AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
	1 218

2. AMENDMENT/MODIFICAITON NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. *(If applicble)*
0004	02 NOV 2020		

6. ISSUED BY	CODE	7. ADMINISTERED BY *(If other than Item 6)*	CODE
U.S Army Corps of Engineers,Los Angeles Dist CESPL-CT-E, East Region Branch 915 Wilshire Blvd. Los Angeles, CA 90017	W912PL	SEE ITEM 6	

8. NAME AND ADDRESS OF CONTRACTOR *(No., street, county, State and ZIP Code)*	(X)	9A. AMENDMENT OF SOLICIATION NO.
	☐	W912PL-21-B-0002
		9B. DATED *(SEE ITEM 11)* 18 September2020
	☐	10A. MODIFICATION OF CONTRACT/ORDER NO.
		10B. DATED *(SEE ITEM 13)*

CODE | FACILITY CODE

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☒ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☒ is extended, ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a)By completing items 8 and 15, and returning 1 copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment your desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPIRATION DATA *(If required)*

13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

CHECK ONE	
☐	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: *(Specify authority)* THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
☐	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES *(such as changes in paying office, appropriation date, etc.*) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
☐	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
☐	D. OTHER *(Specify type of modification and authority)*

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 1 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (*Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

FY18 GROUND TRANSPORT EQUIPMENT FACILITY, FORT HUACHUCA, AZ

BID DUE DATE HAS BEEN EXTENDED FROM 6 NOV 2020 TO MONDAY 9 NOV 2020 12PM (PDT).

SEE CONTINUATION PAGE FOR AMENDMENT 0004 SUMMARY OF CHANGES.

PLEASE BE ADVISED THAT DOD SAFE DROP-OFF CODES EXPIRE IN 14 DAYS. ALL BIDDERS MUST REQUEST A NEW CODE IF THEIR EXISTING CODE WILL EXPIRE BEFORE BID SUBMITTAL.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER *(Type or print)*		16A. NAME AND TITLE OF CONTRACTING OFFICER *(Type or print)*	
15B. CONTRACTOR/OFFEROR *(Signature of person authorized to sign)*	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA *(Signature of Contracting Officer)*	16C. DATE SIGNED

GROUND TRANSPORTATION EQUIPMENT BUILDING (GTEB)

FORT HUACHUCA

AMENDMENT 0004

SUMMARY OF CHANGES

SPECIFICATIONS:

1) SF-1442

2) Replaced Table of Contents
3) Replaced submittal register on Section 01 33 00-SUBMITTAL PROCEDURE
3) Replaced entire Section 05 50 13 - MISCELLANEOUS METAL FABRICATIONS
4) Replaced entire Section 08 33 23 - OVERHEAD COILING DOORS
5) Replaced entire Section 08 71 00 - DOOR HARDWARE
6) Added Section 32 01 19.61 - SEALING OF JOINTS IN RIGID PAVEMENT
7) Added Section 32 13 13.06 - PORTLAND CEMENT CONCRETE PAVEMENT FOR ROADS AND SITE FACILITIES

DRAWINGS:

1) Added PCC Option (contractor can use Resin Modified Pavement or PCC Pavement) and revised Drawing B101 PAVEMENT PLAN BASE BID OVERALL and Drawing B101.OP PAVEMENT PLANS OVERALL-OPTIONS.

2) Revised drawing sheet M-602 – HVAC SCHEDULES.

APPENDICES:

1) Added to APPENDIX 1, Hazardous Materials Test Results for Bldg 68048.
2) Added APPENDIX 3 PCASE DETAILS FOR PCC PAVMEMENT OPTION.

SOLICITATION, OFFER, AND AWARD *(Construction, Alteration, or Repair)*	1. SOLICITATION NUMBER	2. TYPE OF SOLICITATION	3. DATE ISSUED	PAGE OF PAGES
	W912PL21B0002	[X] SEALED BID *(IFB)* [ ] NEGOTIATED *(RFP)*	18 SEP 2020	1 OF

IMPORTANT - The "offer" section on the reverse must be fully completed by the offeror.

4. CONTRACT NUMBER	5. REQUISITION/PURCHASE REQUEST NUMBER	6. PROJECT NUMBER

7. ISSUED BY CODE	8. ADDRESS OFFER TO
USACE, Los Angeles District Contracting Division, West Region Branch 915 Wilshire Blvd Los Angeles, CA 90017	DoD Secure Access File Exchange (DoD Safe) at https://safe.apps.mil/ See Section 00 22 13, Special Instructions Pertaining to Submission of Electronic Bids

9. FOR INFORMATION CALL ▶	A. NAME	B. TELEPHONE NUMBER *(Include area code) (NO COLLECT CALLS)*
	JIMMY L. BARTON	213.452.3251

SOLICITATION

NOTE: In sealed bid solicitations "offer" and "offeror" mean "bid" and "bidder".

10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS *(Title, identifying number, date):*

FY18 GROUND TRANSPORT EQUIPMENT FACILITY, FORT HUACHUCA, AZ

This a fully designed project (Design Bid Build). Construct a Ground Transport Equipment Building Complex. Project includes a vehicle maintenance shop (ground transport equipment building), organizational storage building, organizational vehicle parking, vehicle wash platform, vehicle loading dock, petroleum, oils and lubricants (POL) storage, and other hazardous waste/material storage. The vehicle maintenance facility will include mechanical and electrical rooms, telecommunications, HVAC, fire detection and sprinkler suppression systems, building information systems, intrusion detection system (IDS) installation, integrated energy, monitoring and control system (EMCS) connected to the base monitoring systems, and the installation of fire alarm systems. Supporting facilities will include connection to all utilities, lighting, paving, parking areas, sidewalks, curbs and gutters, rainwater harvesting systems, and signage. Heating and air conditioning will be provided by self-contained systems.

The estimated magnitude of project is between $25,000,000 and $100,000,000. This solicitation is UNRESTRICTED and all responsive and responsible parties are invited to submit a bid. The North American Industry Classification System (NAICS) code is 236220 Commercial and Institutional Building

BIDDERS PLEASE NOTE: "This project may be delayed, canceled or revised at any time prior to award."

11. The Contractor shall begin performance within 10 calendar days and complete it within * 00 73 00 calendar days after receiving

[ ] award, [X] notice to proceed. This performance period is [X] mandatory, [ ] negotiable. *(See* *Section 00 73 00 *.)*

12A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE PAYMENT BONDS? *(If "YES," indicate within how many calendar days after award in Item 12B.)*	12B. CALENDAR DAYS
[X] YES [ ] NO	10

13. ADDITIONAL SOLICITATION REQUIREMENTS:

A. Sealed offers in original and 0 copies to perform the work required are due at the place specified in Item 8 by 12PM *(hour)* local time 09 NOV 2020 *(date).* ~~If this is a sealed bid solicitation, offers will be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.~~

B. An offer guarantee [X] is, [ ] is not required.

C. All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by reference.

D. Offers providing less than 120 calendar days for Government acceptance after the date offers are due will not be considered and will be rejected.

OFFER *(Must be fully completed by offeror)*

14. NAME AND ADDRESS OF OFFEROR *(Include ZIP Code)*	15. TELEPHONE NUMBER *(Include area code)*
DUNS NO.: TAX ID NO.: CAGE CODE NO.:	( ) - ; FAX ( ) -
CODE FACILITY CODE	16. REMITTANCE ADDRESS *(Include only if different than Item 14)*

17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by the Government in writing within _____ calendar days after the date offers are due. *(Insert any number equal or greater than the minimum requirement stated in 13D. Failure to insert any number means the offeror accepts the minimum in Item 13D.)*

AMOUNTS ▶

18. The offeror agrees to furnish any required performance and payment bonds.

19. ACKNOWLEDGEMENT OF AMENDMENTS
(The offeror acknowledges receipt of amendments to the solicitation - give number and date of each)

AMENDMENT NO.										
DATE										

20A. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER *(Type or print)*	20B. SIGNATURE	20C. OFFER DATE

AWARD *(To be completed by Government)*

21. ITEMS ACCEPTED

22. AMOUNT	23. ACCOUNTING AND APPROPRIATION DATA

24.SUBMIT INVOICES TO ADDRESS SHOWN IN ▶ *(4 copies unless otherwise specified)*	ITEM	25. OTHER THAN FULL AND OPEN COMPETITION PURSUANT TO ☐ 10 U.S.C. 2304(c) ( ) ☐ 41 U.S.C. 253(c) ( )
26. ADMINISTERED BY CODE		27. PAYMENT WILL BE MADE BY USACE, Finance Center ATTN: CEFCO-AO-D 5722 Integrity Drive Millington, TN 38054-5005

CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE

☐ 28. NEGOTIATED AGREEMENT *(Contractor is required to sign this document and return _____ copies to the issuing office.)* Contractor agrees to furnish and deliver all items or perform all work requirements identified on this form and any continuation sheets for the consideration stated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications incorporated by reference in or attached to this contract.	☐ 29. AWARD. *(Contractor is not required to sign this document.)* Your offer on this solicitation is hereby accepted as to the items listed. This award consummates the contract, which consists of (a) the Government solicitation and your offer, and (b) this contract award. No further contractual document is necessary.

30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN *(Type or print)*		31A. NAME OF CONTRACTING OFFICER *(Type or print)*	
30B. SIGNATURE	30C. DATE	31B. UNITED STATES OF AMERICA BY	31C. AWARD DATE

STANDARD FORM 1442 BACK (REV. 4-85)

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SUBMITTAL REGISTER

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TITLE AND LOCATION
Ground Transportation Equipment Building (GTEB), Fort Huachuca

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)		(q)	(r)
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		01 45 35	Qualification Records	3.1.2															
			SD-11 Closeout Submittals																
			Comprehensive Final Report	3.1.2	G														
		01 50 00	SD-01 Preconstruction Submittals																
			Construction Site Plan	1.3	G														
			Traffic Control Plan	3.1.10.1	G														
			Temporary Earthwork Plan	1.4	G														
			Dust Control Methods And	3.1.10.3	G														
			Procedures																
			SD-06 Test Reports																
			Backflow Preventer Tests	2.4															
			SD-07 Certificates																
			Backflow Tester	1.7.1															
			Backflow Preventers	1.7															
			Backflow Prevention Training	1.7.2															
			Certificate																
		01 57 20	SD-01 Preconstruction Submittals																
			Environmental Protection Plan	1.7	G	DO													
		01 57 23	SD-01 Preconstruction Submittals																
			SWPPP	1.5.1	G	DO													
			SWPPP	1.5.1	G	DO													
			PRRs	1.5.2	G	DO													
			PRRs	1.5.2	G	DO													
			PRRs	1.5.2	G	DO													
			SD-03 Product Data																
			BMP Product Data	1.5.1.3															

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		01 57 23	BMP Product Data	3.1.1															
			BMP Product Data	3.1.1															
			BMP Product Data	3.1.1															
			Geotextiles And Mats	2.1.1.4	G	DO													
			SD-06 Test Reports																
			SWPPP Amendment	3.1.1															
			SWPPP Amendment	3.2.1															
			SWPPP Amendment	3.2.1															
			SWPPP Amendment	3.2.1															
			SWPPP Amendment	3.2.1															
			SWPPP Amendment	3.2.1															
			Sampling Results	1.5.2															
			Sampling Results	3.2.4															
			Inspection Reports	3.2.2															
			Annual Report	1.5.2															
			Annual Report	3.1.2															
			Annual Report	3.1.2															
			SD-10 Operation and Maintenance																
			Data																
			Post-Construction Stormwater	3.1.2	G	DO													
			Management Plan																
			Post-Construction Stormwater	3.1.2	G	DO													
			Management Plan																
			SD-11 Closeout Submittals																
			Final SWPPP	3.1.2	G	DO													
			Final SWPPP	3.2.1	G	DO													

