. Built-up forms shall not be used, except as approved by the RPR. The top face of the form shall not vary from a true plane more than 1/8 inch in 10 feet, and the upstanding leg shall not vary more than 1/4 inch. The forms shall contain provisions for locking the ends of abutting sections together tightly for secure setting. Wood forms may be used under special conditions, when approved by the RPR. The forms shall extend the full depth of the pavement section.

4.3 Form setting. Forms shall be set to line and grade as shown on the plans, sufficiently in advance of the concrete placement, to ensure continuous paving operation. Forms shall be set to withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the concrete placement.

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

4.5 Handling, measuring, and batching material. Aggregate stockpiles shall be constructed and managed in such a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the concrete batch plant. Aggregates that have become segregated or mixed with earth or foreign material shall not be used. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall be stockpiled or binned for draining at least 12 hours before being batched. Store and maintain all aggregates at a uniform moisture content prior to use. A continuous supply of materials shall be provided to the work to ensure continuous placement.

4.6 Mixing concrete. The concrete may be mixed at the work site, in a central mix plant or in truck mixers. The mixer shall be of an approved type and capacity. Mixing time shall be measured from the time all materials are placed into the drum until the drum is emptied into the truck. All concrete shall be mixed and delivered to the site in accordance with the requirements of ASTM C94 or ASTM C685.
Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators, or non-agitating trucks. The elapsed time from the addition of cementitious material to the mix until the concrete is discharged from the truck should not exceed 30 minutes when the concrete is hauled in non-agitating trucks, nor 90 minutes when the concrete is hauled in truck mixers or truck agitators. In no case shall the temperature of the concrete when placed exceed 90°F (32°C). Retempering concrete by adding water or by other means will not be permitted. With transit mixers additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements provided the addition of water is performed within 45 minutes after the initial mixing operations and provided the water/cementitious ratio specified is not exceeded.

4.7 Weather Limitations on mixing and placing. No concrete shall be mixed, placed, or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

a. Cold weather. Unless authorized in writing by the RPR, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40°F and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F.

The aggregate shall be free of ice, snow, and frozen lumps before entering the mixer. The temperature of the mixed concrete shall not be less than 50°F at the time of placement. Concrete shall not be placed on frozen material nor shall frozen aggregates be used in the concrete.

When concreting is authorized during cold weather, water and/or the aggregates may be heated to not more than 150°F. The apparatus used shall heat the mass uniformly and shall be arranged to preclude the possible occurrence of overheated areas which might be detrimental to the materials.

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

b. Hot weather. During periods of hot weather when the maximum daily air temperature exceeds 85°F, the following precautions shall be taken.

The forms and/or the underlying surface shall be sprinkled with water immediately before placing the concrete. The concrete shall be placed at the coolest temperature practicable, and in no case shall the temperature of the concrete when placed exceed 90°F. The aggregates and/or mixing water shall be cooled as necessary to maintain the concrete temperature at or not more than the specified maximum.

The concrete placement shall be protected from exceeding an evaporation rate of 0.2 psf per hour. When conditions are such that problems with plastic cracking can be expected, and particularly if any plastic cracking begins to occur, the Contractor shall immediately take such additional measures as necessary to protect the concrete surface. If the Contractor's measures are not effective in preventing plastic cracking, paving operations shall be immediately stopped.

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

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

(1) Anticipated tensile strains in the fresh concrete as related to heating and cooling of the concrete material.

(2) Anticipated weather conditions such as ambient temperatures, wind velocity, and relative humidity; and anticipated evaporation rate using Figure 19-9, PCA, Design and Control of Concrete Mixtures.

(3) Anticipated timing of initial sawing of joint.

(4) Anticipated number and type of saws to be used.

d. **Rain.** The Contractor shall have available materials for the protection of the concrete during inclement weather. Such protective materials shall consist of rolled polyethylene sheeting at least 4 mils thick of sufficient length and width to cover the plastic concrete slab and any edges. The sheeting may be mounted on either the paver or a separate movable bridge from which it can be unrolled without dragging over the plastic concrete surface. When rain appears imminent, all paving operations shall stop and all available personnel shall begin covering the surface of the unhardened concrete with the protective covering.

4.8 Concrete Placement. At any point in concrete conveyance, the free vertical drop of the concrete from one point to another or to the underlying surface shall not exceed 3 feet. The finished concrete product must be dense and homogeneous, without segregation and conforming to the standards in this specification. Backhoes and grading equipment shall not be used to distribute the concrete in front of the paver. Front end loaders will not be used. All concrete shall be consolidated without voids or segregation, including under and around all load-transfer devices, joint assembly units, and other features embedded in the pavement. Hauling equipment or other mechanical equipment can be permitted on adjoining previously constructed pavement when the concrete strength reaches a flexural strength of 550 psi, based on the average of four field cured specimens per 2,000 cubic yards (1,530 cubic meters) of concrete placed. The Contractor must determine that the above minimum strengths are adequate to protection the pavement from overloads due to the construction equipment proposed for the project.

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

a. Slip-form construction. The concrete shall be distributed uniformly into final position by a self-propelled slip-form paver without delay. The alignment and elevation of the paver shall be regulated from outside reference lines established for this purpose. The paver shall vibrate the concrete for the full width and depth of the strip of pavement being placed and the vibration shall be adequate to provide a consistency of concrete that will stand normal to the surface with sharp well-defined edges. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms. The plastic concrete shall be effectively consolidated by internal vibration with transverse vibrating units for the full width of the pavement and/or a series of equally placed longitudinal vibrating units. The space from the outer edge of the pavement to longitudinal unit shall not exceed 9 inches for slipform and at the end of the dowels for the fill-in lanes. The spacing of internal units shall be uniform and shall not exceed 18 inches.

The term internal vibration means vibrating units located within the specified thickness of pavement section.

The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without, segregation, voids, or vibrator trails and the amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete along the entire length of the vibrating unit and for a distance of at least one foot. The frequency of vibration or amplitude should be adjusted proportionately with the rate of travel to result in a uniform density and air content. The paving machine shall be equipped with a tachometer or other suitable device for measuring and indicating the actual frequency of vibrations.

The concrete shall be held at a uniform consistency. The slip-form paver shall be operated with as nearly a continuous forward movement as possible and all operations of mixing, delivering, and spreading concrete shall be coordinated to provide uniform progress with stopping and starting of the paver held to a minimum. If for any reason, it is necessary to stop the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately. No tractive force shall be applied to the machine, except that which is controlled from the machine.

When concrete is being placed adjacent to an existing pavement, that part of the equipment which is supported on the existing pavement shall be equipped with protective pads on crawler tracks or rubber-tired wheels on which the bearing surface is offset to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.

Not more than 15% of the total free edge of each 500-foot segment of pavement, or fraction thereof, shall have an edge slump exceeding 1/4 inch, and none of the free edge of the pavement shall have an edge slump exceeding 3/8 inch. (The total free edge of 500 feet of pavement will be considered the cumulative total linear measurement of pavement edge originally constructed as nonadjacent to any existing pavement; that is, 500 feet of paving lane originally constructed as a separate lane will have 1,000 feet of free edge, 500 feet of fill-in lane will have no free edge, etc.). The area affected by the downward movement of the concrete along the pavement edge shall be limited to not more than 18 inches from the edge.

When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump will be removed the full width of the slip form lane and replaced at the expense of the Contractor as directed by the RPR.

b. Fixed-form construction. Forms shall be drilled in advance of being placed to line and grade to accommodate tie bars / dowel bars where these are specified.

Immediately in advance of placing concrete and after all subbase operations are completed, side forms shall be trued and maintained to the required line and grade for a distance sufficient to prevent delay in placing.

Side forms shall remain in place at least 12 hours after the concrete has been placed, and in all cases until the edge of the pavement no longer requires the protection of the forms. Curing compound shall be applied to the concrete immediately after the forms have been removed.

Side forms shall be thoroughly cleaned and coated with a release agent each time they are used and before concrete is placed against them.

Concrete shall be spread, screed, shaped and consolidated by one or more self-propelled machines. These machines shall uniformly distribute and consolidate concrete without segregation so that the completed pavement will conform to the required cross-section with a minimum of handwork.

The number and capacity of machines furnished shall be adequate to perform the work required at a rate equal to that of concrete delivery. The equipment must be specifically designed for placement and finishing using stationary side forms. Methods and equipment shall be reviewed and accepted by the RPR.

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

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

c. Consolidation. Concrete shall be consolidated with the specified type of lane-spanning, gang-mounted, mechanical, immersion type vibrating equipment mounted in front of the paver, supplemented, in rare instances as specified, by hand-operated vibrators. The vibrators shall be inserted into the concrete to a depth that will provide the best full-depth consolidation but not closer to the underlying material than 2 inches. Vibrators shall not be used to transport or spread the concrete. For each paving train, at least one additional vibrator spud, or sufficient parts for rapid replacement and repair of vibrators shall be maintained at the paving site at all times. Any evidence of inadequate consolidation (honeycomb along the edges, large air pockets, or any other evidence) or over-consolidation (vibrator trails, segregation, or any other evidence) shall require the immediate stopping of the paving operation and adjustment of the equipment or procedures as approved by the RPR.

If a lack of consolidation of the hardened concrete is suspected by the RPR, referee testing may be required. Referee testing of hardened concrete will be performed by the RPR by cutting cores from the finished pavement after a minimum of 24 hours curing. The RPR shall visually examine the cores for evidence of lack of consolidation. Density determinations will be made by the RPR based on the water content of the core as taken. ASTM C642 shall be used for the determination of core density in the saturated-surface dry condition. When required, referee cores will be taken at the minimum rate of one for each 500 cubic yards of pavement, or fraction. The Contractor shall be responsible for all referee testing cost if they fail to meet the required density.

The average density of the cores shall be at least 97% of the original concrete mix density, with no cores having a density of less than 96% of the original concrete mix density. Failure to meet the referee tests will be considered evidence that the minimum requirements for vibration are inadequate

for the job conditions. Additional vibrating units or other means of increasing the effect of vibration shall be employed so that the density of the hardened concrete conforms to the above requirements.

4.9 Strike-off of concrete and placement of reinforcement. Following the placing of the concrete, it shall be struck off to conform to the cross-section shown on the plans and to an elevation that when the concrete is properly consolidated and finished, the surface of the pavement shall be at the elevation shown on the plans. When reinforced concrete pavement is placed in two layers, the bottom layer shall be struck off to such length and depth that the sheet of reinforcing steel fabric or bar mat may be laid full length on the concrete in its final position without further manipulation. The reinforcement shall then be placed directly upon the concrete, after which the top layer of the concrete shall be placed, struck off, and screed. If any portion of the bottom layer of concrete has been placed more than 30 minutes without being covered with the top layer or if initial set has taken place, it shall be removed and replaced with freshly mixed concrete at the Contractor's expense. When reinforced concrete is placed in one layer, the reinforcement may be positioned in advance of concrete placement or it may be placed in plastic concrete by mechanical or vibratory means after spreading.

Reinforcing steel, at the time concrete is placed, shall be free of mud, oil, or other organic matter that may adversely affect or reduce bond. Reinforcing steel with rust, mill scale or a combination of both will be considered satisfactory, provided the minimum dimensions, weight, and tensile properties of a hand wire-brushed test specimen are not less than the applicable ASTM specification requirements.

4.10 Joints. Joints shall be constructed as shown on the plans and in accordance with these requirements. All joints shall be constructed with their faces perpendicular to the surface of the pavement and finished or edged as shown on the plans. Joints shall not vary more than 1/2-inch from their designated position and shall be true to line with not more than 1/4-inch variation in 10 feet. The surface across the joints shall be tested with a 12-foot straightedge as the joints are finished and any irregularities in excess of 1/4 inch shall be corrected before the concrete has hardened. All joints shall be so prepared, finished, or cut to provide a groove of uniform width and depth as shown on the plans.

a. Construction. Longitudinal construction joints shall be slip-formed or formed against side forms as shown in the plans.

Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for more than 30 minutes or it appears that the concrete will obtain its initial set before fresh concrete arrives. The installation of the joint shall be located at a planned contraction or expansion joint. If placing of the concrete is stopped, the Contractor shall remove the excess concrete back to the previous planned joint.

b. Contraction. Contraction joints shall be installed at the locations and spacing as shown on the plans. Contraction joints shall be installed to the dimensions required by forming a groove or cleft in the top of the slab while the concrete is still plastic or by sawing a groove into the concrete surface after the concrete has hardened. When the groove is formed in plastic concrete the sides of the grooves shall be finished even and smooth with an edging tool. If an insert material is used, the installation and edge finish shall be according to the manufacturer's instructions. The groove shall be finished or cut clean so that spalling will be avoided at intersections with other joints. Grooving or sawing shall produce a slot at least 1/8 inch wide and to the depth shown on the plans.

c. Isolation (expansion). Isolation joints shall be installed as shown on the plans. The premolded filler of the thickness as shown on the plans, shall extend for the full depth and width of the slab at the joint. The filler shall be fastened uniformly along the hardened joint face with no buckling or debris

between the filler and the concrete interface, including a temporary filler for the sealant reservoir at the top of the slab. The edges of the joint shall be finished and tooled while the concrete is still plastic

d. Dowels and Tie Bars for Joints

(1) Tie bars. Tie bars shall consist of deformed bars installed in joints as shown on the plans. Tie bars shall be placed at right angles to the centerline of the concrete slab and shall be spaced at intervals shown on the plans. They shall be held in position parallel to the pavement surface and in the middle of the slab depth and within the tolerances in paragraph 4.10(f.). When tie bars extend into an unpaved lane, they may be bent against the form at longitudinal construction joints, unless threaded bolt or other assembled tie bars are specified. Tie bars shall not be painted, greased, or enclosed in sleeves. When slip-form operations call for tie bars, two-piece hook bolts can be installed.