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		01 57 23	NOT Application	3.1.2	G	DO												
			NOT Application	3.1.2	G	DO												
			NOT Application	3.1.2	G	DO												
		01 74 19	SD-01 Preconstruction Submittals															
			Waste Management Plan	1.6	G													
			SD-11 Closeout Submittals															
			Records	1.7														
		01 78 00	SD-03 Product Data															
			Warranty Management Plan	1.7.1														
			Warranty Tags	1.7.5														
			Spare Parts Data	1.5														
			SD-06 Test Reports															
			working as-built drawings	3.1.4	G													
			final as-built record drawings	3.2	G	DO												
			SD-08 Manufacturer's Instructions															
			Instructions	1.7.1														
			SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	3.9														
			Manuals															
			SD-11 Closeout Submittals															
			Record Drawings	1.3.4	G	DO												
			Certification of EPA Designated	2.3	G													
			Items															
			Interim DD FORM 1354	3.11	G													
			Checklist for DD FORM 1354	3.11	G													

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		01 78 00	Final Approved Shop Drawings	3.6	G													
			Construction Contract	3.7	G													
			Specifications															
			As-Built Record Of Equipment	3.8														
			And Materials															
		01 78 23	SD-10 Operation and Maintenance															
			Data															
			O&M Database	1.3	G													
			Training Plan	3.1.1	G													
			Training Outline	3.1.3	G													
			Training Content	3.1.2	G													
			SD-11 Closeout Submittals															
			Training Video Recording	3.1.4	G													
			Validation of Training Completion	3.1.6	G													
		01 91 00.15	SD-06 Test Reports															
			Design Review Report	3.1.4	G	DO												
			Interim Construction Phase	3.1.3.1	G	DO												
			Commissioning Plan															
			Final Construction Phase	3.1.3.2	G	DO												
			Commissioning Plan															
			Template Building Envelope	3.1.3.1.2	G	DO												
			Inspection Checklists															
			Building Envelope Inspection	3.1.6.2	G	DO												
			Checklists															
			Pre-Functional Checklists	3.1.6.3	G	DO												
			Issues Log	1.9														

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		01 91 00.15	Commissioning Report	3.2	G	DO													
			Post-Construction Trend Log	3.3.1	G	DO													
			Report																
			SD-07 Certificates																
			Certificate of Readiness	1.10	G	DO													
			SD-10 Operation and Maintenance																
			Data																
			Training Plan	3.1.7	G	RO													
			Training Attendance Rosters	3.1.7	G	RO													
			Systems Manual and	3.1.8	G	DO													
			Computerized Maintenance																
			Management System Manual																
			Maintenance and Service Life	3.1.9	G	DO													
			Plans																
			SD-11 Closeout Submittals																
			Construction Phase	3.1.3.1	S	DO													
			Commissioning Plan																
			Final Commissioning Report	3.2	S	DO													
		02 41 00	SD-01 Preconstruction Submittals																
			Demolition Plan	1.2.1	G														
			Existing Conditions	1.9															
			SD-07 Certificates																
			Notification	1.6	G														
			SD-11 Closeout Submittals																
			Receipts	3.3.4															
		02 82 13	SD-02 Shop Drawings																

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		02 82 13	Detailed Drawings	1.3	G														
			SD-03 Product Data																
			Asbestos Waste Shipment Records	3.10.3.1	G														
			Encapsulants	2.1	G														
			Respiratory Protection Program	1.8.1	G DO														
			Cleanup and Disposal	3.10	G														
			Qualifications	1.5.1	G														
			Training Program	1.10															
			Licenses, Permits and Notifications	1.7.1															
			Asbestos Management Plan	3.10.3.2	G DO														
			SD-06 Test Reports																
			Exposure Assessment and Air Monitoring	3.8															
			Local Exhaust System	1.6.3															
			SD-07 Certificates																
			Local Exhaust System	1.6.3															
			Encapsulants	2.1	G														
			Medical Surveillance Requirements	1.8															
		02 83 13	SD-01 Preconstruction Submittals																
			Lead Compliance Plan	1.5.2.2	G														
			Competent Person	1.5.1.1	G														
			Training Certification	1.5.1.2	G														
			Lead waste management plan	1.5.2.8	G														

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		02 83 13	Written evidence	3.5.2.1	G														
			Medical Examinations	1.5.2.4	G														
			SD-06 Test Reports																
			Sampling results	1.5.2.3	G														
			Occupational and Environmental	1.5.2.3	G														
			Assessment Data Report																
			SD-07 Certificates																
			Testing laboratory	1.5.1.3															
			Clearance Certification	3.5.1.1															
			SD-11 Closeout Submittals																
			hazardous waste manifest	3.5.2.1															
			turn-in documents or weight	3.5.2.1															
			tickets																
		02 84 16	SD-06 Test Reports																
			Testing Results	3.3.1	G														
			SD-07 Certificates																
			Qualifications of CIH	1.8.1															
			Training Certification	1.8.1															
			PCB and Lamp Removal Work	1.8.2	G														
			Plan																
			PCB and Lamp Disposal Plan	1.8.3	G														
			Certification of Decontamination	3.2.4	G														
			SD-11 Closeout Submittals																
			Transporter certification	3.5.2	G														
			Certificate of Disposal and/or	3.5.2.1															
			recycling																

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		02 84 16	DD Form 1348-1	3.5.3															
		03 11 13	SD-02 Shop Drawings																
			Formwork	2.2.1	G														
			Formwork	3.1.1	G														
			Form Removal Schedule	2.2.1	G														
			SD-03 Product Data																
			Form Materials	2.2															
			SD-04 Samples																
			Sample Panels	1.3	G														
			SD-05 Design Data																
			Calculations	2.1															
			SD-06 Test Reports																
			Inspection	3.2															
		03 15 00	SD-03 Product Data																
			Preformed Expansion Joint Filler	2.2															
			Sealant	2.3															
			SD-04 Samples																
			Lubricant for Preformed	2.3.2															
			Compression Seals																
			Field-Molded Type	2.3.3															
			SD-07 Certificates																
			Preformed Expansion Joint Filler	2.2															
			Sealant	2.3															
		03 20 00	SD-02 Shop Drawings																
			Reinforcement	3.1	G														
			SD-03 Product Data																

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		03 20 00	Mechanical Butt-Splices	2.3.1															
			SD-07 Certificates																
			Reinforcing Steel	2.3															
			Qualified Welders	1.3.1															
			Qualification of Steel Bar Butt-Splicers	1.3.2															
		03 30 00	SD-01 Preconstruction Submittals																
			Quality Control Plan	1.4.2	G														
			Laboratory Accreditation	1.4.1															
			Sampling Plan	3.9.5.4	G														
			SD-03 Product Data																
			Recycled Content Products	Part 2															
			Cementitious Materials	2.2															
			Vapor Barrier	2.11															
			Floor Finish	2.1.5															
			Floor Hardener	2.9															
			Chemical Admixtures	2.4															
			SD-04 Samples																
			Surface Retarder	2.4.5															
			SD-05 Design Data																
			Mixture Proportions	2.1.1	G														
			SD-06 Test Reports																
			Mixture Proportions	2.1.1	G														
			Testing and Inspection for CQC	3.9	G														
			Fly Ash	2.2.2															

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		03 30 00	Ground Granulated Blast-Furnace	2.2.3															
			(GGBF) Slag																
			Aggregates	2.3															
			Air Content	3.9.5.1															
			Slump	3.9.5.2															
			Compressive Strength	3.9.5.4															
			Water	2.5															
			SD-07 Certificates																
			Contractor Quality Control	1.4															
			personnel																
			Ready-Mix Plant	3.2.1															
		03 35 00	SD-03 Product Data																
			Recycled Content Products	Part 2															
			SD-04 Samples																
			Field Test Panels	1.3.1															
			Sample Wall Panels	1.3.1.1															
			Slab Panels	1.3.1.2															
		03 39 00	SD-03 Product Data																
			Curing Materials	2.1															
			SD-06 Test Reports																
			Testing and Inspection for CQC	3.2															
			SD-08 Manufacturer’s Instructions																
			Curing Compound	2.1															
		03 42 13	SD-01 Preconstruction Submittals																
			Quality Control Procedures	1.3.2.2															
			SD-02 Shop Drawings																

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		03 42 13	Standard Precast Units	2.1.1	G														
			Custom-Made Precast Units	2.1.2	G														
			Special Finishes	3.2.4.3															
			SD-03 Product Data																
			Standard Precast Units	2.1.1															
			Proprietary Precast Units	2.1.3															
			Embedded Items	3.1.3															
			Accessories	2.2.4															
			SD-05 Design Data																
			Design Calculations	2.1.2	G														
			Concrete Mix Proportions	2.1.5.1															
			SD-06 Test Reports																
			Test Reports	1.3.2.4															
			SD-07 Certificates																
			Quality Control Procedures	1.3.2.2															
		04 20 00	SD-02 Shop Drawings																
			Cut CMU	3.3.2.1	G														
			Detail Drawings	3.4.1.1	G														
			SD-03 Product Data																
			Hot Weather Procedures	1.5.1	G														
			Cold Weather Procedures	1.5.2	G														
			Cement	2.2.2.2.1	G														
			Cementitious Materials	2.4.1.1	G														
			SD-04 Samples																
			Mock-Up Panel	1.3.1.1	G														
			Admixtures for Masonry Mortar	2.4.1.4	G														

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		04 20 00	Anchors, Ties, and Bar	2.6.2	G														
			Positioners																
			Joint Reinforcement	1.3.1.3	G														
			SD-05 Design Data																
			Masonry Compressive Strength	2.1.2	G														
			Fire-Rated Concrete Masonry	2.2.2.5															
			Units																
			Bracing Calculations	3.2.5	G														
			SD-06 Test Reports																
			Field Testing of Mortar	3.6.1.1															
			Field Testing of Grout	3.6.1.2															
			Prism Tests	3.6.1.3															
			SD-07 Certificates																
			Special Masonry Inspector	1.3.2															
			Qualifications																
			Cementitious Materials	2.4.1.1															
			Admixtures for Masonry Mortar	2.4.1.4															
			Admixtures for Grout	2.4.2.2															
			Anchors, Ties, and Bar	2.6.2															
			Positioners																
			Joint Reinforcement	1.3.1.3															
			SD-08 Manufacturer’s Instructions																
			Admixtures for Masonry Mortar	2.4.1.4															
			Admixtures for Grout	2.4.2.2															
			SD-10 Operation and Maintenance																
			Data																

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Ground Transportation Equipment Building (GTEB), Fort Huachuca

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		04 20 00	Take-Back Program	3.8															
		05 05 23.16	SD-01 Preconstruction Submittals																
			Welding Quality Assurance Plan	3.2	G														
			SD-03 Product Data																
			Welding Procedure Qualifications	1.3	G														
			Welder, Welding Operator, and	1.3.5															
			Tacker Qualification																
			Inspector Qualification	1.3.6															
			Previous Qualifications	1.3.2															
			Pre-Qualified Procedures	1.3.3															
			Welding Electrodes and Rods	2.2															
			SD-06 Test Reports																
			Nondestructive Testing	3.3															
			SD-07 Certificates																
			Certified Welding Procedure	1.3.1															
			Specifications (WPS)																
			Certified Brazing Procedure	1.3.1															
			Specifications (BPS)																
			Certified Procedure Qualification	1.3.1															
			Records (PQR)																
			Certified Welder Performance	1.3.1															
			Qualifications (WPQ)																
			Certified Brazer Performance	1.3.1															
			Qualifications (BPQ)																
		05 12 00	SD-01 Preconstruction Submittals																
			Erection Drawings	1.5.1.1	G														

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		05 12 00	SD-02 Shop Drawings																
			Fabrication drawings	1.5.2	G														
			SD-03 Product Data																
			Shop primer	2.6.2															
			Welding electrodes and rods	2.4.1															
			Direct Tension Indicator Washers	2.3.2.3															
			Non-Shrink Grout	2.4.2															
			Tension control bolts	2.3.3															
			SD-06 Test Reports																
			Class B coating	2.6.2															
			Bolts	2.3.1.1															
			Bolts	2.3.2.1															
			Nuts	2.3.1.2															
			Nuts	2.3.2.2															
			Washers	2.3.1.3															
			Washers	2.3.2.4															
			Weld Inspection Reports	3.8.1.2															
			Direct Tension Indicator Washer	3.8.2.1															
			Inspection Reports																
			Bolt Testing Reports	3.8.3.1															
			Embrittlement Test Reports	3.8.4															
			SD-07 Certificates																
			Steel	2.2															
			Bolts	2.3.1.1															
			Bolts	2.3.2.1															
			Nuts	2.3.1.2															

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		05 12 00	Nuts	2.3.2.2														
			Washers	2.3.1.3														
			Washers	2.3.2.4														
			Galvanizing	2.5														
			AISC Fabrication Plant Quality	1.3														
			Certification															
			AISC Erector Quality Certification	1.3														
			Welding procedures and	1.5.3.1														
			qualifications															
			Welding electrodes and rods	2.4.1														
		05 21 00	SD-01 Preconstruction Submittals															
			Welder Qualification	1.3.2														
			SD-02 Shop Drawings															
			Steel Joist Framing	1.3.1	G													
			SD-05 Design Data															
			Design Calculations	2.2	G													
			SD-06 Test Reports															
			Erection Inspection	3.4														
			Welding Inspections	3.4														
			SD-07 Certificates															
			Certification of Compliance	1.3.2														
			SD-11 Closeout Submittals															
			Recycled Content of Steel	2.3	S													
			Products															
		05 30 00	SD-02 Shop Drawings															
			Fabrication Drawings	1.3.4	G	RO												

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		05 30 00	Roof Deck Units	2.3	G	RO												
			Cant Strips	2.3.2.1	G	RO												
			Ridge and Valley Plates	2.3.2.2	G	RO												
			Metal Closure Strips	2.3.2.3	G	RO												
			SD-03 Product Data															
			Accessories	2.2														
			Deck Units	2.3.1	G	RO												
			Galvanizing Repair Paint	2.1.5														
			Joint Sealant Material	2.1.4														
			Roof Deck Units	2.3														
			Repair Paint	2.3.4														
			Welder Qualifications	1.3.2														
			Welding Equipment	1.3.2														
			Welding Rods and Accessories	1.3.2														
			SD-04 Samples															
			Roof Deck Units	2.3														
			Flexible Closure Strips	2.1.6														
			Flexible Closure Strips	2.3														
			Accessories	2.2														
			SD-05 Design Data															
			Deck Units	2.3.1	G	RO												
			SD-07 Certificates															
			Welding Procedures	1.3.2														
			Fire Safety	1.3.3.1														
			Wind Storm Resistance	1.3.3.2														
		05 40 00	SD-02 Shop Drawings															

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		05 40 00	Framing Components	1.6.1	G														
			SD-03 Product Data																
			Studs, Joists	2.1															
			SD-05 Design Data																
			Metal Framing Calculations	1.6.2	G														
			SD-07 Certificates																
			Load-Bearing Cold-Formed Metal Framing	1.4															
			Welds	3.2.1															
			SD-11 Closeout Submittals																
			Recycled Content of Steel Products	2.1	S														
		05 50 13	SD-02 Shop Drawings																
			Floor Gratings	2.4	G														
			Roof Walkways	2.4	G														
			Bollards/Pipe Guards	2.5	G														
			SD-03 Product Data																
			Floor Gratings	2.4	G														
			Roof Walkways	2.4	G														
			SD-07 Certificates																
			Certificates of Compliance	2.1	G														
			Certified Mill	2.2	G														
			SD-11 Closeout Submittals																
			Recycled Content	2.1	S														
		05 51 00	SD-02 Shop Drawings																
			Iron and Steel Hardware	2.1	G														

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		05 51 00	Steel Shapes, Plates, Bars, and	2.1	G													
			Strips															
			Metal Stair System	2.2.1	G													
			SD-03 Product Data															
			Structural-Steel Plates, Shapes,	2.4.1	G													
			and Bars															
			Structural-Steel Tubing	2.4.2	G													
			Hot-Rolled Carbon Steel Sheets	2.4.5	G													
			and Strips															
			Cold-Finished Steel Bars	2.4.4	G													
			Hot-Rolled Carbon Steel Bars	2.4.3	G													
			Cold-Rolled Carbon Steel Sheets	2.4.6	G													
			Galvanized Carbon Steel Sheets	2.4.7	G													
			Cold-Drawn Steel Tubing	2.4.8	G													
			Gray Iron Castings	2.4.9	G													
			Malleable Iron Castings	2.4.10	G													
			Concrete Inserts	2.3.4	G													
			Masonry Anchorage Devices	2.3.5	G													
			Protective Coating	2.2.4	G													
			Steel Pan Stairs	2.2.2	G													
			Steel Stairs	2.3.1	G													
			Steel Stairs, Circular	2.3.2	G													
			SD-07 Certificates															
			Welding Procedures	1.3.1	G													
			Welder Qualification	1.3.1	G													
			SD-08 Manufacturer’s Instructions															

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		05 51 00	Structural-Steel Plates, Shapes,	2.4.1	G														
			and Bars																
			Structural-Steel Tubing	2.4.2	G														
			Hot-Rolled Carbon Steel Sheets	2.4.5	G														
			and Strips																
			Cold-Finished Steel Bars	2.4.4	G														
			Hot-Rolled Carbon Steel Bars	2.4.3	G														
			Cold-Rolled Carbon Steel Sheets	2.4.6	G														
			Galvanized Carbon Steel Sheets	2.4.7	G														
			Cold-Drawn Steel Tubing	2.4.8	G														
			Gray Iron Castings	2.4.9	G														
			Malleable Iron Castings	2.4.10	G														
			Protective Coating	2.2.4	G														
			Masonry Anchorage Devices	2.3.5	G														
		05 51 33	SD-02 Shop Drawings																
			Ladders	2.3															
			Ship's Ladder	2.3.3															
			SD-03 Product Data																
			Ladders	2.3															
			Ship's Ladder	2.3.3															
			Ladder Safety Devices	2.3.2															
			SD-07 Certificates																
			Fabricator Certification for Ladder	1.3															
			Assembly																
			Fabricator Certification for Ships	1.3															
			Ladder Assembly																

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		05 52 00	SD-02 Shop Drawings															
			Fabrication Drawings	1.2.1	G													
			Iron and Steel Hardware	3.2	G													
			Steel Shapes, Plates, Bars and Strips	3.2	G													
			SD-03 Product Data															
			Structural Steel Plates, Shapes, and Bars	2.2.1	G													
			Structural Steel Tubing	2.2.2	G													
			Cold-Finished Steel Bars	2.2.4	G													
			Hot-Rolled Carbon Steel Bars	2.2.3	G													
			Cold-Drawn Steel Tubing	2.2.5	G													
			Concrete Inserts	2.2.7	G													
			Masonry Anchorage Devices	2.2.8	G													
			Protective Coating	2.1.3	G													
			Steel Railings and Handrails	2.2.10	G													
			Aluminum Railings and Handrails	2.2.11	G													
			Anchorage and Fastening Systems	1.2.1	G													
			SD-07 Certificates															
			Welding Procedures	1.4.1	G													
			Welder Qualification	1.4.2	G													
			SD-08 Manufacturer’s Instructions															
			Installation Instructions	3.2	G													
		06 10 00	SD-03 Product Data															
			Fire-retardant Treatment	1.8														

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		06 10 00	Adhesives	2.2.2															
			SD-06 Test Reports																
			Preservative-treated	1.4.3															
			SD-07 Certificates																
			Certificates of Grade	1.9.1															
			Preservative Treatment	1.7															
		06 20 00	SD-02 Shop Drawings																
			Detail Drawings Indicating All	1.3	G														
			Wood Assemblies																
			SD-03 Product Data																
			Wood Products	2.2	G														
			Countertops	2.3	G														
			Treated Wood Products	1.4	G														
			Soffits	3.4	G														
			Hardware and Accessories	2.7	G														
			SD-04 Samples																
			Samples	1.5	G														
			SD-07 Certificates																
			Certificates of Grade	1.7.1.1	G														
			Certified Sustainably Harvested	1.7.1.2	G														
			Wood																
			Indoor Air Quality	1.7.1.3	G														
			SD-11 Closeout Submittals																
			Certified Sustainably Harvested	2.2.5	S														
			Softwood Plywood																

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		06 20 00	Certified Sustainably Harvested	2.2.7	S														
			Hardboard																
			VOC Content for Softwood	2.2.5	S														
			Plywood																
			VOC Content for Hardwood	2.2.6	S														
			Plywood																
			Indoor Air Quality for Non-aerosol	2.8.1.2	S														
			Adhesives																
			Indoor Air Quality for Aerosol	2.8.1.2	S														
			Adhesives																
		06 41 10	SD-02 Shop Drawings																
			Shop Drawings	3.1.2	G														
			Installation	3.1															
			SD-03 Product Data																
			Laminated Plastic Covered	2.1.1															
			Hardware Finish	2.2.1															
			Certification	1.4															
			SD-04 Samples																
			Cabinet Hardware	2.2															
			Casework Hardware	2.2.2															
		06 61 16	SD-02 Shop Drawings																
			Solid Polymer Material	2.1.3	G														
			Solid Polymer Material	2.3	G														
			Solid Polymer Material	2.3.2	G														
			SD-03 Product Data																
			Solid Polymer Material	2.1.3															

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		06 61 16	Solid Polymer Material	2.3															
			Solid Polymer Material	2.3.2															
			SD-04 Samples																
			Solid Polymer Material	2.1.3	G														
			Solid Polymer Material	2.3	G														
			Solid Polymer Material	2.3.2	G														
			SD-06 Test Reports																
			Solid Polymer Material	2.1.3															
			Solid Polymer Material	2.3															
			Solid Polymer Material	2.3.2															
			SD-08 Manufacturer’s Instructions																
			Solid Polymer Material	2.1.3															
			Solid Polymer Material	2.3															
			Solid Polymer Material	2.3.2															
		07 05 23	SD-01 Preconstruction Submittals																
			Work Plan	1.4	G														
			SD-03 Product Data																
			Thermal Imaging Camera	2.2	G														
			SD-05 Design Data																
			Envelope Surface Area	3.2	G														
			Calculations																
			SD-07 Certificates																
			Pressure Test Agency	1.6.2.1															
			Thermographer Qualifications	1.6.2.2															
			Test Instruments	1.6.3															
			Date Of Last Calibration	1.6.3															

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		07 05 23	SD-06 Test Reports																
			Pressure Test Procedures	3.5	G														
			Air Leakage Test Report	3.5.8	G														
			Diagnostic Test Report	3.6.5	G														
		07 13 53	SD-03 Product Data																
			Manufacturer's Standard Details	1.3	G														
			Elastomeric Waterproofing Sheet	2.2	G														
			Material																
			Primers, Adhesives, and Mastics	1.4	G														
			Primers, Adhesives, and Mastics	2.2	G														
			SD-06 Test Reports																
			Elastomeric Waterproofing Sheet	2.2	G														
			Material																
			Field Quality Control	3.6	G														
			Protective Covering	3.7	G														
			SD-07 Certificates																
			Elastomeric Waterproofing Sheet	2.2															
			Material																
			Primers, Adhesives, and Mastics	1.4	G														
			Primers, Adhesives, and Mastics	2.2	G														
			Protective Coverings	1.4	G														
			Special Warranties	1.8	G														
			Special Warranties	1.8	G														
			Certificates Of Compliance	2.1.1	G														
			Certificates Of Compliance	2.1.2	G														
			SD-08 Manufacturer’s Instructions																