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

(3) Placing dowels and tie bars. Horizontal spacing of dowels shall be within a tolerance of ±3/4 inch. The vertical location on the face of the slab shall be within a tolerance of ±1/2 inch. The method used to install dowels shall ensure that the horizontal and vertical alignment will not be greater than 1/4 inch per feet, except for those across the crown or other grade change joints. Dowels across crowns and other joints at grade changes shall be measured to a level surface. Horizontal alignment shall be checked perpendicular to the joint edge. The portion of each dowel intended to move within the concrete or expansion cap shall be wiped clean and coated with a thin, even film of lubricating oil or light grease before the concrete is placed. Dowels shall be installed as specified in the following subparagraphs.

(a) Contraction joints. Dowels and tie bars in longitudinal and transverse contraction joints within the paving lane shall be held securely in place by means of rigid metal frames or basket assemblies of an approved type. The basket assemblies shall be held securely in the proper location by means of suitable pins or anchors. Do not cut or crimp the dowel basket tie wires.

At the Contractor's option, dowels and tie bars in contraction joints may be installed by insertion into the plastic concrete using approved equipment and procedures per the paver manufacturer's design. Approval of installation methods will be based on the results of the control strip showing that the dowels and tie bars are installed within specified tolerances as verified by cores or non-destructive rebar location devices approved by the RPR.

(b) Construction joints. Install dowels and tie bars by the cast-in- place or the drill-and-dowel method. Installation by removing and replacing in preformed holes will not be permitted. Dowels and tie bars shall be prepared and placed across joints where indicated, correctly aligned, and securely held in the proper horizontal and vertical position during placing and finishing operations, by means of devices fastened to the forms.

(c) Joints in hardened concrete. Install dowels in hardened concrete by bonding the dowels into holes drilled into the concrete. The concrete shall have cured for seven (7) days or reached a minimum flexural strength of 450 psi before drilling begins. Holes 1/8 inch greater in diameter than the dowels shall be drilled into the hardened concrete using rotary-core drills. Rotary-percussion drills may be used, provided that excessive spalling

does not occur. Spalling beyond the limits of the grout retention ring will require modification of the equipment and operation. Depth of dowel hole shall be within a tolerance of ±1/2 inch of the dimension shown on the drawings. On completion of the drilling operation, the dowel hole shall be blown out with oil-free, compressed air. Dowels shall be bonded in the drilled holes using epoxy resin. Epoxy resin shall be injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel will not be permitted. The dowels shall be held in alignment at the collar of the hole by means of a suitable metal or plastic grout retention ring fitted around the dowel.

e. Sawing of joints. Sawing shall commence, without regard to day or night, as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling, or tearing and before uncontrolled shrinkage cracking of the pavement occurs and shall continue without interruption until all joints have been sawn. All slurry and debris produced in the sawing of joints shall be removed by vacuuming and washing. Curing compound or system shall be reapplied in the initial saw-cut and maintained for the remaining cure period.

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

4.11 Finishing. Finishing operations shall be a continuing part of placing operations starting immediately behind the strike-off of the paver. Initial finishing shall be provided by the transverse screed or extrusion plate. The sequence of operations shall be transverse finishing, longitudinal machine floating if used, straightedge finishing, edging of joints, and then texturing. Finishing shall be by the machine method. The hand method shall be used only on isolated areas of odd slab widths or shapes and in the event of a breakdown of the mechanical finishing equipment. Supplemental hand finishing for machine finished pavement shall be kept to an absolute minimum. Any machine finishing operation which requires appreciable hand finishing, other than a moderate amount of straightedge finishing, shall be immediately stopped and proper adjustments made or the equipment replaced. Equipment, mixture, and/or procedures which produce more than 1/4 inch of mortar-rich surface shall be immediately modified as necessary to eliminate this condition or operations shall cease. Compensation shall be made for surging behind the screeds or extrusion plate and settlement during hardening and care shall be taken to ensure that paving and finishing machines are properly adjusted so that the finished surface of the concrete (not just the cutting edges of the screeds) will be at the required line and grade. Finishing equipment and tools shall be maintained clean and in an approved condition. At no time shall water be added to the surface of the slab with the finishing equipment or tools, or in any other way. Fog (mist) sprays or other surface applied finishing aids specified to prevent plastic shrinkage cracking, approved by the RPR, may be used in accordance with the manufacturers requirements.

a. Machine finishing with slipform pavers. The slipform paver shall be operated so that only a very minimum of additional finishing work is required to produce pavement surfaces and edges meeting the specified tolerances. Any equipment or procedure that fails to meet these specified requirements shall immediately be replaced or modified as necessary. A self-propelled non-rotating pipe float may be used while the concrete is still plastic, to remove minor irregularities and score marks. Only one pass of the pipe float shall be allowed. Equipment, mixture, and/or procedures which produce more than 1/4 inch of mortar-rich surface shall be immediately modified as necessary to eliminate this condition or operations shall cease. Remove excessive slurry from the surface with a cutting straightedge and wipe off the edge. Any slurry which does run down the vertical edges shall be immediately removed by hand, using stiff

brushes or scrapers. No slurry, concrete or concrete mortar shall be used to build up along the edges of the pavement to compensate for excessive edge slump, either while the concrete is plastic or after it hardens.

b. Machine finishing with fixed forms. The machine shall be designed to straddle the forms and shall be operated to screed and consolidate the concrete. Machines that cause displacement of the forms shall be replaced. The machine shall make only one pass over each area of pavement. If the equipment and procedures do not produce a surface of uniform texture, true to grade, in one pass, the operation shall be immediately stopped and the equipment, mixture, and procedures adjusted as necessary.

c. Other types of finishing equipment. Clary screeds, other rotating tube floats, or bridge deck finishers are not allowed on mainline paving, but may be allowed on irregular or odd-shaped slabs, and near buildings or trench drains, subject to the RPR's approval.

Bridge deck finishers shall have a minimum operating weight of 7500 pounds and shall have a transversely operating carriage containing a knock-down auger and a minimum of two immersion vibrators. Vibrating screeds or pans shall be used only for isolated slabs where hand finishing is permitted as specified, and only where specifically approved.

d. Hand finishing. Hand finishing methods will not be permitted, except under the following conditions: (1) in the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade and (2) in areas of narrow widths or of irregular dimensions where operation of the mechanical equipment is impractical.

e. Straightedge testing and surface correction. After the pavement has been struck off and while the concrete is still plastic, it shall be tested for trueness with a 12-foot finishing straightedge swung from handles capable of spanning at least one-half the width of the slab. The straightedge shall be held in contact with the surface in successive positions parallel to the centerline and the whole area gone over from one side of the slab to the other, as necessary. Advancing shall be in successive stages of not more than one-half the length of the straightedge. Any excess water and laitance in excess of 1/8 inch thick shall be removed from the surface of the pavement and wasted. Any depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the smoothness requirements. Straightedge testing and surface corrections shall continue until the entire surface is found to be free from observable departures from the straightedge and until the slab conforms to the required grade and cross-section. The use of long-handled wood floats shall be confined to a minimum; they may be used only in emergencies and in areas not accessible to finishing equipment.

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

a. Brush or broom finish. Not used.

b. Burlap drag finish. Burlap, at least 15 ounces per square yard, will typically produce acceptable texture. To obtain a textured surface, the transverse threads of the burlap shall be removed approximately one foot from the trailing edge. A heavy buildup of grout on the burlap threads produces the desired wide sweeping longitudinal striations on the pavement surface.

c. Artificial turf finish. Not used.

4.13 Curing. Immediately after finishing operations are completed and bleed water is gone from the surface, all exposed surfaces of the newly placed concrete shall be cured for a 7-day cure period in accordance with one of the methods below. Failure to provide sufficient cover material of whatever kind the Contractor may elect to use, or lack of water to adequately take care of both curing and other requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than 1/2 hour during the curing period.

When a two-saw-cut method is used to construct the contraction joint, the curing compound shall be applied to the saw-cut immediately after the initial cut has been made. The sealant reservoir shall not be sawed until after the curing period has been completed. When the one cut method is used to construct the contraction joint, the joint shall be cured with wet rope, wet rags, or wet blankets. The rags, ropes, or blankets shall be kept moist for the duration of the curing period.

a. Impervious membrane method. Curing with liquid membrane compounds should not occur until bleed and surface moisture has evaporated. All exposed surfaces of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place. The curing compound shall not be applied during rainfall. Curing compound shall be applied by mechanical sprayers under pressure at the rate of one gallon to not more than 150 square feet. The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application, the compound shall be stirred continuously by mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms will be permitted. When hand spraying is approved by the RPR, a double application rate shall be used to ensure coverage. Should the film become damaged from any cause, including sawing operations, within the required curing period, the damaged portions shall be repaired immediately with additional compound or other approved means. Upon removal of side forms, the sides of the exposed slabs shall be protected immediately to provide a curing treatment equal to that provided for the surface.

b. White burlap-polyethylene sheets. The surface of the pavement shall be entirely covered with the sheeting. The sheeting used shall be such length (or width) that it will extend at least twice the thickness of the pavement beyond the edges of the slab. The sheeting shall be placed so that the entire surface and both edges of the slab are completely covered. The sheeting shall be placed and weighted to remain in contact with the surface covered, and the covering shall be maintained fully saturated and in position for seven (7) days after the concrete has been placed.

c. Water method. The entire area shall be covered with burlap or other water absorbing material. The material shall be of sufficient thickness to retain water for adequate curing without excessive runoff. The material shall be kept wet at all times and maintained for seven (7) days. When the forms are stripped, the vertical walls shall also be kept moist. It shall be the responsibility of the Contractor to prevent ponding of the curing water on the subbase.

d. Concrete protection for cold weather. Maintain the concrete at a temperature of at least 50°F for a period of 72 hours after placing and at a temperature above freezing for the remainder of the 7-day curing period. The Contractor shall be responsible for the quality and strength of the concrete placed during cold weather; and any concrete damaged shall be removed and replaced at the Contractor's expense.

e. Concrete protection for hot weather. Concrete should be continuous moisture cured for the entire curing period and shall commence as soon as the surfaces are finished and continue for at least 24 hours. However, if moisture curing is not practical beyond 24 hours, the concrete surface shall be

protected from drying with application of a liquid membrane-forming curing compound while the surfaces are still damp. Other curing methods may be approved by the RPR.

4.14 Removing forms. Unless otherwise specified, forms shall not be removed from freshly placed concrete until it has hardened sufficiently to permit removal without chipping, spalling, or tearing. After the forms have been removed, the sides of the slab shall be cured in accordance with paragraph 4.13.
If honeycombed areas are evident when the forms are removed, materials, placement, and consolidation methods must be reviewed and appropriate adjustments made to assure adequate consolidation at the edges of future concrete placements. Honeycombed areas that extend into the slab less than approximately 1 inch, shall be repaired with an approved grout, as directed by the RPR. Honeycombed areas that extend into the slab greater than a depth of 1 inch shall be considered as defective work and shall be removed and replaced in accordance with paragraph 4.19.

4.15 Saw-cut grooving. If shown on the plans, grooved surfaces shall be provided in accordance with the requirements of Item P-621.

4.16 Sealing joints. The joints in the pavement shall be sealed in accordance with Item 321373.

4.17 Protection of pavement. The Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by the Contractor's employees and agents until accepted by the RPR. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, crossovers, and protection of unsealed joints from intrusion of foreign material, etc. Any damage to the pavement occurring prior to final acceptance shall be repaired or the pavement replaced at the Contractor's expense.

Aggregates, rubble, or other similar construction materials shall not be placed on airfield pavements.
Traffic shall be excluded from the new pavement by erecting and maintaining barricades and signs until the concrete is at least seven (7) days old, or for a longer period if directed by the RPR.
In paving intermediate lanes between newly paved pilot lanes, operation of the hauling and paving equipment will be permitted on the new pavement after the pavement has been cured for seven (7) days, the joints are protected, the concrete has attained a minimum field cured flexural strength of 450 psi, and the slab edge is protected.

All new and existing pavement carrying construction traffic or equipment shall be kept clean and spillage of concrete and other materials shall be cleaned up immediately.
Damaged pavements shall be removed and replaced at the Contractor's expense. Slabs shall be removed to the full depth, width, and length of the slab.

4.18 Opening to construction traffic. The pavement shall not be opened to traffic until test specimens molded and cured in accordance with ASTM C31 have attained a flexural strength of 450 pounds per square inch when tested in accordance with ASTM C78. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Prior to opening the pavement to construction traffic, all joints shall either be sealed or protected from damage to the joint edge and intrusion of foreign materials into the joint. As a minimum, backer rod or tape may be used to protect the joints from foreign matter intrusion.