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		07 13 53	Primers, Adhesives, and Mastics	1.4	G													
			Primers, Adhesives, and Mastics	2.2	G													
			SD-11 Closeout Submittals															
			Certificates Of Compliance	2.1.1	G													
			Certificates Of Compliance	2.1.2	G													
		07 21 13	SD-03 Product Data															
			Manufacturer's Standard Details	1.3	G													
			Block or Board Insulation	2.2	G													
			Vapor Retarder	2.3	G													
			Pressure Sensitive Tape	2.4	G													
			Protection Board or Coatings	1.4	G													
			Accessories	2.6	G													
			SD-07 Certificates															
			Block or Board Insulation	2.2	G													
			Vapor Retarder	2.3	G													
			Protection Board or Coating	2.5	G													
			Protection Board or Coating	3.4.5	G													
			Special Warranties	1.8	G													
			Special Warranties	1.8	G													
			ULE Greenguard	1.5	G	S												
			SD-08 Manufacturer’s Instructions															
			Block or Board Insulation	2.2														
			Adhesive	2.6.1														
			SD-11 Closeout Submittals															
			ULE Greenguard	1.5	S													

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		07 21 13	Volatile Organic Compound	2.1.1	S													
			(VOC) Content															
			Recycled Content	2.1.2	S													
		07 21 16	SD-03 Product Data															
			Blanket Insulation	2.2														
			Sill Sealer Insulation	2.3														
			Vapor Retarder	2.5														
			Pressure Sensitive Tape	2.6														
			Accessories	2.7														
			SD-08 Manufacturer's Instructions															
			Insulation	3.3.1														
			SD-11 Closeout Submittals															
			Recycled Content for Insulation	2.1.1	S													
			Materials															
			Reduce Volatile Organic	2.1.2	S													
			Compounds (VOC)															
		07 22 00	SD-02 Shop Drawings															
			Insulation Board Layout	1.3	G													
			Verification of Existing Conditions	1.3	G													
			SD-03 Product Data															
			Insulation	2.2	G													
			Cover Board	1.4	G													
			Fasteners	2.5	G													
			Moisture Control	2.4	G													
			SD-06 Test Reports															
			Flame Spread Rating	1.8.1	G													

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		07 22 00	SD-07 Certificates															
			Volatile Organic Compounds	1.9	G													
			(VOC) Content															
			Installer Qualifications	1.6	G													
			Certificates Of Compliance For	1.6	G													
			Felt Materials															
			SD-08 Manufacturer's Instructions															
			Fasteners	2.5	G													
			Insulation	2.2	G													
			SD-11 Closeout Submittals															
			Volatile Organic Compounds	1.9	S													
			(VOC) Content															
		07 27 10	SD-04 Samples															
			Mock-Up	3.1.2	G													
			SD-06 Test Reports															
			Design Review Report	1.8	G	DO												
			Testing and Inspection	3.1.3	G	RO												
			SD-07 Certificates															
			Air Barrier Inspector	1.7	G	RO												
		07 27 19.01	SD-01 Preconstruction Submittals															
			Qualifications of Manufacturer	1.8.1	G													
			Qualifications of Installer	1.8.2	G													
			SD-02 Shop Drawings															
			Self-adhering Air Barrier	1.4	G													
			SD-03 Product Data															
			Self-adhering Air Barrier	1.4	G													

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		07 27 19.01	Primers, Adhesives, and Mastics	2.2	G														
			Safety Data Sheets	1.4.2	G														
			SD-04 Samples																
			Self-adhering Air Barrier	1.4	G														
			SD-06 Test Reports																
			Field Peel Adhesion Test	1.6	G														
			Flame Propagation of Wall	1.4.4	G														
			Assemblies																
			Flame Spread and Smoke	1.4.4	G														
			Developed Index Ratings																
			Site Inspections and Testing	3.4.1	G														
			SD-07 Certificates																
			Self-adhering Air Barrier	1.4	G														
			Qualifications of Manufacturer	1.8.1	G														
			Qualifications of Installer	1.8.2	G														
			SD-08 Manufacturer’s Instructions																
			Self-adhering Air Barrier	1.4	G														
			Primers, Adhesives, and Mastics	2.2	G														
		07 27 26	SD-01 Preconstruction Submittals																
			Qualifications of Manufacturer	1.9.1	G														
			Qualifications of Installer	1.9.2	G														
			SD-02 Shop Drawings																
			Fluid-Applied Membrane Air	1.4	G														
			Barrier																
			SD-03 Product Data																

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		07 27 26	Fluid-Applied Membrane Air Barrier	1.4	G														
			Transition Membrane	2.4	G														
			Primers, Adhesives, and Mastics	2.3	G														
			Reinforcement	2.7	G														
			Safety Data Sheets	1.4.2	G														
			SD-04 Samples																
			Mockup	1.4.3	G														
			SD-06 Test Reports																
			Capillary Moisture Test	1.6	G														
			Field Peel Adhesion Test	1.4.4	G														
			Flame Propagation of Wall Assemblies	1.4.4	G														
			Flame Spread and Smoke Developed Index Ratings	1.4.4	G														
			Site Inspections	3.4.1	G														
			SD-07 Certificates																
			Fluid-Applied Membrane Air Barrier	1.4	G														
			Transition Membrane	2.4	G														
			Qualifications of Manufacturer	1.9.1	G														
			Qualifications of Installer	1.9.2	G														
			SD-08 Manufacturer’s Instructions																
			Fluid-Applied Membrane Air Barrier	1.4	G														
			Transition Membrane	2.4	G														

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		07 27 26	Primers, Adhesives, and Mastics	2.3	G													
			SD-11 Closeout Submittals															
			Volatile Organic Compound	2.1	S													
			(VOC) Content															
		07 41 13	SD-02 Shop Drawings															
			Roofing Panels	1.4.5	G													
			Flashing and Accessories	1.4.5	G													
			Gutter/Downspout Assembly	1.4.5	G													
			SD-03 Product Data															
			Roof Panels	2.1	G													
			Factory-Applied Color Finish	1.4.5	G													
			Accessories	2.4	G													
			Fasteners	1.4.5	G													
			Pressure Sensitive Tape	1.4.5	G													
			Underlayments	2.7	G													
			Gaskets and Sealing/Insulating	2.8	G													
			Compounds															
			Coil Stock	1.4.5	G													
			Galvanizing Repair Paint	1.4.5	G													
			SD-04 Samples															
			Roof Panels	2.1	G													
			Factory-applied Color Finish	1.4.5	G													
			Accessories	2.4	G													
			Fasteners	1.4.5	G													
			Gaskets and Sealant/Insulating	1.4.5	G													
			Compounds															

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		07 41 13	SD-05 Design Data																
			Wind Uplift Resistance	1.2.1.2	G														
			SD-06 Test Reports																
			Leakage Test Report	1.2.1.1	G														
			Wind Uplift Test Report	1.2.1.2	G														
			Fire Rating Test Report	2.6.2	G														
			Factory Finish and Color	2.2	G														
			Performance Requirements																
			SD-07 Certificates																
			Roof Panels	2.1	G														
			Coil Stock Compatibility	1.4.5	G														
			Self-Adhering Modified Bitumen	2.7.1	G														
			Underlayment																
			Qualification of Manufacturer	1.4.1	G														
			Qualification of Applicator	1.4.2	G														
			SD-08 Manufacturer’s Instructions																
			Insulation	2.6	G														
			Installation Manual	1.4.5	G														
			SD-11 Closeout Submittals																
			Warranties	1.8	G														
			Information Card	3.11	G														
		07 41 16	SD-03 Product Data																
			Soffit panels	2.1	G														
			Closures	3.1.1															
			flashing	3.1.1															
			Accessories	2.3															

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		07 41 16	Fasteners	2.4															
			Gaskets and Insulating	2.6															
			Compounds																
			SD-04 Samples																
			SOFFIT PANEL	2.1															
			Accessories	2.3															
			Fasteners	2.4															
			Gaskets and Insulating	2.6															
			Compounds																
			Sealant	2.5	G														
			SD-06 Test Reports																
			Salt Spray Test	2.2.1															
			SD-07 Certificates																
			Accessories	2.3															
			SD-08 Manufacturer’s Instructions																
			INSTALLATION	3.1	G														
		07 60 00	SD-02 Shop Drawings																
			Exposed Sheet Metal	2.2.1	G														
			Gutters	3.1.17	G														
			Downspouts	3.1.18	G														
			Expansion Joints	3.1.26	G														
			Gravel Stops and Fasciae	2.2.1	G														
			Splash Pans	3.1.22	G														
			Flashing for Roof Drains	3.1.19	G														
			Base Flashing	3.1.11	G														
			Counterflashing	3.1.12	G														

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		07 60 00	Flashing at Roof Penetrations	3.1.27	G													
			and Equipment Supports															
			Reglets	2.2.15	G													
			Scuppers	3.1.20	G													
			Copings	3.1.30	G													
			Drip Edges	3.1.16	G													
			Conductor Heads	3.1.21	G													
			Open Valley Flashing	3.1.23	G													
			Eave Flashing	3.1.24	G													
			SD-03 Product Data															
			Cool Roof	2.2.12	G	S												
			SD-04 Samples															
			Finish Samples	1.4.2	G													
			SD-07 Certificates															
			Certificates of Compliance	2.1	G													
			SD-08 Manufacturer’s Instructions															
			Instructions for Installation	1.4.3	G													
			Quality Control Plan	3.5	G													
			SD-10 Operation and Maintenance															
			Data															
			Cleaning and Maintenance	1.4.3	G													
			SD-11 Closeout Submittals															
			Recycled Content	2.1	S													
		07 84 00	SD-02 Shop Drawings															
			Firestopping System	2.1	G													
			SD-03 Product Data															

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		07 84 00	Firestopping Materials	2.2	G														
			SD-06 Test Reports																
			Inspection	3.3	G														
			SD-07 Certificates																
			Inspector Qualifications	1.5.2															
			Firestopping Materials	2.2															
			Installer Qualifications	1.5.1	G														
		07 92 00	SD-03 Product Data																
			Sealants	2.2	G														
			Primers	2.3	G														
			Bond Breakers	2.4	G														
			Backstops	2.5	G														
			SD-06 Test Reports																
			Field Adhesion	3.1	G														
			SD-07 Certificates																
			Indoor Air Quality	1.4.1	G														
			SD-11 Closeout Submittals																
			Indoor Air Quality For Interior Sealants	2.2.1	S														
			Indoor Air Quality For Interior Floor Joint Sealants	2.2.3	S														
			Indoor Air Quality For Interior Acoustical Sealants	2.2.4	S														
			Indoor Air Quality For Interior Caulking	2.6	S														
		08 11 13	SD-02 Shop Drawings																

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		08 11 13	Doors	2.1	G													
			Doors	2.1	G													
			Frames	2.7	G													
			Frames	2.7	G													
			Accessories	2.5														
			Weatherstripping	2.9														
			SD-03 Product Data															
			Doors	2.1	G													
			Frames	2.7	G													
			Accessories	2.5														
			Weatherstripping	2.9														
		08 33 23	SD-02 Shop Drawings															
			Overhead Coiling Doors	2.2.1														
			Counterbalancing Mechanism	2.2.3														
			Manual Door Operators	2.2.4														
			Electric Door Operators	2.2.5														
			Bottom Bars	2.2.1.2														
			Guides	2.1.1.1														
			Mounting Brackets	2.2.3.1														
			Overhead Drum	2.2.1.9														
			Hood	3.3.2														
			Installation Drawings	2.1.1.1														
			SD-03 Product Data															
			Overhead Coiling Doors	2.2.1														
			Hardware	2.2.2														
			Counterbalancing Mechanism	2.2.3														

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		08 33 23	Manual Door Operators	2.2.4															
			Electric Door Operators	2.2.5															
			Recycled Content For Steel	2.2.1.1															
			Curtain Slats																
			SD-05 Design Data																
			Overhead Coiling Doors	2.2.1															
			Hardware	2.2.2															
			Counterbalancing Mechanism	2.2.3															
			Manual Door Operators	2.2.4															
			Electric Door Operators	2.2.5															
			SD-10 Operation and Maintenance																
			Data																
			Operation and Maintenance	3.3.2	G														
			Manuals																
			Materials	3.3.2															
			Devices	3.3.2															
			Procedures	3.3.2															
			Manufacture's Brochures	3.3.2															
			Parts Lists	3.3.2	G														
			SD-11 Closeout Submittals																
			Warranty	3.3.1	G														
		08 34 59	SD-02 Shop Drawings																
			Vault Door Unit	2.1	G														
			SD-03 Product Data																
			Vault Door and Frame	2.2															
			SD-07 Certificates																

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CONTRACT NO.