4.19 Repair, removal, or replacement of slabs. New pavement slabs that are broken or contain cracks or are otherwise defective or unacceptable as defined by acceptance criteria in paragraph 6.6 shall be removed and replaced or repaired, as directed by the RPR, at the Contractor's expense. Spalls along joints shall be repaired as specified. Removal of partial slabs is not permitted. Removal and replacement shall be full depth, shall be full width of the slab, and the limit of removal shall be normal to the paving lane

and to each original transverse joint. The RPR will determine whether cracks extend full depth of the pavement and may require cores to be drilled on the crack to determine depth of cracking. Such cores shall be have a diameter of 2 inches to 4 inches, shall be drilled by the Contractor and shall be filled by the Contractor with a well consolidated concrete mixture bonded to the walls of the hole with a bonding agent, using approved procedures. Drilling of cores and refilling holes shall be at no expense to the Owner. Repair of cracks as described in this section shall not be allowed if in the opinion of the RPR the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of cracks shall be allowed in any panel that demonstrates segregated aggregate with an absence of coarse aggregate in the upper 1/8 inch of the pavement surface.

a. Shrinkage cracks. Shrinkage cracks which do not exceed one-third of the pavement depth shall be cleaned and either high molecular weight methacrylate (HMWM) applied; or epoxy resin (Type IV, Grade 1) pressure injected using procedures recommended by the manufacturer and approved by the RPR. Sandblasting of the surface may be required following the application of HMWM to restore skid resistance. Care shall be taken to ensure that the crack is not widened during epoxy resin injection. All epoxy resin injection shall take place in the presence of the RPR. Shrinkage cracks which exceed one-third the pavement depth shall be treated as full depth cracks in accordance with paragraphs 4.19b and 19c.

b. Slabs with cracks through interior areas. Interior area is defined as that area more than 6 inches from either adjacent original transverse joint. The full slab shall be removed and replaced at no cost to the Owner, when there are any full depth cracks, or cracks greater than one-third the pavement depth, that extend into the interior area.

c. Cracks close to and parallel to joints. All full-depth cracks within 6 inches either side of the joint and essentially parallel to the original joints, shall be treated as follows.

(1) Full depth cracks and original joint not cracked. The full-depth crack shall be treated as the new joint and the original joint filled with an epoxy resin.

i. Full-depth crack. The joint sealant reservoir for the crack shall be formed by sawing to a depth of 3/4 inches, ±1/16 inch, and to a width of 5/8 inch, ±1/8 inch. The crack shall be sawed with equipment specially designed to follow random cracks. Any equipment or procedure which causes raveling or spalling along the crack shall be modified or replaced to prevent raveling or spalling. The joint shall be sealed with sealant in accordance with 321373 or as directed by the RPR.

ii. Original joint. If the original joint sealant reservoir has been sawed out, the reservoir and as much of the lower saw cut as possible shall be filled with epoxy resin, Type IV, Grade 2, thoroughly tooled into the void using approved procedures.

If only the original narrow saw cut has been made, it shall be cleaned and pressure injected with epoxy resin, Type IV, Grade 1, using approved procedures.

Where a parallel crack goes part way across paving lane and then intersects and follows the original joint which is cracked only for the remained of the width, it shall be treated as specified above for a parallel crack, and the cracked original joint shall be prepared and sealed as originally designed.

(2) Full depth cracks and original joint cracked. If there is any place in the lane width where a parallel crack and a cracked portion of the original joint overlap, the entire slab containing the crack shall be removed and replaced.

d. Removal and replacement of full slabs. Make a full depth cut perpendicular to the slab surface along all edges of the slab with a concrete saw cutting any dowels or tie-bars. Remove damaged slab protecting adjacent pavement from damage. Damage to adjacent slabs may result in removal of additional slabs as directed by the RPR at the Contractor's expense.

The underlying material shall be repaired, re-compacted and shaped to grade.

Dowels of the size and spacing specified for other joints in similar pavement on the project shall be installed along all four (4) edges of the new slab in accordance with paragraph 4.10d.

Placement of concrete shall be as specified for original construction. The joints around the new slab shall be prepared and sealed as specified for original construction.

e. Spalls along joints.

(1) Spalls less than one inch wide and less than the depth of the joint sealant reservoir, shall be filled with joint sealant material.

(2) Spalls larger than one inch and/or deeper than the joint reservoir, but less than ½ the slab depth, and less than 25% of the length of the adjacent joint shall be repaired as follows:

i. Make a vertical saw cut at least one inch outside the spalled area and to a depth of at least 2 inches. Saw cuts shall be straight lines forming rectangular areas surrounding the spalled area.

ii. Remove unsound concrete and at least 1/2 inch of visually sound concrete between the saw cut and the joint or crack with a light chipping hammer.

iii. Clean cavity with high-pressure water jets supplemented with compressed air as needed to remove all loose material.

iv. Apply a prime coat of epoxy resin, Type III, Grade I, to the dry, cleaned surface of all sides and bottom of the cavity, except any joint face.

v. Fill the cavity with low slump concrete or mortar or with epoxy resin concrete or mortar.

vi. An insert or other bond-breaking medium shall be used to prevent bond at all joint faces.

vii. A reservoir for the joint sealant shall be sawed to the dimensions required for other joints, or as required to be routed for cracks. The reservoir shall be thoroughly cleaned and sealed with the sealer specified for the joints.

(3) Spalls deeper than 1/2 of the slab depth or spalls longer than 25% of the adjacent joint require replacement of the entire slab.

f. Diamond grinding of Concrete surfaces. Diamond grinding shall be completed prior to pavement grooving. Diamond grinding of the hardened concrete should not be performed until the concrete is at least 14 days old and has achieved full minimum strength. Equipment that causes ravels, aggregate fractures, spalls or disturbance to the joints will not be permitted. The depth of diamond grinding shall not exceed 1/2 inch and all areas in which diamond grinding has been performed will be subject to the final pavement thickness tolerances specified.

Diamond grinding shall be performed with a machine specifically designed for diamond grinding capable of cutting a path at least 3 feet wide. The saw blades shall be 1/8-inch wide with sufficient number of flush cut blades that 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 Contractor shall

determine the number and type of blades based on the hardness of the aggregate. Contractor shall demonstrate to the RPR that the grinding equipment will produce satisfactory results prior to making corrections to surfaces.

Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The slurry resulting from the grinding operation shall be continuously removed and the pavement left in a clean condition. All grinding shall be at the expense of the Contractor.

PART 5- CONSTRUCTION QUALITY CONTROL (QC)

5.1 Quality control program. The Contractor shall develop a Quality Control Program in accordance with Item 010000. No partial payment will be made for materials that are subject to specific quality control requirements without an approved quality control program.

5.2 Contractor Quality Control (CQC). The Contractor shall provide or contract for testing facilities in accordance with Item 010000. 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.

5.3 Contractor QC testing. The Contractor shall perform all QC tests necessary to control the production and construction processes applicable to this specification and as set forth in the CQCP. The testing program shall include, but not necessarily be limited to, tests for aggregate gradation, aggregate moisture content, slump, and air content. A QC Testing Plan shall be developed and approved by the RPR as part of the CQCP.

The RPR may at any time, notwithstanding previous plant acceptance, reject and require the Contractor to dispose of any batch of concrete mixture which is rendered unfit for use due to contamination, segregation, or improper slump. Such rejection may be based on only visual inspection. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the RPR, and if it can be demonstrated in the laboratory, in the presence of the RPR, that such material was erroneously rejected, payment will be made for the material at the contract unit price**.**

a. Fine aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily in accordance with ASTM C136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C70 or ASTM C566.

(3) Deleterious substances. Fine aggregate as delivered to the mixer shall be tested for deleterious substances in fine aggregate for concrete as specified in paragraph 2.1b, prior to

production of the control strip, and a minimum of every 30-days during production or more frequently as necessary to control deleterious substances.

b. Coarse Aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily for each size of aggregate. Tests shall be made in accordance with ASTM C136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C566.

(3) Deleterious substances. Coarse aggregate as delivered to the mixer shall be tested for deleterious substances in coarse aggregate for concrete as specified in paragraph 2.1c, prior to production of the control strip, and a minimum of every 30-days during production or more frequently as necessary to control deleterious substances.

c. Slump. One test shall be made for each sublot. Slump tests shall be performed in accordance with ASTM C143 from material randomly sampled from material discharged from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

d. Air content. One test shall be made for each sublot. Air content tests shall be performed in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag or other porous coarse aggregate, from material randomly sampled from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

e. Unit weight and Yield. One test shall be made for each sublot. Unit weight and yield tests shall be in accordance with ASTM C138. The samples shall be taken in accordance with ASTM C172 and at the same time as the air content tests.

f. Temperatures. Temperatures shall be checked at least four times per lot at the job site in accordance with ASTM C1064.

g. Smoothness for Contractor Quality Control.

The Contractor shall perform smoothness testing in transverse and longitudinal directions daily to verify that the construction processes are producing pavement with variances less than ¼ inch in 12 feet, identifying areas that may pond water which could lead to hydroplaning of aircraft. If the smoothness criteria is not met, appropriate changes and corrections to the construction process shall be made by the Contractor before construction continues

The Contractor may use a 12-foot 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 the FAA profile program, ProFAA, using the 12-foot straightedge simulation function.

Smoothness readings shall not be made across grade changes or cross slope transitions. The transition between new and existing pavement 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.

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 4.19f or by removing and replacing the surface course to full depth. Grinding shall be tapered in all directions to provide smooth transitions to areas not requiring grinding. All areas in which diamond grinding has been performed shall be subject to the final pavement thickness tolerances specified in paragraph 6.6.

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

h. Grade. Grade will be evaluated prior to and after placement of the concrete surface.

Measurements will be taken at appropriate gradelines (as a minimum at center and edges of paving lane) and longitudinal spacing as shown on cross-sections and plans. The final surface of the pavement will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch vertically and 0.1 feet laterally. The documentation will be provided by the Contractor to the RPR within 48 hours.

Areas with humps or depression that that exceed grade or smoothness and that retain water on the surface must be ground off provided the course thickness after grinding is not more than 1/2 inch less than the thickness specified on the plans. If these areas cannot be corrected with grinding then the slabs that are retaining water must be removed and replaced in accordance with paragraph 4.19d. Grinding shall be in accordance with paragraph 4.19f. All corrections will be at the Contractors expense.

5.4 Control charts. The Contractor shall maintain linear control charts for fine and coarse aggregate gradation, slump, and air content. The Contractor shall also maintain a control chart plotting the coarseness factor/workability factor from the combined gradations in accordance with paragraph 2.1d.
Control charts shall be posted in a location satisfactory to the RPR and shall be kept up to date at all times. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and suspension Limits, or Specification limits, applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a potential problem and the Contractor is not taking satisfactory corrective action, the RPR may halt production or acceptance of the material.

a. Fine and coarse aggregate gradation. The Contractor shall record the running average of the last five gradation tests for each control sieve on linear control charts. Superimposed on the control charts shall be the action and suspension limits. Gradation tests shall be performed by the Contractor per ASTM C136. The Contractor shall take at least two samples per lot to check the final gradation. Sampling shall be per ASTM D75 from the flowing aggregate stream or conveyor belt.

b. Slump and air content. The Contractor shall maintain linear control charts both for individual measurements and range (that is, difference between highest and lowest measurements) for slump and air content in accordance with the following Action and Suspension Limits.

c. Combined gradation. The Contractor shall maintain a control chart plotting the coarseness factor and workability factor on a chart in accordance with paragraph 2.1d.

Control Chart Limits[1]

Control Parameter	Individual Measurements	
	Action Limit	Suspension Limit
Gradation[2]	*[3]	*[3]
Coarseness Factor (CF)	±3.5	±5
Workability Factor (WF)	±2	±3
Slump	+0.5 to -1 inch	+1 to -1.5 inch
Air Content	±1.5%	±2.0%

[1] Control charts shall developed and maintained for each control parameter indicated.

[2] Control charts shall be developed and maintained for each sieve size.

[3] Action and suspension limits shall be determined by the Contractor.

5.5 Corrective action at Suspension Limit. The CQCP shall indicate that appropriate action shall be taken when the process is believed to be out of control. The CQCP shall detail what action will be taken to bring the process into control and shall contain sets of rules to gauge when a process is out of control. As a minimum, a process shall be deemed out of control and corrective action taken if any one of the following conditions exists.

a. Fine and coarse aggregate gradation. When two consecutive averages of five tests are outside of the suspension limits, immediate steps, including a halt to production, shall be taken to correct the grading.

b. Coarseness and Workability factor. When the CF or WF reaches the applicable suspension limits, the Contractor, immediate steps, including a halt to production, shall be taken to correct the CF and WF.

c. Fine and coarse aggregate moisture content. Whenever the moisture content of the fine or coarse aggregate changes by more than 0.5%, the scale settings for the aggregate batcher and water batcher shall be adjusted.

d. Slump. The Contractor shall halt production and make appropriate adjustments whenever:

(1) one point falls outside the Suspension Limit line for individual measurements

OR

(2) two points in a row fall outside the Action Limit line for individual measurements.

d. Air content. The Contractor shall halt production and adjust the amount of air-entraining admixture whenever:

(1) one point falls outside the Suspension Limit line for individual measurements

OR

(2) two points in a row fall outside the Action Limit line for individual measurements.