TITLE AND LOCATION
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CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY					MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		08 34 59	Vault Door and Frame	2.2														
			SD-08 Manufacturer’s Instructions															
			Installation	3.1														
			SD-11 Closeout Submittals															
			LEED Documentation	1.2														
		08 51 13	SD-02 Shop Drawings															
			Windows	2.2	G													
			Fabrication Drawings	1.10														
			SD-03 Product Data															
			Windows	2.2	G													
			Hardware	2.3.8.1	G													
			Fasteners	2.3.3	G													
			Window Performance	1.11	G													
			Thermal-Barrier Windows	2.5	G													
			Mullions	2.6	G													
			Window Cleaners' Bolts	2.7	G													
			Screens	2.3.10	G													
			Weatherstripping	2.3.2	G													
			Accessories	2.3.8	G													
			Adhesives	2.3.4														
			Thermal Performance	1.11.5	G													
			SD-04 Samples															
			Finish Sample	1.4.2.1														
			Window Sample	1.4.2.2														
			SD-05 Design Data															

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		08 51 13	Structural Calculations for	2.2	G													
			Deflection															
			Design Analysis	1.4.3	G													
			SD-06 Test Reports															
			Minimum Condensation	1.4.4														
			Resistance Factor															
			Resistance to Forced Entry	1.4.4														
			Standard Airblast Test	1.11.2.3														
			SD-10 Operation and Maintenance															
			Data															
			Windows	2.2	G													
			Plastic Identification	1.7														
			SD-11 Closeout Submittals															
			Recycled Content of Aluminum	2.1.1	S													
			Windows															
		08 60 45	SD-02 Shop Drawings															
			Shop Drawings	3.2	G													
			SD-03 Product Data															
			Skylights and Translucent Panels	2.2	G													
			Warranty	1.6														
			SD-06 Test Reports															
			Test Reports	2.2														
			SD-07 Certificates															
			Systems	2.6														
			Qualifications	1.4														
			SD-11 Closeout Submittals															

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		08 60 45	Recycled Content for Aluminum Framing	2.1.1	S													
		08 71 00	SD-02 Shop Drawings															
			Hardware Schedule	1.4	G													
			Keying System	2.3.6	G													
			SD-03 Product Data															
			Hardware Items	2.3	G													
			SD-08 Manufacturer’s Instructions															
			Installation	3.1														
			SD-10 Operation and Maintenance Data															
			Hardware Schedule	1.4	G													
			SD-11 Closeout Submittals															
			Key Bitting	1.5.1														
		08 81 00	SD-02 Shop Drawings															
			Installation	3.3.1	G													
			SD-03 Product Data															
			Insulating Glass	1.6.1														
			Glazing Accessories	1.3														
			SD-04 Samples															
			Insulating Glass	1.6.1														
			Plastic Sheet	3.2.7														
			Glazing Compound	2.4.2														
			Tape	2.4.5														
			Sealant	2.4.3.1														
			SD-07 Certificates															

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		08 81 00	Insulating Glass	1.6.1															
			SD-08 Manufacturer's Instructions																
			Setting and Sealing Materials	2.4															
			Glass Setting	3.2															
		08 91 00	SD-02 Shop Drawings																
			Wall louvers	1.4															
			Wall louvers	1.5															
			SD-03 Product Data																
			Metal Wall Louvers	2.2															
			SD-04 Samples																
			Wall louvers	1.4	G														
			Wall louvers	1.5	G														
			Door louvers	1.5	G														
			Door louvers	2.3	G														
		09 22 00	SD-02 Shop Drawings																
			Metal support systems	2.1	G														
		09 29 00	SD-03 Product Data																
			Cementitious Backer Units	2.2.7															
			Glass Mat Water-Resistant	2.2.4															
			Gypsum Tile Backing Board																
			Water-Resistant Gypsum Backing	2.2.3															
			Board																
			Glass Mat Covered or Reinforced	2.2.5															
			Gypsum Sheathing																
			Glass Mat Covered or Reinforced	2.2.5.1															
			Gypsum Sheathing Sealant																

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		09 29 00	Abuse Resistant Gypsum Board	2.2.6														
			Accessories	2.2.13														
			Certifications	1.3														
			Gypsum Board	2.2.1														
			SD-07 Certificates															
			Asbestos Free Materials	2.2	G													
			Indoor Air Quality	1.3.1	G													
			SD-11 Closeout Submittals															
			Recycled Content for Gypsum	2.2.1	S													
			Board															
			Recycled Content for Paper	2.2.1	S													
			Facing and Gypsum Cores															
			Indoor Air Quality for Gypsum	2.2.1	S													
			Board															
			VOC Content of Joint Compound	2.2.8	S													
			Indoor Air Quality for Non-aerosol	2.2.10	S													
			Adhesives															
			Indoor Air Quality for Aerosol	2.2.10	S													
			Adhesives															
		09 30 10	SD-02 Shop Drawings															
			Detail Drawings	3.2	G													
			SD-03 Product Data															
			Porcelain Tile	2.1.1	G													
			Glazed Wall Tile	2.1.2	G													
			Setting-Bed	2.2	G													
			Mortar, Grout, and Adhesive	2.4	G													

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		09 30 10	Reinforcing Wire Fabric	2.2.6	G													
			SD-04 Samples															
			Tile	2.1	G													
			Accessories	2.1	G													
			Accessories	2.1.3	G													
			Transition Strips	2.1	G													
			Transition Strips	2.6	G													
			Grout	2.4.3	G													
			SD-07 Certificates															
			Indoor Air Quality	1.3.1														
			SD-08 Manufacturer's Instructions															
			Maintenance Instructions	3.7														
			SD-10 Operation and Maintenance															
			Data															
			Installation	3.2	G													
			SD-11 Closeout Submittals															
			Recycled Content for Porcelain	2.1.1	S													
			Tile															
			Recycled Content For Glazed	2.1.2														
			Wall Tile															
			Indoor Air Quality For Adhesives	2.4														
			Indoor Air Quality For Sealants	2.4.7														
		09 51 00	SD-02 Shop Drawings															
			Approved Detail Drawings	1.2	G	RO												
			SD-03 Product Data															
			Acoustical Ceiling Systems	1.2.4	G	RO												

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		09 51 00	SD-04 Samples																
			Acoustical Units	2.1	G	RO													
			Acoustic Ceiling Tiles	2.1.1	G	RO													
			SD-06 Test Reports																
			Ceiling Attenuation Class and	1.2.1	G	RO													
			Test																
			SD-07 Certificates																
			Acoustical Units	2.1	G	RO													
			Acoustic Ceiling Tiles	2.1.1	G	RO													
		09 65 00	SD-02 Shop Drawings																
			Resilient Flooring and	2.8	G														
			Accessories																
			SD-03 Product Data																
			Resilient Flooring and	2.8	G														
			Accessories																
			Adhesives	2.4															
			Wall Base	2.2															
			SD-04 Samples																
			Resilient Flooring and	2.8	G	G													
			Accessories																
			SD-06 Test Reports																
			Moisture, Alkalinity and Bond	3.3	G														
			Tests																
			SD-08 Manufacturer’s Instructions																
			Surface Preparation	3.2	G														
			Installation	3.1	G														

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		09 65 00	Luxury Vinyl Tile	2.1															
			SD-10 Operation and Maintenance																
			Data																
			Resilient Flooring and	2.8	G	G													
			Accessories																
			SD-11 Closeout Submittals																
			LEED Documentation	1.3															
		09 67 23	SD-02 Shop Drawings																
			Installation Drawings	2.1	G														
			SD-03 Product Data																
			Manufacturer's Catalog Data	1.2.1	G														
			SD-04 Samples																
			Hardboard Mounted Epoxy	1.5.2	G														
			Flooring																
			Floor Topping	3.1.4	G														
			SD-05 Design Data																
			Design Mix Data	1.2.2	G														
			SD-07 Certificates																
			Listing of Product Installations	1.5.1	G														
			Referenced Standards	1.5	G														
			Certificates																
			SD-11 Closeout Submittals																
			Warranty	1.6	G														
		09 68 00	SD-02 Shop Drawings																
			Installation Drawings	3.4	G														
			SD-03 Product Data																

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		09 68 00	Carpet	2.1	G														
			Moldings	2.4	G														
			SD-04 Samples																
			Carpet	2.1	G														
			Moldings	2.4	G														
			SD-06 Test Reports																
			Moisture and Alkalinity Tests	3.2	G														
			SD-07 Certificates																
			Carpet	2.1															
			Regulatory Requirements	1.4															
			SD-08 Manufacturer’s Instructions																
			Surface Preparation	3.1															
			Installation	3.4															
			SD-10 Operation and Maintenance																
			Data																
			Carpet	2.1	G														
			Cleaning and Protection	3.5	G														
			SD-11 Closeout Submittals																
			LEED Documentation	1.2															
		09 84 20	SD-02 Shop Drawings																
			Approved Detail Drawings	2.2	G														
			SD-03 Product Data																
			Installation	3.2															
			Acoustical Wall Panels	2.2	G														
			SD-04 Samples																
			Acoustical Wall Panels	2.2	G														

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		09 84 20	SD-07 Certificates															
			Acoustical Wall Panels	2.2														
			Certified Sustainably Harvested	1.3.1	S													
			Wood															
			SD-11 Closeout Submittals															
			Warranty	1.5														
		09 90 00	SD-02 Shop Drawings															
			Piping identification	3.10	G													
			stencil	3.10	G													
			SD-03 Product Data															
			Coating	2.1	G													
			Manufacturer's Technical Data	2.1														
			Sheets															
			SD-04 Samples															
			Color	1.10	G													
			SD-07 Certificates															
			Applicator's qualifications	1.3														
			Qualification Testing	1.4.1.2	G													
			SD-08 Manufacturer’s Instructions															
			Application instructions	3.2.1														
			Mixing	3.6.2														
			Manufacturer's Material Safety	1.7.2														
			Data Sheets															
			SD-10 Operation and Maintenance															
			Data															
			Coatings:	2.1	G													

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		10 11 00	SD-03 Product Data																
			Visual Display Board	1.2	G														
			SD-04 Samples																
			Aluminum	2.1.4	G														
			Porcelain Enamel	2.1.1	G														
			Materials	2.1	G														
			SD-07 Certificates																
			Visual Display Board	1.2															
		10 21 13	SD-02 Shop Drawings																
			Fabrication Drawings	2.1															
			Installation Drawings	3.3	G														
			SD-03 Product Data																
			Cleaning and Maintenance	2.1															
			Instructions																
			Colors And Finishes	2.7															
			Galvanized Steel Sheet	2.2.1															
			Sound-Deadening Cores	2.2.2															
			Anchoring Devices and Fasteners	2.2.3															
			Hardware and Fittings	2.2.5															
			Brackets	2.2.4															
			Door Hardware	2.2.6															
			Pilaster Shoes	2.5															
			Finishes	2.2.5.2	G														
			Toilet Enclosures	2.3.1															
			Urinal Screens	2.3.2															
			SD-04 Samples																