PART 6 - MATERIAL ACCEPTANCE

6.1 Quality Assurance (QA) Acceptance sampling and testing. All acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the contractor. The Contractor shall provide adequate facilities for the initial curing of beams. The Contractor shall bear the cost of providing initial curing facilities and coring and filling operations, per paragraph 6.5b(1).

The samples will be transported while in the molds. The curing, except for the initial cure period, will be accomplished using the immersion in saturated lime water method. During the 24 hours after molding, the temperature immediately adjacent to the specimens must be maintained in the range of 60° to 80°F, and loss of moisture from the specimens must be prevented. The specimens may be stored in tightly constructed wooden boxes, damp sand pits, temporary buildings at construction sites, under wet burlap in favorable weather, or in heavyweight closed plastic bags, or using other suitable methods, provided the temperature and moisture loss requirements are met.

6.2 Quality Assurance (QA) testing laboratory. Quality assurance testing organizations performing these acceptance tests will be accredited in accordance with ASTM C1077. The quality assurance laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods will be submitted to the RPR prior to start of construction.

6.3 Lot size. Concrete will be accepted for strength and thickness on a lot basis. A lot will consist of a day's production not to exceed 2,000 cubic yards. Each lot will be divided into approximately equal sublots with individual sublots between 400 to 600 cubic yards. Where three sublots are produced, they will constitute a lot. Where one or two sublots are produced, they will be incorporated into the previous or next lot. Where more than one plant is simultaneously producing concrete for the job, the lot sizes will apply separately for each plant.

6.4 Partial lots. When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot or for overages or minor placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.
Where three sublots have been produced, they will constitute a lot. Where one or two sublots have been produced, they will be incorporated into the next lot or the previous lot and the total number of sublots will be used in the acceptance criteria calculation, that is, n=5 or n=6.

6.5 Acceptance Sampling and Testing.

a. Strength.

(1) Sampling. One sample will be taken for each sublot from the concrete delivered to the job site. Sampling locations will be determined by the RPR in accordance with random sampling procedures contained in ASTM D3665. The concrete will be sampled in accordance with ASTM C172.

(2) Test Specimens. The contractor will be responsible for the casting, initial curing, transportation, and curing of specimens in accordance with ASTM C31. Two (2) specimens will be made from each sample and slump, air content, unit weight, and temperature tests will be conducted for each set of strength specimens. Within 24 to 48 hours, the samples will be transported from the field to the laboratory while in the molds. Samples will be cured in saturated lime water.

The strength of each specimen will be determined in accordance with ASTM C78. The strength for each sublot will be computed by averaging the results of the two test specimens representing that sublot.

(3) Acceptance. Acceptance of pavement for strength will be determined by the RPR in accordance with paragraph 6.6b(1). All individual strength tests within a lot will be checked for outliers in accordance with ASTM E178, at a significance level of 5%. Outliers will be discarded and the remaining test values will be used to determine acceptance in accordance with paragraph 6.5b.

b. Pavement thickness.

(1) Sampling. One core will be taken by the Contractor for each sublot in the presence of the RPR. Sampling locations will be determined by the RPR in accordance with random sampling procedures contained in ASTM D3665. Areas, such as thickened edges, with planned variable thickness, will be excluded from sample locations.

Cores shall be a minimum 4 inch in diameter neatly cut with a core drill. The Contractor will furnish all tools, labor, and materials for cutting samples and filling the cored hole. Core holes will be filled by the Contractor with a non-shrink grout approved by the RPR within one day after sampling.

(2) Testing. The thickness of the cores will be determined by the RPR by the average caliper measurement in accordance with ASTM C174. Each core shall be photographed and the photograph included with the test report.

(3) Acceptance. Acceptance of pavement for thickness will be determined by the RPR in accordance with paragraph 6.6.

6.6 Acceptance criteria.

a. General. Acceptance will be based on the following characteristics of the completed pavement discussed in paragraph 6.5b:

(1) Strength

(2) Thickness

(3) Grade

~~(4) Profilograph smoothness~~

(5) Adjustments for repairs

Acceptance for strength, thickness, and grade, will be based on the criteria contained in accordance with paragraph 6.6b(1), 6.6b(2), and 6.6b(3), respectively. ~~Acceptance for profilograph smoothness will be based on the criteria contained in paragraph 6.6b(4).~~

Production quality must achieve 90 PWL or higher to receive full payment.

Strength and thickness will be evaluated for acceptance on a lot basis using the method of estimating PWL. Production quality must achieve 90 PWL or higher to receive full pavement. The PWL will be determined in accordance with procedures specified in FAA AC 150/5370-10H Specification C-110 (010010 Method of Estimating Percentage of Material).

The lower specification tolerance limit (L) for strength and thickness will be:

Lower Specification Tolerance Limit (L)

Strength	0.93 × strength specified in paragraph 3.3
Thickness	Lot Plan Thickness in inches, - 0.50 in

b. Acceptance criteria.

(1) Strength. If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment for the lot will be determined in accordance with paragraph 8.1.

(**2) Thickness.** If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment for the lot will be determined in accordance with paragraph 8.1.

(3) Grade. The final finished surface of the pavement of the completed project will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch vertically or 0.1 feet laterally**]**. The documentation, stamped and signed by a licensed surveyor shall be in accordance with paragraph 5.3h. Payment for sublots that do not meet grade for over 25% of the sublot shall reduced by 5% and not be more than 95%.

~~**(4) Profilograph roughness for QA Acceptance.** The final profilograph shall be the full length of the project to facilitate testing of roughness between lots. The Contractor, in the presence of the RPR shall perform a profilograph roughness test on the completed project with a profilograph meeting the requirements of ASTM E1274 or a Class I inertial profiler meeting ASTM E950. Data and results shall be provided within 48 hrs of profilograph roughness tests.~~

~~The pavement shall have an average profile index less than 15 inches per mile per 1/10 mile. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2-inch 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 4.19f or by removing and replacing full depth of surface course. as directed by the RPR. Where corrections are necessary, a second profilograph run shall be performed to verify that the corrections produced an average profile index of 15 inches per mile per 1/10 mile or less.~~

(5) Adjustments for repair. Sublots with spall repairs, crack repairs, or partial panel replacement, will be limited to no more than 95% payment.

(6) Adjustment for grinding. For sublots with grinding over 25% of a sublot, payment will be reduced 5%.

PART 7 - METHOD OF MEASUREMENT

7.1 Concrete pavement shall be measured by the number of square yards of plain and reinforced pavement as specified in-place, completed and accepted by the RPR.

PART 8 - BASIS OF PAYMENT

8.1 Payment. Payment for concrete pavement meeting all acceptance criteria as specified in paragraph 6.6. Acceptance Criteria shall be based on results of strength, smoothness, and thickness tests. Payment for acceptable lots of concrete pavement shall be adjusted in accordance with paragraph 8.1a for strength and thickness; 8.1b for repairs; 8.1c for grinding; and 8.1d for smoothness, subject to the limitation that: The total project payment for concrete pavement shall not exceed **100** percent of the product of the contract unit price and the total number of square yards of concrete pavement used in the accepted work (See Note 1 under the Price Adjustment Schedule table below).

Payment shall be full compensation for all labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and on the drawings.

a. Basis of adjusted payment. The pay factor for each individual lot shall be calculated in accordance with the Price Adjustment Schedule table below. A pay factor shall be calculated for both strength and thickness. The lot pay factor shall be the higher of the two values when calculations for both strength and thickness are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either strength or thickness is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both strength and thickness are less than 100%.

Price Adjustment Schedule[1]

Percentage of Materials Within Specification Limits (PWL)	**Lot Pay Factor (Percent of Contract Unit Price)**
96 – 100	106
90 – 95	PWL + 10
75 – 90	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject[2]

[1] Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment in excess of 100% shall be subject to the total project payment limitation specified in paragraph 8.1.

[2] The lot shall be removed and replaced unless, after receipt of FAA concurrence, the Owner and Contractor agree in writing that the lot will remain; the lot paid at 50% of the contract unit price; and the total project payment limitation reduced by the amount withheld for that lot.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation

specified in paragraph 8.1. Payment in excess of 100% for accepted lots of concrete pavement shall be used to offset payment for accepted lots of concrete pavement that achieve a lot pay factor less than 100%; except for rejected lots which remain in place and/or sublots with adjustments for repairs.

b. Adjusted payment for repairs. The PWL lot pay factor shall be reduced by 5% and be no higher than 95% for sublots which contain repairs in accordance with paragraph 4.19 on more than 20% of the slabs within the sublot. Payment factors greater than 100 percent for the strength and thickness cannot be used to offset adjustments for repairs.

c. Adjusted payment for grinding. The PWL lot pay factor shall be reduced by 5% and be no higher than 95% for sublots with grinding over 25% of a sublot.

~~**d. Profilograph Roughness.** The Contractor will receive full payment when the profilograph average profile index is in accordance with paragraph 6.6b(4). When the final average profile index for the entire length of pavement does not exceed 15 inches per mile per 1/10-mile, payment will be made at the contract unit price for the completed pavement.~~

e. Payment. Payment shall be made under:

Item 321313-1 10” Unreinforced PCC Pavement - per square yard
Item 321313-2 10” Reinforced PCC Pavement - per square yard
Item 321313-3 10” to 12.5” Thickened Edge PCC Pavement - per square yard
Item 321313-4 10” to 12.5” Reinforced Thickened Edge PCC Pavement – per square yard
Item 321313-5 10” to 14” Thickened Edge PCC pavement – per square yard
Item 321313-5 8” Unreinforced PCC Pavement - per square yard
Item 321313-6 8” Reinforced PCC Pavement - 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 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 A996	Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM A1035	Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A1078	Standard Specification for Epoxy-Coated Steel Dowels for Concrete Pavement
ASTM C29	Standard Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate
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 C70	Standard Test Method for Surface Moisture in Fine Aggregate
ASTM C78	Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C117	Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C123	Standard Test Method for Lightweight Particles in Aggregate
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
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 C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in 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 C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C174	Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C227	Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
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 C295	Standard Guide for Petrographic Examination of Aggregates 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 C566	Standard Test Method for Total Evaporable Moisture Content of Aggregates by Drying
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C642	Standard Test Method for Density, Absorption, and Voids in Hardened 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 C881	Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
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 C1064	Test Method for Temperature of Freshly Mixed Hydraulic-Cement 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 C1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber and Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
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 D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate

ASTM E178	Standard Practice for Dealing with Outlying Observations
ASTM E1274	Standard Test Method for Measuring Pavement Roughness Using a Profilograph
ASTM E2133	Standard Test Method for Using a Rolling Inclinometer to Measure Longitudinal and Transverse Profiles of a Traveled Surface

American Concrete Institute (ACI)

ACI 305R	Guide to Hot Weather Concreting
ACI 306R	Guide to Cold Weather Concreting
ACI 309R	Guide for Consolidation of Concrete

Advisory Circulars (AC)

AC 150/5320-6	Airport Pavement Design and Evaluation

Federal Highway Administration (FHWA)

HIPERPAV 3, version 3.2

Portland Concrete Association (PCA)

PCA	Design and Control of Concrete Mixtures, 16th Edition

U.S. Army Corps of Engineers (USACE) Concrete Research Division (CRD)

CRD C662	Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar-Bar Method)

United States Air Force Engineering Technical Letter (ETL)

ETL 97-5	Proportioning Concrete Mixtures with Graded Aggregates for Rigid Airfield Pavements

END OF SECTION 321313

SECTION 321314 - CONCRETE PAVING FOR SIDEWALKS AND CURBS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes concrete paving including the following:
   1. Curbs and gutters.
   2. Walks.
   3. Equipment Pads

B. Related Requirements:

   1. Section 033000 "Cast-in-Place Concrete" for general building applications of concrete.
   2. Section 321373 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.
   3. Section 321713 "Parking Bumpers."

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

   1. Review methods and procedures related to concrete paving, including but not limited to, the following:

      a. Concrete mixture design.
      b. Quality control of concrete materials and concrete paving construction practices.

   2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:

      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Concrete paving Subcontractor.
      e. Manufacturer's representative of stamped concrete paving system used for stamped detectable warnings.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

C. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.

B. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Applied finish materials.
6. Joint fillers.

C. Material Test Reports: For each of the following:

1. Aggregates: Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

B. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests must be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

1.8 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

C. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.

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2.3 STEEL REINFORCEMENT

A. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, fabricated from steel wire into flat sheets.

B. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.

C. Epoxy-Coated Welded-Wire Reinforcement: ASTM A884/A884M, Class A, plain steel.

D. Reinforcing Bars: ASTM A615/A615M, Grade 60; deformed.

E. Galvanized Reinforcing Bars: ASTM A767/A767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A615/A615M, Grade 60 deformed bars.