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		10 21 13	Colors and Finishes	2.7	G														
			Hardware and Fittings	2.2.5															
			Anchoring Devices and Fasteners	2.2.3															
			SD-07 Certificates																
			Warranty	1.6															
			Indoor Air Quality	1.3.1	G														
			SD-11 Closeout Submittals																
			Recycled content for stainless	2.3	S														
			steel partitions and screens																
		10 26 13	SD-02 Shop Drawings																
			Corner Guards	2.2	G	RO													
			SD-03 Product Data																
			Corner Guards	2.2	G	RO													
			SD-04 Samples																
			Finish	2.4	G	RO													
			SD-06 Test Reports																
			Corner Guards	2.2															
			SD-07 Certificates																
			Corner Guards	2.2															
		10 28 13	SD-03 Product Data																
			Finishes	2.1.2	G														
			Accessory Items	2.2	G														
			SD-04 Samples																
			Finishes	2.1.2															
			Accessory Items	2.2															
			SD-07 Certificates																

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ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		10 28 13	Accessory Items	2.2															
		10 51 13	SD-02 Shop Drawings																
			Types	2.1	G														
			Location	1.4	G														
			Installation	3.1															
			SD-03 Product Data																
			Material	2.2															
			Locking Devices	2.3.1															
			Handles	2.3.4															
			Finish	2.2.3															
			components	2.3															
			Assembly	3.1															
			SD-04 Samples																
			Color chips	1.5.1	G														
		10 56 13	SD-01 Preconstruction Submittals																
			Shelving Units	2.1															
			SD-03 Product Data																
			Shelving Units	2.1															
			Accessories	2.2															
			Installation instructions	3.2															
			SD-04 Samples																
			Finish	2.3															
			SD-06 Test Reports																
			Shelving Units	2.1															
			Finish	2.3															
		12 24 13	SD-02 Shop Drawings																

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		12 24 13	Installation	3.3	G	DO												
			SD-03 Product Data															
			Window Shades	2.1	G	DO												
			Certification	1.4.6														
			SD-04 Samples															
			Window Shades	2.1	G	DO												
			SD-06 Test Reports															
			Window Shades	2.1														
			SD-08 Manufacturer’s Instructions															
			Window Shades	2.1														
			SD-10 Operation and Maintenance															
			Data															
			Window Shades	2.1														
			SD-11 Closeout Submittals															
			Local/Regional Materials (LEED)	1.1														
			Shade Cloth (LEED)	1.4.5														
		12 48 13	SD-02 Shop Drawings															
			Installation Drawings	3.2	G													
			Detail Drawings	3.2	G													
			Custom Graphics Drawings	3.2	G													
			SD-03 Product Data															
			Entrance Floor Mats and Frames	2.1.1	G													
			Adhesives and Concrete Primers	2.1.2	G													
			SD-04 Samples															
			Entrance Floor Mats and Frames	2.1.1	G													
			Custom Graphics	2.1.1	G													

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		12 48 13	SD-08 Manufacturer’s Instructions																
			Manufacturer's Instructions	3.2															
			SD-10 Operation and Maintenance																
			Data																
			Protection, Maintenance, and	3.2															
			Repair Information																
		13 34 19	SD-01 Preconstruction Submittals																
			Manufacturer's Qualifications	1.6.3	G														
			SD-02 Shop Drawings																
			Detail Drawings	1.2.1.8	G														
			Detail Drawings	1.6.1	G														
			SD-03 Product Data																
			sustainable acquisition	2.4.4	G														
			compliance																
			Manufacturer's catalog data	1.6.1	G														
			SD-04 Samples																
			Coil Stock	1.6.1	G														
			Coil Stock	2.1.8	G														
			Roof Panels	1.2.1.10	G														
			Wall Panels	1.2.1.10	G														
			Fasteners	2.5.2	G														
			Metal Closure Strips	2.8.1	G														
			Insulation	1.4.7	G														
			Insulation	2.4.3	G														
			Vapor Barrier	1.6.10	G														

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		13 34 19	Manufacturer's color charts and	2.4.5	G													
			chips															
			SD-05 Design Data															
			descriptive and technical	1.6.1	G													
			literature															
			building design analysis	1.6.1	G													
			SD-06 Test Reports															
			test reports	1.6.1	G													
			Coatings and base metals	1.6.1	G													
			Factory Color Finish Performance	1.6.1	G													
			Requirements															
			SD-07 Certificates															
			system components	1.6.1	G													
			Coil Stock	1.6.1	G													
			Coil Stock	2.1.8	G													
			Aluminized Steel Repair Paint	1.6.1	G													
			Galvanizing Repair Paint	1.6.1	G													
			Enamel Repair Paint	1.6.1	G													
			Qualification of Manufacturer	1.6.1	G													
			Qualification of Erector	1.6.1	G													
			SD-08 Manufacturer’s Instructions															
			Installation of Roof and Wall	1.6.2	G													
			panels															
			shipping, handling, and storage	1.7	G													
			SD-11 Closeout Submittals															
			Manufacturer's Warranty	3.14.1	G													

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		13 34 19	Contractor's Warranty for	3.14.2	G													
			Installation															
		13 48 00	SD-02 Shop Drawings															
			Bracing	3.1	G	PO												
			Resilient Vibration Isolation	3.4	G	PO												
			Devices															
			Equipment Requirements	2.1	G	PO												
			SD-03 Product Data															
			Bracing	3.1	G	PO												
			Equipment Requirements	2.1	G	PO												
			SD-06 Test Reports															
			Anchor Bolts	3.3	G	PO												
		13 48 00.10	SD-02 Shop Drawings															
			Coupling and Bracing	3.1	G													
			Flexible Couplings or Joints	3.3	G													
			Equipment Requirements	2.1	G													
			Contractor Designed Bracing	1.2.4	G													
			SD-03 Product Data															
			Coupling and Bracing	3.1	G													
			Equipment Requirements	2.1	G													
			Contractor Designed Bracing	1.2.4	G													
			SD-07 Certificates															
			Flexible Ball Joints	2.3														
		13 48 56	SD-01 Preconstruction Submittals															
			Bridge Manufacturer's	1.4.1.1	G													
			Qualifications															

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		13 48 56	Manufacture's Descriptive and Technical Literature	1.4.1.2	G													
			Detailed Design Drawings	1.4.1.3	G													
			Manufacture's design analysis	1.4.1.4	G													
			Representative Design Calculations	1.4.1.5	G													
			Splicing and Erection Procedures	1.4.1.6	G													
			Warranty Information	1.4.1.7	G													
			Inspection and Maintenance Procedures	1.4.1.8	G													
			Welder Qualifications	1.4.1.9	G													
		21 13 13	SD-02 Shop Drawings															
			Shop Drawings	1.4.3	G													
			As-Built Drawings	3.9														
			SD-03 Product Data															
			Fire Protection Related Submittals	1.4.1														
			Materials and Equipment	2.3	G													
			Spare Parts	1.6														
			Preliminary Tests	3.8	G													
			Final Acceptance Test	3.9	G													
			Onsite Training	3.10	G													
			Fire Protection Specialist	1.4.1	G													
			Sprinkler System Installer	1.4.2	G													
			SD-05 Design Data															
			Sway Bracing	1.4.3	G													

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		21 13 13	Hydraulic Calculations	1.2.1.3	G														
			SD-06 Test Reports																
			Preliminary Test Report	3.8															
			Final Acceptance Test Report	3.9															
			SD-07 Certificates																
			Inspection by Fire Protection	3.3															
			Specialist																
			SD-10 Operation and Maintenance																
			Data																
			Operating and Maintenance	3.10	G														
			Manuals																
		22 00 00	SD-02 Shop Drawings																
			Plumbing System	3.9.1	G														
			SD-03 Product Data																
			Fixtures	2.5															
			Flush Valve Water Closets	2.5.2															
			Countertop Lavatories	2.5.4															
			Kitchen Sinks	2.5.5															
			Service Sinks	2.5.6															
			Water Heaters	2.10	G														
			Pumps	2.12	G														
			Backflow Prevention Assemblies	3.9.1.1	G														
			Welding	1.5.1															
			Vibration-Absorbing Features	3.4	G														
			Plumbing System	3.9.1															
			SD-06 Test Reports																

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		22 00 00	Tests, Flushing and Disinfection	3.9															
			Test of Backflow Prevention	3.9.1.1	G														
			Assemblies																
			SD-07 Certificates																
			Materials and Equipment	1.3															
			Bolts	2.2.1															
			SD-10 Operation and Maintenance																
			Data																
			Plumbing System	3.9.1	G														
			SD-11 Closeout Submittals																
			Water-Efficient Products	2.1.1	S														
			Energy-Efficient Water Heaters	2.1.2	S														
		22 31 00	SD-02 Shop Drawings																
			Installation	3.2															
			SD-03 Product Data																
			Softening Equipment	2.2															
			Spare Parts	1.4															
			Field Instructions	3.3.2															
			SD-06 Test Reports																
			Softening Equipment	2.2															
			Piping	3.4.2															
			SD-10 Operation and Maintenance																
			Data																
			Operating and Maintenance	3.3.2	G														
			Instructions																
		23 00 00	SD-02 Shop Drawings																

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		23 00 00	Detail Drawings	1.4.5	G													
			SD-03 Product Data															
			Metallic Flexible Duct	2.10.1.1														
			Insulated Nonmetallic Flexible	2.10.1.2														
			Duct Runouts															
			Duct Connectors	2.10.1.2														
			Duct Access Doors	2.10.2	G													
			Manual Balancing Dampers	2.10.3	G													
			Diffusers	2.10.6.1														
			Registers and Grilles	2.10.6.2														
			Louvers	2.10.7														
			Air Vents, Penthouses, and	2.10.8														
			Goosenecks															
			Centrifugal Fans	2.11.1.1														
			In-Line Centrifugal Fans	2.11.1.2														
			Panel Type Power Wall	2.11.1.3														
			Ventilators															
			Air Handling Units	2.12	G													
			Variable Volume, Single Duct	2.15.1.1	G													
			Terminal Units															
			Reheat Units	2.15.1.2	G													
			Radiant Heaters	2.13	G													
			Unit Heaters	2.14														
			Unit Heaters	3.3.2														
			Diagrams	1.2.1.2	G													
			SD-06 Test Reports															

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		23 00 00	Performance Tests	3.13	G													
			Damper Acceptance Test	3.11	G													
			SD-07 Certificates															
			Bolts	1.4.1														
			Certification	1.4.6														
			Ozone Depleting Substances	1.4.3														
			SD-08 Manufacturer’s Instructions															
			Manufacturer's Installation	3.3														
			Instructions															
			Operation and Maintenance	3.15.2														
			Training															
			SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	3.15.1	G													
			Manuals															
			Manual Balancing Dampers	2.10.3	G													
			Centrifugal Fans	2.11.1.1	G													
			In-Line Centrifugal Fans	2.11.1.2	G													
			Panel Type Power Wall	2.11.1.3	G													
			Ventilators															
			Air Handling Units	2.12	G													
			Reheat Units	2.15.1.2	G													
			Radiant Heaters	2.13	G													
			Unit Heaters	2.14														
			Unit Heaters	3.3.2														
			SD-11 Closeout Submittals															