F. Epoxy-Coated Reinforcing Bars: ASTM A775/A775M or ASTM A934/A934M; with ASTM A615/A615M, Grade 60 deformed bars.

G. Steel Bar Mats: ASTM A184/A184M; with ASTM A615/A615M, Grade 60 deformed bars; assembled with clips.

H. Plain-Steel Wire: ASTM A1064/A1064M,.

I. Deformed-Steel Wire: ASTM A1064/A1064M.

J. Epoxy-Coated-Steel Wire: ASTM A884/A884M, Class A; coated, plain

K. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

L. Zinc Repair Material: ASTM A780/A780M.

2.4 CONCRETE MATERIALS

A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C150/C150M, gray portland cement Type I or Type II ***or Type IL per ASTM C595.***
2. Fly Ash: ASTM C618, Class C or Class F.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C33/C33M, , uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: Coarse Aggregate Size shall be in accordance with GDOT Class B concrete mix. Retain "Fine Aggregate" Subparagraph below to prohibit the exception in ASTM C33/C33M that allows using reactive fine aggregate if low-alkali cement or reaction-inhibiting admixture is also required.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C260/C260M. Provide in accordance with GDOT Class B concrete mix.

D. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

E. Water: Potable and complying with ASTM C94/C94M.

2.5 CURING MATERIALS

A. Cure in accordance with GDOT Section 430

2.6 RELATED MATERIALS

A. Joint Fillers: ASTM D1751, asphalt-saturated cellulosic fiber, ASTM D1752, cork or self-expanding cork or ASTM D8139, semirigid, closed-cell polypropylene foam in preformed strips.

2.7 STAMPED DETECTABLE WARNING MATERIALS

A. Detectable Warning Stamp: Semirigid polyurethane mats with formed underside capable of imprinting detectable warning pattern on plastic concrete; perforated with a vent hole at each dome.
1. Size of Stamp: One piece, 24 by 24 inches

2.8 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.

B. Cementitious Materials: Provide Cementitious Material in accordance with Class B GDOT Concrete mix. Add air-entraining admixture in accordance with GDOT Class 2 Concrete mixture.

1. Air Content shall be in accordance with Class 2 GDOT concrete mixture

C. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture in concrete as required for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

D. Concrete Mixtures: Normal-weight concrete.

1. Compressive Strength (28 Days): Strength shall be in accordance with GDOT class B concrete mixture requirements.
2. Maximum W/C Ratio at Point of Placement: Water/Cement ratio shall be in accordance with GDOT Class B Concrete Mixture Requirements.
3. Slump Limit: Slump shall be in accordance with GDOT Class B Concrete Mixture Requirements.

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F , reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons .
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Section 312000 "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 INSTALLATION OF STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.

5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows, to match jointing of existing adjacent concrete paving:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies**, reinforcement,** or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating **reinforcement and** joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations..

B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 SPECIAL FINISHES

3.9 INSTALLATION OF DETECTABLE WARNINGS

3.10 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete in accordance with GDOT Specification section XX

3.11 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch
2. Thickness: Plus 3/8 inch .
3. Surface: Gap below 10-feet-long; unleveled straightedge not to exceed 1/2 inch
4. Joint Spacing: 3 inches
5. Contraction Joint Depth: Plus 1/4 inch no minus.
6. Joint Width: Plus 1/8 inch, no minus.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C172/C172M will be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or 5000 sq. ft. or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143/C143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231/C231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C31/C31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C39/C39M; test one specimen at seven days and two specimens at 28 days.

    a. A compressive-strength test to be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no

compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results to be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests to contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency will make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.13 REPAIR AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

PART 4 - METHOD OF MEASUREMENT

4.1 The quantity of curb and gutter will be determined by the number of linear feet of concrete actually constructed and accepted by the RPR as complying with the plans and specifications.

4.2 The quantity of concrete sidewalks will be determined by the number of square yards of in place concrete when completed and accepted by the RPR as complying with the plans and specifications.

4.3 The quantity of Concrete Exterior Equipment Pads shall ***not*** be measured ***separately*** ~~by the number of square yards of concrete complete in place and accepted by the RPR as complying with the plans and specifications.~~ ***and shall be incidental to the installation of the equipment.***

PART 5 -BASIS OF PAYMENT

5.1 Concrete curb and gutter. Payment shall be made at the contract unit price per linear foot. This price shall be full compensation for furnishing all materials including concrete, reinforcement, joints, and embedded items, and for all preparation, delivery, installation, and curing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

5.2 Concrete sidewalks. Payment shall be made at the contract unit price per square yard. The price shall be full compensation for furnishing all concrete sidewalk materials, and for all labor, equipment tools, and incidentals necessary to complete this item.

~~5.3 Concrete Exterior Equipment Pads. Payment shall be made at the contract unit price per square yard. The price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to install the structures.~~

Payment will be made under:

321314-1 Curb and Gutter, per linear foot

321314-2 Concrete Sidewalk - per square yard

~~321314-3 Concrete Exterior Equipment Pads- per square yard~~

END OF SECTION 321313

SECTION 323113.53 – CHAIN LINK FENCES AND GATE

PART 1 - DESCRIPTION

1.1 This item shall consist of furnishing and erecting a chain-link fence and gates in accordance with these specifications, the details shown on the plans, and in conformity with the lines and grades shown on the plans or established by the RPR.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
2. Review sequence of operation for each type of gate operator.
3. Review coordination of interlocked equipment specified in this Section and elsewhere.
4. Review required testing, inspecting, and certifying procedures.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Fence and gate posts, rails, and fittings.
b. Chain-link fabric, reinforcements, and attachments.
c. Accessories: Barbed wire.
d. Gates and hardware.
e. Gate operators, including operating instructions and motor characteristics.

B. Shop Drawings: For each type of fence and gate assembly.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include accessories, hardware, gate operation, and operational clearances.
3. Gate Operator: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
4. Wiring Diagrams: For power, signal, and control wiring.

C. Samples for Initial Selection: For each type of factory-applied finish.

D. Samples for Verification: For each type of component with factory-applied finish, prepared on Samples of size indicated below:

E. Delegated-Design Submittal: For structural performance of chain-link fence and gate frameworks, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency

B. Product Certificates: For each type of chain-link fence, operator, and gate.

C. Product Test Reports: For framework strength according to ASTM F1043, for tests performed by manufacturer and witnessed by a qualified testing agency. Operator Test reports shall be submitted from the manufacturer demonstrating the gate mechanism has a mean time between failures of at least 200,000 cycles. The reports shall also demonstrate the operator mechanism has been tested for full power and pressure of all hydraulics, full stress tests of all mechanical components and electrical tests of all overload devices.

D. Field quality-control reports.

E. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For gate operators to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing fence grounding; member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

B. Emergency Access Requirements: According to requirements of authorities having jurisdiction for gates with automatic gate operators serving as a required means of access.

C. Mockups: Build mockups to set quality standards for fabrication and installation.

1. Build mockup for typical chain-link fence and gate, including accessories.

a. Size: 10-foot length of fence.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Failure to comply with performance requirements.
    b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    c. Faulty operation of gate operators and controls.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - MATERIALS

2.1 Fabric. The fabric shall be woven with a 9-gauge wire in a 2-inch mesh and shall meet the requirements of **ASTM 392, Class II**.

2.2 Barbed wire. Barbed wire shall be 3-strand 12-1/2 gauge zinc-coated wire with 4-point barbs and shall conform to the requirements of

2.3 Posts, rails, and braces. Line posts, rails, and braces shall conform to the requirements of ASTM F1043 or ASTM F1083 as follows:

- Galvanized tubular steel pipe shall conform to the requirements of Group IA, (Schedule 40) coatings conforming to Type A, or Group IC (High Strength Pipe), External coating Type B, and internal coating Type B or D.

- Roll Formed Steel Shapes (C-Sections) shall conform to the requirements of Group IIA, and be galvanized in accordance with the requirements of ASTM F1043, Type A.

- Hot-Rolled Shapes (H Beams) shall meet the requirements of Group III, and be galvanized in accordance with the requirements of ASTM F1043, Type A.

- Aluminum Pipe shall conform to the requirements of Group IB.

- Aluminum Shapes shall conform to the requirements of Group IIB.

- Vinyl or polyester coated steel shall conform to the requirements of ASTM F1043, Paragraph 7.3, Optional Supplemental Color Coating.

- Composite posts shall conform to the strength requirements of ASTM F1043 or ASTM F1083. The strength loss of composite posts shall not exceed 10% when subjected to 3,600 hours of exposure to light and water in accordance with ASTM G152, ASTM G153, ASTM G154, and ASTM G155.

- Posts, rails, and braces furnished for use in conjunction with aluminum alloy fabric shall be aluminum alloy or composite.

Posts, rails, and braces, with the exception of galvanized steel conforming to ASTM F1043 or ASTM F1083, Group 1A, Type A, or aluminum alloy, shall demonstrate the ability to withstand testing in salt spray in accordance with ASTM B117 as follows:

- External: 1,000 hours with a maximum of 5% red rust.

- Internal: 650 hours with a maximum of 5% red rust.

The dimensions of the posts, rails, and braces shall be in accordance with Tables I through VI of Federal Specification RR-F-191/3.

2.4 Gates. Gate frames shall consist of aluminum alloy pipe and shall conform to the specifications for the same material under paragraph section 2.3. The fabric shall be of the same type material as used in the fence.

2.5 Wire ties and tension wires. Wire ties for use in conjunction with a given type of fabric shall be of the same material and coating weight identified with the fabric type. Tension wire shall be 7-gauge marcelled steel wire with the same coating as the fabric type and shall conform to ASTM A824. All material shall conform to Federal Specification RR-F-191/4.

2.6 Miscellaneous fittings and hardware. Miscellaneous steel fittings and hardware for use with zinc-coated steel fabric shall be of commercial grade steel or better quality, wrought or cast as appropriate to the article, and sufficient in strength to provide a balanced design when used in conjunction with fabric posts, and wires of the quality specified herein. All steel fittings and hardware shall be protected with a zinc coating applied in conformance with ASTM A153. Miscellaneous aluminum fittings for use with aluminum alloy fabric shall be wrought or cast aluminum alloy. Barbed wire support arms shall withstand a load of 250 pounds (113 kg) applied vertically to the outermost end of the arm.

2.7 Concrete. Concrete shall have a minimum 28-day compressive strength of 3000 psi (2670 kPa).

2.8 Marking. Each roll of fabric shall carry a tag showing the kind of base metal (steel, aluminum, or aluminum alloy number), kind of coating, the gauge of the wire, the length of fencing in the roll, and the name of the manufacturer. Posts, wire, and other fittings shall be identified as to manufacturer, kind of base metal (steel, aluminum, or aluminum alloy number), and kind of coating.

2.9 Gate Operator

Cantilever Slide Gate and Operator System manufacturer shall submit test results stating that the gate panel and operator have been tested as a system for 200,000 cycles.

Gate manufacturer shall certify gate is manufactured in compliance with ASTM F 2200, Standard Specification for Automated Vehicular Gate Construction and the operators are UL 325 listed.

Gate operator shall be in compliance with UL 325 as evidenced by UL listing label attached to gate operator.

Gate manufacturer shall provide independent certification as to the use of a documented Welding Procedure Specification and Procedure Qualification Record to insure conformance to the AWS D1.2 welding code. Upon request, Individual Certificates of Welder Qualification documenting successful completion of the requirements of the AWS D1.2 code shall also be provided.

Basis of Design (TYM-VSA Operator) System Function:

A. Operation: System shall be designed so that gate movement from the closed position is impossible except by electric or mechanical means.

B. Variable Speed-Rate of Travel: The gate operator shall have the ability to achieve a maximum gate speed of 2.2 feet per second, and shall be equipped with soft-start and soft-stop function to prevent shock load to the gate panel and operator.

C. Cycle Testing: The cantilever slide gate and operator system shall be cycle tested a minimum of 200,000 cycles.

The operator utilizes or 208/230 Volt AC three phase power. Motor box is 10 gauge galvanized steel with detention grade hinges and mogul lock.

D. The gate operator shall be UL 325 compliant for Class III and IV.

E. The gate operator includes an APeX Controller with integrated radio receiver, plug-in loop detector capability, surge protection, and easy to read labeling standard.

F. Capacity: The gate operator shall be rated to operate a gate weighing up to 5,000 lbs.

G. Motor Size: The electrical motor shall be 1 HP or 208/230VAC, Three Phase or as produced by a nationally recognized manufacturer.

H. AC Drive: The variable frequency drive unit shall allow for programmable speeds and programmable soft-start and soft-stop features.

I. Overload Protection: Motor shall be protected against overload by either a thermal or a current sensing overload device.

J. Gear (Box) Reducer:

The self-enclosed gear-head gearbox shall be manufactured as a single unit, and shall consist of a hardened steel, machine cut worm and mating bronze gear running in oil bath. The gearbox shall perform the following functions:

a. Adjustable Clutching Device.

b. Manual disconnect by crank handle.

I. Gear Box Heater: Operator shall include internal gearbox heater and a heater strip for the control box.

J. Drive – Chain: A #50 roller chain shall be utilized. All chain brackets and required attachment hardware shall be supplied.

K. Manual Operation:

A crank handle, located at ground level in the motor box, shall provide a two-step emergency procedure for manual operation:

a. Unlock and open motor-box door.

b. Fold out handle and crank gate opened or closed.

L. Limits: The operator shall be equipped with an integral limit system, providing accurate settings to control the open and close positions of the gate, and shall not be affected by manual operation or motor removal.