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		23 00 00	Energy Efficient Equipment	2.1.1	S														
			Reduce Volatile Organic	2.1.2	S														
			Compounds (VOC)																
			Indoor Air Quality During	3.1	S														
			Construction																
			Ozone Depleting Substances for	2.1.3	S														
			Refrigerants																
		23 05 15	SD-01 Preconstruction Submittals																
			Material, Equipment, and Fixture	1.2	G														
			Lists																
			SD-02 Shop Drawings																
			Record Drawings	1.2	G														
			Connection Diagrams	1.2	G														
			Coordination Drawings	1.2	G														
			Fabrication Drawings	1.2	G														
			Installation Drawings	3.1	G														
			SD-03 Product Data																
			Pipe and Fittings	2.1	G														
			Piping Specialties	2.2	G														
			Valves	2.3	G														
			Miscellaneous Materials	2.4	G														
			Supporting Elements	2.5	G														
			Equipment Foundation Data	1.2	G														
			SD-04 Samples																
			Manufacturer's Standard Color	1.2	G														
			Charts																

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		23 05 15	SD-05 Design Data																
			Pipe and Fittings	2.1	G														
			Piping Specialties	2.2	G														
			Valves	2.3	G														
			SD-06 Test Reports																
			Hydrostatic Tests	3.1	G														
			Air Tests	3.1	G														
			Valve-Operating Tests	3.1	G														
			Drainage Tests	3.1	G														
			Pneumatic Tests	3.1	G														
			Non-Destructive Electric Tests	3.1	G														
			System Operation Tests	3.1	G														
			SD-07 Certificates																
			Record of Satisfactory Field Operation	1.4.2	G														
			List of Qualified Permanent Service Organizations	1.4.3	G														
			Listing of Product Installations	1.2	G														
			Records of Existing Conditions	1.2	G														
			Surface Resistance	3.1	G														
			Shear and Tensile Strengths	3.1	G														
			Temperature Ratings	3.1	G														
			Bending Tests	3.1	G														
			Flattening Tests	3.1	G														
			Transverse Guided Weld Bend Tests	3.1	G														

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		23 05 15	SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	3.10	G													
			Manuals															
		23 05 93	SD-01 Preconstruction Submittals															
			Records of Existing Conditions	1.3.3	G	RO												
			TAB Firm	1.5.3.1	G	RO												
			TAB Team Assistants	1.2	G	RO												
			TAB Team Engineer	1.2	G	RO												
			TAB Specialist	1.5.3.2	G	RO												
			TAB Team Field Leader	1.2	G	RO												
			SD-02 Shop Drawings															
			TAB Schematic Drawings and	1.3.3	G	RO												
			Report Forms															
			SD-03 Product Data															
			Equipment and Performance	1.3	G	RO												
			Data															
			TAB Related HVAC Submittals	1.5.3.4	G	RO												
			TAB Procedures	1.5.2	G	RO												
			Calibration	1.5.2	G	RO												
			Systems Readiness Check	1.3.3	G	RO												
			TAB Execution	1.5.4	G	RO												
			TAB Verification	1.5.4.3	G	RO												
			SD-06 Test Reports															
			Completed Pre-Final DALT	3.3.5	G													
			Report															

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		23 05 93	Certified Final DALT Report	3.3.8	G													
			TAB Design Review Report	1.6.2.1	G													
			TAB Report for Season 1	1.5.5.2	G													
			TAB Report for Season 2	1.5.5.2	G													
			SD-07 Certificates															
			Independent TAB Agency and	1.5.1	G	PO												
			Personnel Qualifications															
			DALT and TAB Submittal and	1.6.2	G	PO												
			Work Schedule															
			TAB Pre-Field Engineering	1.6.2.3	G	PO												
			Report															
			TAB Firm	1.5.3.1	G	PO												
			Design Review Report	1.3.3	G	PO												
			Pre-field DALT Preliminary	1.6.2.2	G													
			Notification															
			Advanced Notice for Season 1	1.6.2	G	PO												
			TAB Field Work															
			Prerequisite HVAC Work Check	1.6.2	G	PO												
			Out List For Season 1															
			Advanced Notice for Season 2	1.6.2	G	PO												
			TAB Field Work															
			Prerequisite HVAC Work Check	1.6.2	G	PO												
			Out List For Season 2															
		23 07 00	SD-02 Shop Drawings															
			MICA Plates	3.2.2.4	G	PO												
			Pipe Insulation Systems	2.4														

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		23 07 00	Pipe Insulation Systems	3.2															
			Duct Insulation Systems	3.3															
			Equipment Insulation Systems	3.4															
			SD-03 Product Data																
			Pipe Insulation Systems	2.4	G	PO													
			Pipe Insulation Systems	3.2	G	PO													
			Duct Insulation Systems	3.3	G	PO													
			Equipment Insulation Systems	3.4	G	PO													
			SD-04 Samples																
			Thermal Insulation	2.3.1.3	G	PO													
			Display Samples	3.1.1	G	PO													
			SD-08 Manufacturer’s Instructions																
			Pipe Insulation Systems	2.4	G	PO													
			Pipe Insulation Systems	3.2	G	PO													
			Duct Insulation Systems	3.3	G	PO													
			Equipment Insulation Systems	3.4	G	PO													
			SD-11 Closeout Submittals																
			Reduce Volatile Organic	2.1.1	S														
			Compounds (VOC)																
			Recycled Content	2.1.2	S														
		23 09 00	SD-02 Shop Drawings																
			DDC Contractor Design Drawings	3.2	G														
			Draft As-Built Drawings	3.2	G														
			Final As-Built Drawings	3.2	G														
			SD-03 Product Data																

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		23 09 00	Certificate of Networthiness	1.8.7	G													
			Documentation															
			Programming Software	1.8.1	G													
			Controller Application Programs	1.8.2	G													
			Configuration Software	1.8.1	G													
			Manufacturer's Product Data	2.2	G													
			XIF files	2.2.1	G													
			Draft LNS Database	3.4.3	G													
			Final LNS Database	3.5.4	G													
			LNS Plug-ins	1.8.3	G													
			Niagara Framework Supervisory	1.8.5	G													
			Gateway Backups															
			Niagara Framework Engineering	1.8.6	G													
			Tool															
			Niagara Framework Wizards	1.8.4	G													
			SD-06 Test Reports															
			Start-Up Testing Report	3.4.2	G													
			PVT Procedures	3.5.1	G													
			PVT Report	3.5.3	G													
			Pre-Construction Quality Control	1.9.1	G													
			(QC) Checklist															
			Post-Construction Quality Control	1.9.2	G													
			(QC) Checklist															
			SD-10 Operation and Maintenance															
			Data															

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		23 09 00	Operation and Maintenance	3.6	G													
			(O&M) Instructions															
			Training Documentation	3.7.1	G													
			SD-11 Closeout Submittals															
			Enclosure Keys	2.5	G													
			Password Summary Report	3.1.6.1	G													
			Closeout Quality Control (QC)	1.9.3	G													
			Checklist															
		23 11 25	SD-02 Shop Drawings															
			Gas Piping System	1.5.3	G													
			Gas Piping System	2.2	G													
			Gas Piping System	3.3	G													
			SD-03 Product Data															
			Pipe and Fittings	1.6.1	G													
			Gas Equipment Connectors	1.5.3	G													
			Gas Piping System	1.5.3	G													
			Gas Piping System	2.2	G													
			Gas Piping System	3.3	G													
			Pipe Coating Materials	2.1	G													
			Pressure Regulators	2.6	G													
			Risers	2.4	G													
			Transition Fittings	2.2.12	G													
			Valves	2.3	G													
			Warning and Identification Tape	2.2.8	G													
			SD-06 Test Reports															
			Testing	3.19	G													

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		23 11 25	Pressure Tests	3.19.1	G														
			Pressure Tests for Liquified	3.19.2	G														
			Petroleum Gas																
			Test with Gas	3.19.3	G														
			SD-07 Certificates																
			Welders Procedures and	1.5.1	G														
			Qualifications																
			Assigned Number, Letter, or	1.5.1	G														
			Symbol																
			SD-08 Manufacturer’s Instructions																
			PE Pipe and Fittings	1.5.2	G														
			Pipe Coating Materials	2.1	G														
			SD-10 Operation and Maintenance																
			Data																
			Gas Facility System and	1.3.1	G														
			Equipment Operation																
			Gas Facility System Maintenance	1.3.2	G														
			Gas Facility Equipment	1.3.3	G														
			Maintenance																
		23 21 23	SD-02 Shop Drawings																
			System Coordination	2.1.2	G														
			SD-03 Product Data																
			Instructions	2.2.2	G														
			Equipment Data	2.2.5	G														
			Training Period	3.5.2	G														
			SD-06 Test Reports																

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		23 21 23	Factory Tests	2.1.1															
			Field Quality Control	3.3															
			SD-07 Certificates																
			Manufacturer's Representative	1.3.1															
			SD-10 Operation and Maintenance																
			Data																
			Operation and Maintenance	3.5.1	G														
			Manuals																
			Training	3.5.2	G														
		23 23 00	SD-02 Shop Drawings																
			Refrigerant Piping System	2.3	G														
			SD-03 Product Data																
			Refrigerant Piping System	2.3															
			Spare Parts	1.5.2															
			Qualifications	1.3.1															
			Refrigerant Piping Tests	3.5															
			Verification of Dimensions	3.1															
			SD-06 Test Reports																
			Refrigerant Piping Tests	3.5															
			SD-07 Certificates																
			Service Organization	2.1															
			SD-10 Operation and Maintenance																
			Data																
			Maintenance	1.5	G														
			Operation and Maintenance	3.4	G														
			Manuals																

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		23 23 00	Demonstrations	3.4	G													
		23 25 00	SD-03 Product Data															
			Water Analysis	2.5	G													
			Spare Parts	1.6														
			Field Instructions	3.4														
			Tests	3.5	G													
			Training Course	3.4	G													
		23 35 00	SD-02 Shop Drawings															
			Detail Drawings	1.4.1	G													
			Exhaust System Installation	3.4	G													
			SD-03 Product Data															
			Related Submittals	1.4.2														
			Ductwork Components	2.4	G													
			Materials and Equipment	2.1														
			Spare Parts	1.6														
			Field Instructions	3.6														
			Final Acceptance Tests	3.7														
			Onsite Training	3.6	G													
			Exhaust System Specialist	1.4.2	G													
			SD-06 Test Reports															
			Final Acceptance Tests	3.7														
			SD-07 Certificates															
			Inspection	3.3	G													
			SD-10 Operation and Maintenance															
			Data															
			Exhaust System	1.2														

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		23 35 00	Operation and Maintenance	3.6															
			Manuals																
		23 52 00	SD-02 Shop Drawings																
			Detail Drawings	1.5	G														
			SD-03 Product Data																
			Materials and Equipment	2.2.1															
			Spare Parts	1.5															
			Heating System Tests	3.9															
			Fuel System Tests	3.12															
			Welding	1.3															
			Qualifications	3.9															
			Field Instructions	3.11															
			Tests	3.5															
			SD-06 Test Reports																
			Heating System Tests	3.9															
			Fuel System Tests	3.12															
			SD-07 Certificates																
			Bolts	2.9.9.3															
			Energy Star	2.2.3															
			SD-10 Operation and Maintenance																
			Data																
			Operation and Maintenance	3.11	G														
			Instructions																
			SD-11 Closeout Submittals																
			Energy Efficient Equipment for	2.1	S														
			Boilers																

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		23 52 00	Indoor Air Quality During	3.1	S														
			Construction																
		23 54 16	SD-02 Shop Drawings																
			Detail Drawings	1.3	G														
			Installation	3.2	G														
			SD-03 Product Data																
			Spare Parts	1.5															
			SD-06 Test Reports																
			Testing, Adjusting, and Balancing	3.4															
			SD-10 Operation and Maintenance																
			Data																
			Operation and Maintenance	3.3															
			Instructions																
		23 64 10	SD-03 Product Data																
			Water Chiller	2.10.2	G														
			Posted Instructions	3.2.3															
			Verification of Dimensions	1.5.1															
			Factory Tests	2.9															
			System Performance Tests	3.7															
			Demonstrations	3.8															
			Water Chiller - Field Acceptance	3.6.1															
			Test Plan																
			SD-06 Test Reports																
			Field Acceptance Testing	3.6															
			Water Chiller - Field Acceptance	3.6.2															
			Test Report																