M. Control Circuit: U.L. listed operator shall have 5VDC control signal.

N. Control wiring: The electrical contractor shall supply all exterior control wiring.

O. Audio Alarm: This alarm shall have a dual function. The first function shall be as a warning prior to gate movement. When the motor control board recognizes a command, this alarm shall be activated three (3) seconds before the motor is energized and the gate begins to move. This shall be continuously activated while the gate is in motion.

P. Main Power Disconnect Switch and Wiring Compartment: When this switch is in the OFF position, the main power shall be disconnected from the Variable Speed Drive, Motor Control Board and power transformer(s).

Q. Speed: The gate operator speed shall be fully programmable allowing a maximum speed of 2 feet per second.

R. Transformer: Operators shall have an isolated low voltage (24VDC, 750mA) power supplied to provide power for external control devices (not including external gate lock).

S. Auto Close Timer: The timer provides an automatic closure of the gate from the full open position, adjustable from 0 to 60 seconds.

T. Master/Slave: Master/Slave or stand alone capable with programmable setting.

2.10 Motor Housing:

A. Water Resistant Motor Box: The motor box shall be constructed of 10-gauge sheet steel, hot-dip galvanized per ASTM A 123, gasketed and located at ground level for easy maintenance.

B. Security Hinges and Tamper Resistant Security Screws: Security hinges and screws shall be furnished to secure operator enclosure components.

C. Motor Box Lock: Motor box shall be locked with a detention grade dead bolt. Three (3) keys shall be provided per key code.

2.11 Access Control:

A. Entrapment Devices: Photoelectric through beams/photo eyes shall be installed to span the clear opening and gate path at the tail section.

B. Optional accessories, contact, non-contact, and control devices:

1. Control devices include pushbuttons, radio controls, keypads, card readers, key switches, telephone entry systems, and revenue control equipment.

2. Contact and non-contact devices include photoelectric sensors, vehicle detectors, proximity sensors, and contact edges.

Accessories include flashing strobe lights, cycle counters, and intercom systems.

PART 3 - CONSTRUCTION METHODS

3.1 General. The fence shall be constructed in accordance with the details on the plans and as specified here using new materials. All work shall be performed in a workmanlike manner satisfactory to the RPR. The Contractor shall layout the fence line based on the plans. The Contractor shall span the opening below the fence with barbed wire at all locations where it is not practical to conform the fence to the general contour of the ground surface because of natural or manmade features such as drainage ditches.

The new fence shall be permanently tied to the terminals of existing fences as shown on the plans. The Contractor shall stake down the woven wire fence at several points between posts as shown on the plans. The Contractor shall arrange the work so that construction of the new fence will immediately follow the removal of existing fences. The length of unfenced section at any time shall not exceed 300 feet (90 m). The work shall progress in this manner and at the close of the working day the newly constructed fence shall be tied to the existing fence.

3.2 Clearing fence line. Clearing shall consist of the removal of all stumps, brush, rocks, trees, or other obstructions that will interfere with proper construction of the fence. Stumps within the cleared area of the fence shall be grubbed or excavated. The bottom of the fence shall be placed a uniform distance above ground, as specified in the plans. When shown on the plans or as directed by the RPR, the existing fences which interfere with the new fence location shall be removed by the Contractor as a part of the construction work unless such removal is listed as a separate item in the bid schedule. All holes remaining after post and stump removal shall be refilled with suitable soil, gravel, or other suitable material and compacted with tampers.
The cost of removing and disposing of the material shall not constitute a pay item and shall be considered incidental to fence construction.

3.3 Installing posts. All posts shall be set in concrete at the required dimension and depth and at the spacing shown on the plans.

The concrete shall be thoroughly compacted around the posts by tamping or vibrating and shall have a smooth finish slightly higher than the ground and sloped to drain away from the posts. All posts shall be set plumb and to the required grade and alignment. No materials shall be installed on the posts, nor shall the posts be disturbed in any manner within seven (7) days after the individual post footing is completed. Should rock be encountered at a depth less than the planned footing depth, a hole 2 inches (50 mm) larger than the greatest dimension of the posts shall be drilled to a depth of 12 inches (300 mm). After the posts are set, the remainder of the drilled hole shall be filled with grout, composed of one part Portland cement and two parts mortar sand. Any remaining space above the rock shall be filled with concrete in the manner described above.
In lieu of drilling, the rock may be excavated to the required footing depth. No extra compensation shall be made for rock excavation.

3.4 Installing top rails. The top rail shall be continuous and shall pass through the post tops. The coupling used to join the top rail lengths shall allow for expansion.

3.5 Installing braces. Horizontal brace rails, with diagonal truss rods and turnbuckles, shall be installed at all terminal posts.

3.6 Installing fabric. The wire fabric shall be firmly attached to the posts and braced as shown on the plans. All wire shall be stretched taut and shall be installed to the required elevations. The fence shall generally follow the contour of the ground, with the bottom of the fence fabric no less than one inch (25 mm) or more than 4 inches (100 mm) from the ground surface. Grading shall be performed where necessary to provide a neat appearance.
At locations of small natural swales or drainage ditches and where it is not practical to have the fence conform to the general contour of the ground surface, longer posts may be used and multiple strands of barbed wire stretched to span the opening below the fence. The vertical clearance between strands of barbed wire shall be 6 inches or less.

3.7 Electrical grounds. Electrical grounds shall be constructed fence at 500 feet intervals. The ground shall be accomplished with a copper clad rod 8 feet long and a minimum of 5/8 inches (16 mm) in

diameter driven vertically until the top is 6 inches below the ground surface. A No. 6 solid copper conductor shall be clamped to the rod and to the fence in such a manner that each element of the fence is grounded. Installation of ground rods shall not constitute a pay item and shall be considered incidental to fence construction. The Contractor shall comply with FAA-STD-019, Lightning and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment, paragraph 4.2.3.8, Lightning Protection for Fences and Gates, when fencing is adjacent to FAA facilities.

3.8 Cleaning up. The Contractor shall remove from the vicinity of the completed work all tools, buildings, equipment, etc., used during construction. All disturbed areas shall be seeded per 329200.

3.9 Gate Operator Delivery: The gate operator shall be fully assembled and tested at the Factory to assure smooth operation, sequencing, and electrical connection integrity. Physical loads shall be applied to the operator to simulate field conditions. Tests shall simulate physical and electrical loads equal to the full rated capacity of the operator components. All mechanical connections shall be checked for tightness and alignment. All welds shall be checked for completeness and continuity. Welded corners and edges shall be checked for square and straightness. Paint finishes shall be inspected for completeness and gloss. Imperfections shall be touched up prior to shipment.

3.10 Gate Operator Installation: Installation of the gate operator shall be done by the manufacturer's authorized representatives. The drive rail must be securely anchored to the gate panel and the operator must be positioned so the drive wheels are properly in contact with the drive rail. The Installer must have a minimum of three years' experience.

3.11 Operations and Maintenance Manuals. Owner's personnel shall be trained in general maintenance of the gate operator and accessories and provided two copies of "Operations and Maintenance" manuals. Manuals will identify parts of the equipment for future procurement.

A video in digital media format, showing all the components of the gate operator shall be provided. All parts and systems shall be identified. Parts installation and field servicing shall be shown in detail. The purpose of this video is to train operations and maintenance personnel for their contact with this equipment.

PART 4 - METHOD OF MEASUREMENT

4.1 Chain-link fence will be measured for payment by the linear foot. Measurement will be along the top of the fence from center to center of end posts, excluding the length occupied by gate opening. ***Signs associated with the fence shall not be measured separately and shall be incidental to the installation of the chain link fence.***

4.2 Gates will be measured as complete units.

PART 5 - BASIS OF PAYMENT

5.1 Payment for chain-link fence will be made at the contract unit price per linear foot. ***All signs associated with the chain-link fence will not be paid for separately.***

5.2 Payment for temporary security chain link fence will be made at the contract unit price per linear foot. The price shall be full compensation for furnishing all materials, and for all preparation, erection, installation of these materials, and removal of fence and for all labor equipment, tools, and incidentals necessary to complete the item.

5.2 Payment for vehicle gates will be made at the contract unit price for each gate. The price shall be full compensation for furnishing all materials, and for all preparation, erection, and installation of these

materials, and for all labor equipment, tools, and incidentals necessary to complete the item. The price shall include locks, chains, motors, operators, power, and incidental items necessary for the operation of the gate system.

Payment will be made under:

Item 323113.53-1 8’ Tall AOA Chain Link Fence – per linear foot

Item 323113.53-2 Temporary Security Chain Link Fence – per linear foot

Item 323113.53-3 6’ Tall Loading Dock Chain Link Fence – per linear foot

Item 323113.53-4 30’ Wide Slide Gate – per each

Item 323113.53-5 20’ Wide Slide Gate – per each

Item 323113.53-6 3’ Wide Pedestrian Gate – per each

Item 323113.53-7 Arm Gate – 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 A121	Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A392	Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric
ASTM A491	Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric
ASTM A824	Standard Specification for Metallic-Coated Steel Marcelled Tension Wire for Use with Chain Link Fence
ASTM B117	Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM F668	Standard Specification for Polyvinyl Chloride (PVC), Polyolefin and other Organic Polymer Coated Steel Chain-Link Fence Fabric
ASTM F1043	Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework
ASTM F1083	Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

ASTM F1183	Standard Specification for Aluminum Alloy Chain Link Fence Fabric
ASTM F1345	Standard Specification for Zinc 5% Aluminum-Mischmetal Alloy Coated Steel Chain-Link Fence Fabric
ASTM G152	Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G153	Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials
ASTM G155	Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials

Federal Specifications (FED SPEC)

FED SPEC RR-F-191/3	Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces)
FED SPEC RR-F-191/4	Fencing, Wire and Post, Metal (Chain-Link Fence Accessories)

FAA Standard

FAA-STD-019	Lightning and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment

FAA Orders

5300.38	AIP Handbook

END OF SECTION 323113.53

SECTION 329113 - SOIL PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes planting soils specified by composition of the mixes.

B. Related Requirements:
1. Section 311000 "Site Clearing" for topsoil stripping and stockpiling.
2. ~~Section T-904 “Sodding for placing planting soil for turf.~~
3. ~~Section T-901 “Seeding” for placing planting soil for seeded grasses.~~
4. Section 329300 "Plants" for placing planting soil for plantings.
5. ***Section 329200 “Turf and Grasses” for planting seed and turf.***

1.3 ALLOWANCES

A. Preconstruction and field quality-control testing are part of testing and inspecting allowance.

1.4 DEFINITIONS

A. AAPFCO: Association of American Plant Food Control Officials.

B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended, or unamended soil as indicated.

C. CEC: Cation exchange capacity.

D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.

E. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.

F. Imported Soil: Soil that is transported to Project site for use.

G. Layered Soil Assembly: A designed series of planting soils, layered on each other, that together produce an environment for plant growth.

H. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

I. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.

J. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."

K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

L. Scarify: Loosening and roughening the surface of soil and sub soil prior to adding additional soil on top, and further defined in this specification.

M. Soil Fracturing: Deep loosening the soil to the depths specified by using a backhoe, and further defined in this specification.

N. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.

O. SSSA: Soil Science Society of America.

P. Soil Tilling: Loosening the surface of the soil to the depths specified with a rotary tine tilling machine, roto tiller, (or spade tiller), and further defined in this specification.

Q. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

R. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

S. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

T. USCC: U.S. Composting Council.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include recommendations for application and use.
   2. Include test data substantiating that products comply with requirements.

3. Include sieve analyses for aggregate materials.
4. Material Certificates: For each type of imported soil, soil amendment and fertilizer before delivery to the site, according to the following:
    a. Manufacturer's qualified testing agency's certified analysis of standard products.
    b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
    c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For each testing agency.

B. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.

C. Field quality-control reports.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent company showing experience in providing recommendations for soil remediation for vegetative/landscape cover or an independent, state-operated, or university-operated laboratory; each experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.
1. Laboratories: Subject to compliance with requirements, provide testing by one of the following:
    a. PROFILE Products LLC, 800-366-1180; https://profileps3.com/
    b. Georgia Extension Service or approved equal.
2. Multiple Laboratories: At Contractor's option, work may be divided among qualified testing laboratories specializing in physical testing, chemical testing, and fertility testing.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction soil analyses on existing, on-site soil

B. Preconstruction Soil Analyses: For each unamended soil type, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.
1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

1.10 SOIL-SAMPLING REQUIREMENTS

A. General: Extract soil samples according to requirements in this article.

B. Sample Collection and Labeling: Have samples taken and labeled by Contractor under the direction of the testing agency.
   1. Number and Location of Samples: Minimum of three from varied locations for each soil to be used or amended for landscaping purposes.
   2. Procedures and Depth of Samples: According to USDA-NRCS's "Field Book for Describing and Sampling Soils."
   3. Division of Samples: Split each sample into two, equal parts. Send half to the testing agency and half to Owner for its records.
   4. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

1.11 TESTING REQUIREMENTS

A. General: Perform tests on soil samples according to requirements in this article.

B. Physical Testing:
   1. Soil Texture: Soil-particle, size-distribution analysis by[one of] the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":
      a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
      b. Hydrometer Method: Report percentages of sand, silt, and clay.
   2. Total Porosity: Calculate using particle density and bulk density according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
   3. Water Retention: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
   4. Saturated Hydraulic Conductivity: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods"; at 85% compaction according to ASTM D 698 (Standard Proctor).

C. Chemical Testing:
   1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
   2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 1- Physical and Mineralogical Methods."
   3. Metals Hazardous to Human Health: Test for presence and quantities of RCRA metals including aluminum, arsenic, barium, copper, cadmium, chromium, cobalt, lead, lithium, and vanadium. If RCRA metals are present, include recommendations for corrective action.
   4. Phytotoxicity: Test for plant-available concentrations of phytotoxic minerals including aluminum, arsenic, barium, cadmium, chlorides, chromium, cobalt, copper, lead, lithium, mercury, nickel, selenium, silver, sodium, strontium, tin, titanium, vanadium, and zinc.

D. Fertility Testing: Soil-fertility analysis according to standard laboratory protocol of SSSA NAPT SERA-6 including the following:
   1. Percentage of organic matter.
   2. CEC, calcium percent of CEC, and magnesium percent of CEC.
   3. Soil reaction (acidity/alkalinity pH value).

4. Buffered acidity or alkalinity.
5. Nitrogen ppm.
6. Phosphorous ppm.
7. Potassium ppm.
8. Manganese ppm.
9. Manganese-availability ppm.
10. Zinc ppm.
11. Zinc availability ppm.
12. Copper ppm.
13. Sodium ppm and sodium absorption ratio.
14. Soluble-salts ppm.
15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
16. Other deleterious materials, including their characteristics and content of each.

E. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."

F. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.
1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. (100 sq. m) for 6-inch (150-mm) depth of soil.
2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight [per 1000 sq. ft. (100 sq. m) for 6-inch (150-mm) depth of soil.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.

B. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways, and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Do not move or handle materials when they are wet or frozen.
4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Regional Materials: Imported soil, manufactured planting soil shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

2.2 PLANTING SOILS SPECIFIED BY COMPOSITION

A. General: Soil amendments, fertilizers, and rates of application shall be based on testing laboratory's recommendations after preconstruction soil analyses are performed.

B. Planting-Soil Type: Existing, on-site surface soil, with the duff layer, if any, retained and stockpiled on-site; modified to produce viable planting soil. Blend existing, on-site surface soil with amendments and fertilizers in the following quantities to produce planting soil per laboratory recommendations:

C. Planting-Soil Type: Imported, naturally formed soil from off-site sources and consisting of sandy loam, loam, silt loam according to USDA textures; and modified to produce viable planting soil.
   1. Sources: Take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches (100 mm) deep, not from agricultural land, bogs, or marshes; and that do not contain undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants including, but not limited to, quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass.
   2. Additional Properties of Imported Soil before Amending: Soil reaction of pH 6 to 7 and minimum of 6 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.
   3. Unacceptable Properties: Clean soil of the following:
      a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
      b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 8 percent by dry weight of the imported soil.
      c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 3 inches (75 mm) in any dimension.
   4. Amended Soil Composition: Blend imported, unamended soil with the following soil amendments and fertilizers per testing laboratory recommendations.

D. Planting-Soil Type: Manufactured soil consisting of manufacturer's basic topsoil, blended in a manufacturing facility with sand, stabilized organic soil amendments, and other materials to produce viable planting soil.
   1. Additional Properties of Manufacturer's Basic Soil before Amending: Soil reaction of pH 6 to 7 and minimum of 6 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.

2. Unacceptable Properties: Manufactured soil shall not contain the following:
    a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
    b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 5 percent by dry weight of the manufactured soil.
    c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 2 inches (50 mm) in any dimension.

2.3 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
    1. Class: O, with a minimum of 95 percent passing through a No. 8 (2.36-mm) sieve and a minimum of 55 percent passing through a No. 60 (0.25-mm) sieve.

B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through a No. 40 (0.425-mm) sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Perlite: Horticultural perlite, soil amendment grade.

E. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 (0.30-mm) sieve.

F. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C 33/C 33M.

2.4 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:
    1. Feedstock: May include animal waste
    2. Reaction: pH of 5.5 to 8.
    3. Soluble-Salt Concentration: Less than 4 dS/m.
    4. Moisture Content: 35 to 55 percent by weight.
    5. Organic-Matter Content: 30 to 40 percent of dry weight.
    6. Particle Size: Minimum of 98 percent passing through a 1-inch (25-mm) sieve.

B. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.5 MANUFACTURED ORGANIC SOIL AMENDMENTS

A. Biotic Soil Media (BSM): The BSM shall be designed as an alternative to topsoil to accelerate development of depleted soils/substrates with low organic matter, low nutrient levels and limited biological activity. The contractor may use BSM as an alternate to adding topsoil or other amendments as detailed in the drawings.

B. BSM is made in the United States and is non-toxic using bark and wood fibers that have been phytosanitized to eliminate potential weed seeds and pathogens - prior to the introduction of soil building components. This proprietary blend of soil building components includes high-viscosity colloidal polysaccharide biopolymers, biochar, seaweed extract, humic acid, endomycorrhizae and beneficial bacteria.

1. Acceptable products: ProGanics BSM by PROFILE Products LLC 750 Lake Cook Road – Suite 440 Buffalo Grove, IL 60089 International - +1-847-215-1144 United States and Canada – 800-366-1180 (Fax 847-215-0577) www.profileproducts.com
2. Materials: The Biotic Soil Media shall be ProGanics BSM and conform to the following typical property values when uniformly applied at a rate of 3,500 lb./acre.
3.

Property	Test Method	Tested Value (English)
Physical		
Organic Material	ASTM D586	≥ 94%
Mass Per Unit Area	ASTM D6566[1]	≥ 11.6 oz/yd^2
Ground Cover	ASTM D6567	≥ 99%
Water Holding Capacity	ASTM D7367	≥ 900%
pH	ASTM D1293	6.0 ± 0.1
Carbon: Nitrogen (C:N) Ratio	ASTM E1508 & EPA Method 1687	50:1 ± 10
Material Color	Observed	Brown
Performance		
Cover Factor[2]	Large Scale Testing[3]	≤ 0.01

% Effectiveness[4]	Large Scale Testing	≥ 99%
Vegetation Establishment	ASTM D7322	≥ 850%
Environmental		
Ecotoxicity	EPA 2021.0	48-hr LC_{50} > 100%
Biodegradability	ASTM D5338	Yes
EPA 503 Metal Limits	EPA 503 Metal Limits	Pass
Pathogen Reduction	40 CFR 503 Class A Compost	Pass

4. Composition: All components of the ProGanics BSM shall be pre-packaged by the manufacturer to assure both material performance and compliance with the following values. No chemical additives with the exception of fertilizer, soil neutralizers and biostimulant materials should be added to this product.
   a. Thermally Processed Organic Fibers (within a pressurized vessel) – 89%
      1) Heated to a temperature greater than 380 degrees Fahrenheit for 5 minutes at a pressure greater than 50 psi
   b. Proprietary Blend of high-viscosity colloidal polysaccharide biopolymers, biochar, seaweed extract, humic acid, endomycorrhizae and beneficial bacteria – 11%
   c. Moisture Content – 12%
   d.
5. Application Rate

% Organic Matter	Rate (lb./acre)
< 0.75	5,000
≥ 0.75 & < 1.5	4,500
≥ 1.5 & < 2.0	4,000
≥ 2.0 & < 5.0	3,500

6. Packaging:

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[1] When applied at a rate of 3,500 lb./ac

[2] Cover Factor is calculated as soil loss ratio of treated surface versus an untreated control surface.

[3] Large scale testing conducted at Utah Water Research Laboratory (UWRL). ProGanics was applied at 3,500 lb./ac (3,920 kg/ha) and covered with ProMatrix™ EFM, a Bonded Fiber Matrix, at 3,500 lb./ac (3,920 kg/ha) and tested under uniform conditions. For specific testing information please contact a Profile technical service representative at 800-508-8681 (US and Canada) or +1-847-215-1144 (International).

[4] % Effectiveness = One minus Cover Factor multiplied by 100%.

a. Bags: Net Weight – 50 lb., UV, and weather-resistant plastic film
Pallets: Weather-proof, stretch-wrapped with UV resistant pallet cover
Pallet Quantity: 40 bags/pallet or 1 ton/pallet

2.6 FERTILIZERS

A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

PART 3 - EXECUTION

3.1 GENERAL

A. Place planting soil and fertilizers according to requirements in other Specification Sections.

B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

C. Proceed with placement only after unsatisfactory conditions have been corrected.

3.2 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

A. Excavation: Excavate soil from designated area(s) to a depth of 6 inches (150 mm) and stockpile until amended.

B. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.

C. Unsuitable Materials: Clean soil to contain a maximum of 8 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.

D. Screening: Pass unamended soil through a 2-inch (50-mm) sieve to remove large materials.

3.3 MODIFIED SOIL PREPARATION

A. The extent of the areas of soil modification are indicated on the Planting Plan or as directed by the Owner’s Representative. The areas requiring soil modification will include areas that may be compacted during construction, or other undisturbed, compacted areas, i.e., “hardpan” that are to be planted. Follow the requirements for modifying existing soil as indicated for the different types of soil modifications.

B. The Owner's Representative shall verify that the soil in the designated areas is suitable for the specified modification at the beginning of planting bed preparation work in that area. In the event that the work of this project construction has damaged the existing soil in areas designated for modification to the point where the soil is no longer suitable to support the plants specified with the specified modification, the Owner's Representative may require further modification of the damaged soil up to an including removal and replacement with soil of equal quality to the soil that would have resulted from the modification. Damage may include further compaction, contamination, grading, creation of hard pan or drainage problems.

C. General requirements for all soil modifications:
   1. Take soil samples, test for chemical properties, and make appropriate adjustments.
   2. Unless otherwise instructed, remove all existing plants, root thatch, and non-soil debris from the surface of the soil using equipment that does not add to the compaction in the soil.
   3. All soil grading, tilling, and loosening must be completed at times when the soil moisture is below field capacity. Allow soil to drain for at least two days after any rain event more than 1 inch in 24 hours, or long enough so that the soil does not make the hand muddy when squeezed.

D. Modified existing soil – compacted surface soil (Tilling):
   1. Description of condition to be modified: Surface soil compaction to a maximum of 6 inches deep from traffic or light grading. Original A horizon may be previously removed or graded but lower profile intact with acceptable compaction levels and limited grading. The soil organic matter, pH and chemistry in the A horizon may not be suitable for the proposed plants and may need to be modified as required.
   2. Modifications:
      a. Till top 6 inches or deeper of the soil surface, with a *roto tiller, spade tiller,* ripper, or agricultural plow. Spread 2 - 3 inches of Compost on the surface of the tilled soil and make any chemical adjustment as recommended by the soil test.
      b. Till or disk the Compost into the loosened soil. Smooth out grades with a drag rake or drag slip.

E. Modified existing soil – compacted subsoil:
   1. Description of condition to be modified: Deep soil compaction the result of previous grading, filling and dynamic or static compaction forces. Original A horizon likely removed or buried. The soil organic matter, pH and chemistry in the A horizon is likely not suitable for the proposed plants and should be modified as required.
   2. Soil Fracturing:
      a. Step one: After grading and removing all plants and debris from the surface, spread 2 – 3 inches of Compost over the surface of the soil. Loosen the soil to depth of 18 - 24 inches, using a backhoe to dig into the soil through the Compost. Lift and then drop the loosened soil immediately back into the hole. The bucket then moves to the adjacent soil and repeats the process until the entire area indicated has been loosened.
      b. Step 2: Spread 3-4 inches of Compost over the ripped area and till into the top 6 inches of the soil surface.
   3. Following soil ripping or fracturing the average penetration resistance should be less than 250 psi to the depth of the ripping or fracturing.
   4. Do not start planting into ripped or fractured soil until soil has been settled or leave grades sufficiently high to anticipate settlement of 10 – 15% of ripped soil depth.

5. Other soil modifications, such as Soil ripping, or trenching may only be approved by the Owner’s representative.
6.

3.4 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Subgrade Preparation: Till subgrade to a minimum depth of 12 inches (300 mm). Remove stones larger than 2 inches (50 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
   1. Apply, add soil amendments, and mix approximately half the thickness of unamended soil over prepared, loosened subgrade according to "Mixing" Paragraph below. Mix thoroughly into top 4 inches (100 mm) of subgrade. Spread remainder of planting soil.

C. Mixing: Spread unamended soil to total depth of 6 inches (150 mm), but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
   1. Amendments: Apply soil amendments, except compost, and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil.
      a. Mix fertilizer with planting soil no more than seven days before planting.
   2. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 8 inches (200 mm) > in loose depth for material compacted by compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

D. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 and tested in-place except where a different compaction value is indicated on Drawings.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.5 PLACING MANUFACTURED PLANTING SOIL OVER EXPOSED SUBGRADE

A. General: Apply manufactured soil on-site in its final, blended condition. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Subgrade Preparation: Till subgrade to a minimum depth of 12 inches (150 mm). Remove stones larger than 2 inches (50 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
   1. Apply approximately half the thickness of planting soil over prepared, loosened subgrade. Mix thoroughly into top 4 inches (100 mm) of subgrade. Spread remainder of planting soil.

C. Application: Spread planting soil to total depth 6 inches (150 mm)>, but not less than required to meet finish grades after natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
   1. Lifts: Apply planting soil in lifts not exceeding 8 inches (200 mm) in loose depth for material compacted by compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

D. Compaction: Compact each lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 except where a different compaction value is indicated on Drawings.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.6 BLENDING PLANTING SOIL IN PLACE

A. General: Mix amendments with in-place, unamended soil to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Preparation: Till unamended, existing soil in planting areas to a minimum depth of 6 inches (150 mm) Remove stones larger than 2 inches (50 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

C. Mixing: Apply soil amendments, except compost, and fertilizer, if required, evenly on surface, and thoroughly blend them into full depth of unamended, in-place soil to produce planting soil. Retain first subparagraph below if liming or sulfur is required.
   1. Mix fertilizer with planting soil no more than seven days before planting.

D. Compaction: Compact blended planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 except where a different compaction value is indicated on Drawings.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.7 APPLYING COMPOST TO SURFACE OF PLANTING SOIL

A. Application: Apply compost component of planting-soil mix to surface of in-place planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Finish Grading: Grade surface to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D 698. Space tests at no less than one for each 2000 sq. ft. (200 sq. m) of in-place soil or part thereof.

C. Soil will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

3.9 PROTECTION

A. Protection Zone: Identify protection zones according to Section 015639 "Temporary Tree and Plant Protection."

B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Vehicle traffic.
4. Foot traffic.
5. Erection of sheds or structures.
6. Impoundment of water.
7. Excavation or other digging unless otherwise indicated.

C. If planting soil or subgrade is over compacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Design Professional and replace contaminated planting soil with new planting soil.

3.10 CLEANING

A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.

B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
1. Dispose of excess subsoil and unsuitable materials on-site were directed by Owner.

PART 4 - METHOD OF MEASUREMENT AND PAYMENT

A. Soil Preparation shall not be measured or paid for separately and shall be incidental to Specification 329200 Turf and Grasses and Specification 329300 Plants.

END OF SECTION 329113

SECTION 329200 – TURF AND GRASSES

1.1 SUMMARY

A. Section Includes:

1. Sodding.

1.2 DEFINITIONS

A. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

B. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" and drawing designations for planting soils.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at project site.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
2. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the National Association of Landscape Professionals:

    a. Landscape Industry Certified Technician - Exterior.
    b. Landscape Industry Certified Lawn Care Manager.
    c. Landscape Industry Certified Lawn Care Technician.

3. Pesticide Applicator: State licensed, commercial.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.

PART 2 - PRODUCTS

2.1 TURFGRASS SOD

A. Turfgrass Sod: Number 1 Quality/Premium, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.

2.2 FERTILIZERS

A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

PART 3 - EXECUTION

3.1 TURF AREA PREPARATION

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."

B. Reduce elevation of planting soil to allow for soil thickness of sod.

C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

D. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.2 SODDING

A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1. Lay sod across slopes exceeding 1:3.
2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by sod manufacturer but not less than two anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below sod.

3.3 TURF MAINTENANCE

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

B. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings.

3.4 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding [**90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm)**] <**Insert coverage**>.
2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

PART 4 - METHOD OF MEASUREMENT

A. Seeded turf and sodded turf will be measured for payment by the square foot.

PART 5 - BASIS OF PAYMENT

A. Payment for seed and sod will be made at the contract unit price per square foot and shall include all items, labor, tools, equipment, handling, hauling, placing materials, and all incidental work required to complete the item.

END OF SECTION 329200

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SECTION 334200 - STORMWATER CONVEYANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. PVC pipe and fittings.
   2. Concrete pipe and fittings.
   3. Cleanouts.
   4. Drains.
   5. Manholes.
   6. Catch basins.
   7. Stormwater inlets.

1.3 DEFINITIONS

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals

C. Shop Drawings:

   1. Manholes: Include plans, elevations, sections, details, frames, and covers.
   2. Catch basins and stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates..

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

B. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 40 feet and vertical scale of not less than 1 inch equals 4 feet. Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

C. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes in accordance with manufacturer's written rigging instructions.

D. Handle catch basins and stormwater inlets in accordance with manufacturer's written rigging instructions.

1.8 FIELD CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service in accordance with requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PVC PIPE AND FITTINGS

A. Source Limitations: Obtain PVC pipe and fittings from single manufacturer.

B. PVC Type PSM Sewer Piping:

1. Pipe: ASTM D3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D3034, PVC with bell ends.
3. Gaskets: ASTM F477, elastomeric seals.

C. Adhesive Primer: ASTM F656.

2.2 CONCRETE PIPE AND FITTINGS

A. Source Limitations: Obtain concrete pipe and fittings from single manufacturer.

B. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C76

1. Bell-and-spigot or tongue-and-groove ends and gasketed joints with ASTM C443 rubber gaskets
2. Class III, Wall.

2.3 CLEANOUTS

A. Cast-Iron Cleanouts:
1. Source Limitations: Obtain cast-iron cleanouts from single manufacturer.
2. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside caulk or spigot connection and countersunk, tapered-thread, brass closure plug.
3. Top-Loading Classification(s): Light Duty, Medium Duty, Heavy Duty, andExtra-Heavy Duty.
4. Sewer Pipe Fitting and Riser to Cleanout: ASTM A74, Service class, cast-iron soil pipe and fittings.

B. PVC Cleanouts:
1. Source Limitations: Obtain PVC cleanouts from single manufacturer.
2. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.4 DRAINS

A. Cast-Iron Area Drains:
1. Source Limitations: Obtain cast-iron area drains from single manufacturer.
2. Description: Yard drain as defined on Construction Documents.
3. Top-Loading Classification(s): Heavy Duty.

B. Trench Drains:

1. Basis of Design ACO Type 860D/876D Slotted Iron Grate with Outlet Type Q, ACO Type K3-903G 8” Round or Approved Equal
2. Source Limitations: Obtain steel trench drains from single manufacturer.
3. Plate Thicknesses: HS-20 Heavy Duty Rated Grate
4. Overall Widths: 10” minimum

C. Grate Openings: As defined on Construction Documents

2.5 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C478 , precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.

3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C990 , bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C923 , cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches .
10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch- minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A536, Grade 60-40-18 ductile or ASTM A48/A48M, Class 35 gray iron unless otherwise indicated.

2.6 CONCRETE

A. General: Cast-in-place concrete in accordance with ACI 318 , ACI 350 , and the following:

1. Cement: ASTM C150/C150M, Type II.
2. Fine Aggregate: ASTM C33/C33M, sand.
3. Coarse Aggregate: ASTM C33/C33M, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A615/A615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

2.7 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C990 , bitumen or butyl rubber.
6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 225-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and grate.
8. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 .
9. Pipe Connectors: ASTM C923, resilient, of size required, for each pipe connecting to base section.

B. Frames and Grates: As defined on construction documents

2.8 STORMWATER INLETS

A. Curb Inlets: Made with vertical curb opening, of materials and dimensions in accordance with utility standards.

B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions in accordance with utility standards. Include heavy-duty frames and grates.

C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions in accordance with utility standards. Include heavy-duty frames and grates.

D. Frames and Grates: Heavy duty, in accordance with utility standards.

2.9 PIPE OUTLETS

A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure drainage piping in accordance with the following:

1. Install piping pitched down in direction of flow.
2. Install piping with 24 inch- minimum cover.
3. Install PVC sewer piping in accordance with ASTM D2321 and ASTM F1668.
4. Install PVC profile gravity sewer piping in accordance with ASTM D2321 and ASTM F1668.
5. Install reinforced-concrete sewer piping in accordance with ASTM C1479 and ACPA's "Concrete Pipe Installation Manual."

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping in accordance with the following:
1. Join PVC sewer piping in accordance with ASTM D2321 and ASTM D3034 for elastomeric-seal joints or ASTM D3034 for elastomeric-gasketed joints.
2. Join reinforced-concrete sewer piping in accordance with ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
3. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification cleanouts in loading docks or airfield aprons.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.5 DRAIN INSTALLATION

A. Install type of drains in locations indicated.
1. Use Extra-Heavy-Duty, top-loading classification drains in **roads**

B. Embed drains in 4-inch-minimum concrete around bottom and sides.

C. Fasten grates to drains if indicated.

D. Set drain frames and covers with tops flush with pavement surface.

E. Assemble trench sections with flanged joints.

F. Embed trench sections in **4-** inch- minimum concrete around bottom and sides.

3.6 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants in accordance with ASTM C891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops **3** inches above finished surface elsewhere unless otherwise indicated.

3.7 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.8 STORMWATER INLET **AND OUTLET** INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

3.9 CONCRETE PLACEMENT

A. Place cast-in-place concrete in accordance with ACI 318.

3.10 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."

B. Make connections to underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi .
2. Make branch connections from side into to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of manhole, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

3. Protect existing manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.11 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use detectable warning tape over piping.

3.12 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems in accordance with requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test in accordance with requirements of authorities having jurisdiction, UNI-B-6, and the following:

    a. Exception: Piping with soil tight joints unless required by authorities having jurisdiction.
    b. Option: Test plastic piping in accordance with ASTM F1417.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.13 CLEANING

A. Clean interior of piping of dirt and superfluous materials.

PART 4 - METHOD OF MEASUREMENT

4.1 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. The identity of each class, types and size of pipe shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipe being measured.

4.2 Manholes, catch basins, inlets, outlet control structures, cleanouts, riser structures, and oil water separators shall be measured ***vertically from the top of the manhole to the invert at the center of the manhole bottom.*****4.3** Trench drains shall be measured by the linear foot along the centerline of the structure from the end of inside face of the structure to the center of the collection structure.

4.4 Fabriform shall be measured by the square yard.

4.5 Double box culvert shall be measured by the linear foot along the centerline of the double box culvert.

PART 5 -BASIS OF PAYMENT

5.1 Payment will be made at the contract unit price per linear foot for identify each class and size of pipe. 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. No separate payment will be made for demolishing portions of walls of existing structures to make connection with new pipe. Hauling and placement of excess material removed in the pipe trench excavation process will not be measured for payment under this item. Payment for this work will be made under the appropriate embankment item as specified. No separate payment will be made for common trench excavation, trench backfill, including select backfill, or bedding. The cost of this work will be considered incidental to the construction of the storm sewer pipe. No separate payment will be made for any sheeting, shoring, bracing, pumping and counter-floatation measures which are required during construction, whether or not such work is indicated on the plans. No separate payment will be made for the removal and replacement or support of existing utilities necessary during the construction of storm sewers. The cost of this work will be considered incidental to the construction of the storm sewer pipe.

5.2 The accepted quantities of manholes, catch basins, inlets, oil water separators outlet control structures, storm sewer cleanouts 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.

5.3 The accepted quantity of trench drains and flumes shall be paid for at the contract unit price by linear foot 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 334200-1 15-inch reinforced concrete pipe, Class III - per linear foot
Item 334200-2 18-inch reinforced concrete pipe, Class III - per linear foot
Item 334200-3 24-inch reinforced concrete pipe, Class III - per linear foot
Item 334200-4 30-inch reinforced concrete pipe, Class III - per linear foot
Item 334200-5 36-inch reinforced concrete pipe, Class III - per linear foot
Item 334200-6 8-inch schedule SDR 35 PVC - per linear foot
Item 334200-7 10-inch schedule SDR 35 PVC - per linear foot
Item 334200-8 12-inch schedule SDR 35 PVC - per linear foot
Item 334200-9 6’ deep or less Storm Sewer Curb Inlet - per each
Item 334200-10 6’ to 8’ deep Storm Sewer Curb Inlet - per each
Item 334200-11 8’ to 10’ deep Storm Sewer Curb Inlet - per each
Item 334200-12 10’ deep or more Storm Sewer Curb Inlet - per each
Item 334200-13 6’ deep or less deep Storm Sewer Drop Inlet - per each
Item 334200-14 6’ to 8’ deep Storm Sewer Drop Inlet - per each
Item 334200-15 8’ to 10’ deep Storm Sewer Drop Inlet - per each
Item 334200-17 6’ deep or less Storm Sewer Precast Manhole - per each
Item 334200-18 6’ to 8’ deep Storm Sewer Precast Manhole - per each
Item 334200-19 8’ to 10’ deep Storm Sewer Precast Manhole - per each
Item 334200-20 10’ deep or more Storm Sewer Precast Manhole – per each
Item 334200-21 6’ deep or less Storm Sewer Yard Inlet – per each
Item 334200-22 6’ to 8’ deep or less Storm Sewer Yard Inlet – per each
Item 334200-23 Trench Drain - per linear foot
Item 334200-24 Storm Sewer Cleanout - per each
Item 334200-25 Double 10’ x 8’ Box Culvert - per linear foot
Item 334200-26 Double 10’ x 8’ Box Culvert Headwall – per each
Item 334200-27 18” diameter opening - Concrete Headwall - per each
Item 334200-28 24” diameter opening - Concrete Headwall - per each
Item 334200-29 30” diameter opening - Concrete Headwall – per each
Item 334200-30 36” diameter opening - Concrete Headwall – per each
Item 334200-31 Concrete Flume - per linear foot

END OF SECTION 334200