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		23 64 10	Factory Tests	2.9															
			System Performance Tests	3.7															
			SD-07 Certificates																
			Refrigeration System	3.2.9	G														
			SD-08 Manufacturer’s Instructions																
			Water Chiller - Installation	3.2	G														
			Instructions																
			SD-10 Operation and Maintenance																
			Data																
			Operation and Maintenance	3.8	G														
			Manuals																
			SD-11 Closeout Submittals																
			Energy Efficient Equipment for	2.1.1	S														
			Chillers																
			Indoor Air Quality During	3.1.1	S														
			Construction																
			Ozone Depleting Substances	2.1.2	S														
		23 64 26	SD-03 Product Data																
			Grooved Mechanical Connections	2.2.2.4	G PO														
			For Steel																
			Grooved Mechanical Connections	2.4.3	G PO														
			For Copper																
			Calibrated Balancing Valves	2.5.8	G PO														
			Automatic Flow Control Valves	2.5.9	G PO														
			Pump Discharge Valve	2.5.10															
			Water Temperature Mixing Valve	2.5.11	G														

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		23 64 26	Water Temperature Regulating	2.5.12	G														
			Valves																
			Water Pressure Reducing Valve	2.5.13															
			Pressure Relief Valve	2.5.14															
			Combination Pressure and	2.5.15															
			Temperature Relief Valves																
			Expansion Joints	2.6.9	G PO														
			Combination Strainer and Pump	2.6.3															
			Suction Diffuser																
			Expansion Tanks	2.7															
			Air Separator Tanks	2.8															
			SD-06 Test Reports																
			Piping Welds NDE Report	3.1.1.3															
			Pressure Tests Reports	3.5.2	G PO														
			SD-07 Certificates																
			Employer's Record Documents	3.1.1.1															
			(For Welding)																
			Welding Procedures and	3.1.1.2															
			Qualifications																
			SD-08 Manufacturer’s Instructions																
			Lesson plan for the Instruction	3.6	G PO														
			Course																
			SD-10 Operation and Maintenance																
			Data																
			Calibrated Balancing Valves	2.5.8	G PO														
			Automatic Flow Control Valves	2.5.9	G PO														

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		23 64 26	Pump Discharge Valve	2.5.10	G	PO												
			Water Temperature Mixing Valve	2.5.11	G	PO												
			Water Temperature Regulating	2.5.12	G	PO												
			Valves															
			Water Pressure Reducing Valve	2.5.13	G	PO												
			Pressure Relief Valve	2.5.14	G	PO												
			Combination Pressure and	2.5.15	G	PO												
			Temperature Relief Valves															
			Expansion Joints	2.6.9	G	PO												
			Combination Strainer and Pump	2.6.3	G	PO												
			Suction Diffuser															
			Expansion Tanks	2.7	G	PO												
			Air Separator Tanks	2.8	G	PO												
		23 82 02	SD-02 Shop Drawings															
			Drawings	1.4														
			SD-03 Product Data															
			Materials and Equipment	2.1														
			Spare Parts	1.6														
			Posted Instructions	3.4														
			Verification of Dimensions	3.1														
			Coil Corrosion Protection	2.8.1.1														
			System Performance Tests	3.6														
			Demonstrations	3.4	G													
			SD-06 Test Reports															
			Refrigerant Tests, Charging, and	3.5	G													
			Start-Up															

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ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		23 82 02	System Performance Tests	3.6	G														
			SD-07 Certificates																
			Materials and Equipment	2.1															
			Service Organization	2.1.1															
			SD-10 Operation and Maintenance																
			Data																
			Operation and Maintenance	3.4	G														
			Manuals																
		25 05 11	SD-01 Preconstruction Submittals																
			Wireless Communication	3.1.5.3	G														
			Request																
			Device Account Lock Exception	3.1.2.2	G														
			Request																
			Multiple IP Connection Device	3.9	G														
			Request																
			Contractor Computer	1.10.1.4	G														
			Cybersecurity Compliance																
			Statements																
			Contractor Temporary Network	1.10.6	G														
			Cybersecurity Compliance																
			Statements																
			Control System Cybersecurity	1.7.1	G														
			Subject Matter Expert																
			SD-02 Shop Drawings																
			User Interface Banner Schedule	3.1.3.1															
			Network Communication Report	1.8.2	G														

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		25 05 11	Cybersecurity Riser Diagram	1.8.5	G													
			Control System Inventory Report	1.8.3	G													
			Cybersecurity Interconnection	1.8.1	G													
			Schedule															
			SD-03 Product Data															
			Control System Cybersecurity	1.8.6	G													
			Documentation															
			SD-06 Test Reports															
			Wireless Communication Test	3.1.5.4	G													
			Report															
			SD-07 Certificates															
			Software Licenses	1.9	G													
			SD-11 Closeout Submittals															
			Password Summary Report	3.5.2.2.5														
			Software Recovery And	1.8.4														
			Reconstitution Images															
			Device Audit Record Upload	3.2.2.1														
			Software															
		25 08 10	SD-06 Test Reports															
			Building Level DDC Testing	3.1														
			Sequence															
			Performance Verification Test	3.5	G													
		26 05 48	SD-02 Shop Drawings															
			Lighting Fixtures in Buildings	3.1														
			Equipment Requirements	1.3														
			SD-03 Product Data															

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		26 05 48	Lighting Fixtures in Buildings	3.1														
			Equipment Requirements	1.3														
			Contractor Designed Bracing	1.2.4														
		26 08 00	SD-06 Test Reports															
			Acceptance tests and inspections	3.1	G													
			SD-07 Certificates															
			Qualifications	1.4.1	G													
			Acceptance test and inspections	1.4.3	G													
			procedure															
		26 20 00	SD-02 Shop Drawings															
			Panelboards	2.15	G													
			Transformers	2.19	G													
			Busway	2.4	G													
			Cable trays	2.5	G													
			Wireways	2.31														
			Marking strips	3.1.12.1														
			SD-03 Product Data															
			Receptacles	2.14														
			Circuit breakers	2.15.3														
			Switches	2.12														
			Transformers	2.19	G													
			Enclosed circuit breakers	2.17														
			Motor controllers	2.21														
			Manual motor starters	2.22														
			Metering	2.32														

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		26 20 00	Electric Vehicle Supply	2.16															
			Equipment																
			Electric Vehicle Supply	3.1.19															
			Equipment																
			Grounding Busbar	2.25.3															
			Surge protective devices	2.33															
			SD-06 Test Reports																
			600-volt wiring test	3.5.2															
			Grounding system test	3.5.5															
			Transformer tests	3.5.3															
			Ground-fault receptacle test	3.5.4															
			SD-07 Certificates																
			Fuses	2.13															
			SD-09 Manufacturer’s Field																
			Reports																
			Transformer factory tests	2.35.1															
			SD-10 Operation and Maintenance																
			Data																
			Electrical Systems	1.5.1															
			Metering	2.32															
			Electric Vehicle Supply	2.16															
			Equipment																
			Electric Vehicle Supply	3.1.19															
			Equipment																
		26 27 13.10	SD-03 Product Data																
			Power Meters	2.1	G														

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		26 27 13.10	Current Transformers	3.3.1.2															
			Potential Transformer	2.1.2															
			Communications Module	2.2.2															
			Protocol Modules	1.6.1															
			Data Recorder	1.6.2															
			Modem	1.6.2															
			SD-06 Test Reports																
			Acceptance Checks and Tests	3.3.1															
			SD-10 Operation and Maintenance																
			Data																
			Power Meters	2.1															
			Communications Module	2.2.2															
			Protocol Modules	1.6.1															
			Data Recorder	1.6.2															
			Modem	1.6.2															
			SD-11 Closeout Submittals																
			System Function Verification	3.3.2															
		26 28 01	SD-03 Product Data																
			Fault Current Analysis	2.9															
			Protective Device Coordination Study	2.9															
			Equipment	2.1															
			System Coordinator	1.4.1															
			Protective Relays	3.3.4															
			Installation	3.2															
			SD-06 Test Reports																

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		26 28 01	Field Testing	3.3															
			SD-07 Certificates																
			Devices and Equipment	1.6															
		26 29 23	SD-02 Shop Drawings																
			Schematic diagrams	1.5.1															
			Interconnecting diagrams	1.5.2															
			Installation drawings	1.5.3															
			SD-03 Product Data																
			Variable frequency drives	2.1	G														
			Wires and cables	2.3															
			Equipment schedule	1.5.4															
			SD-06 Test Reports																
			VFD Test	3.2.1															
			Performance Verification Tests	3.2.2															
			Endurance Test	3.2.3															
			SD-08 Manufacturer’s Instructions																
			Installation instructions	1.5.5															
			SD-09 Manufacturer’s Field																
			Reports																
			VFD Factory Test Plan	2.5.1															
			Factory test results	1.5.6															
			SD-10 Operation and Maintenance																
			Data																
			Variable frequency drives	2.1															
		26 31 00	SD-02 Shop Drawings																
			Schematic Diagrams	2.9	G														

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		26 31 00	Interconnection Diagrams	2.9	G														
			Installation Drawings	3.1	G														
			SD-03 Product Data																
			Combiner Boxes	2.4															
			Disconnects	3.1.3	G														
			Inverters	2.3	G														
			String Inverter CEC Efficiency	2.3.1	G														
			Ground Mounting Structure for Modules	2.5	G														
			Photovoltaic Module Backsheet	2.2.1															
			Photovoltaic Module Encapsulent	2.2.2															
			Photovoltaic Modules	2.2	G														
			Photovoltaic Wire	2.2	G														
			System Monitoring	2.7	G														
			SD-05 Design Data																
			System Operation	1.6.3	G														
			Calculations	1.9	G														
			System Performance Calculations	1.6.10	G														
			SD-06 Test Reports																
			NABCEP Acceptance Checks and Tests	3.9.1	G														
			NETA Acceptance Checks and Tests	3.9.2	G														
			SD-07 Certificates																
			Installer	1.6.4	G														

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		26 31 00	Materials	1.6.5	G													
			Warranty	1.8	G													
			Cybersecurity Equipment	1.6.6	G													
			Certification															
			Cybersecurity Installation	3.9.4	G													
			Certification															
			SD-08 Manufacturer’s Instructions															
			Installation Instructions	3.1	G													
			SD-10 Operation and Maintenance															
			Data															
			Electrical Systems	1.6.7.1	G													
			Training Course	1.6.7.2	G													
		26 41 00	SD-02 Shop Drawings															
			Overall lightning protection	1.4.1.1	G													
			system															
			Each major component	1.4.1.2	G													
			SD-06 Test Reports															
			Lightning Protection and	1.4.3														
			Grounding System Test Plan															
			Lightning Protection and	3.5.1	G													
			Grounding System Test															
			SD-07 Certificates															
			Lightning Protection System	1.2.3	G													
			Installers Documentation															
			Component UL Listed and	1.4.2														
			Labeled															

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		26 41 00	Lightning protection system	1.4.4	G														
			inspection certificate																
			Roof manufacturer's warranty	3.1.1															
		26 42 14	SD-02 Shop Drawings																
			Drawings	1.3.6															
			Contractor's Modifications	2.1.1	G														
			SD-03 Product Data																
			Equipment	2.1															
			Spare Parts	1.5															
			SD-06 Test Reports																
			Tests and Measurements	3.5															
			Contractor's Modifications	2.1.1															
			SD-07 Certificates																
			Cathodic Protection System	2.1															
			Services of 'Corrosion Expert'	1.3.1															
			SD-10 Operation and Maintenance																
			Data																
			Cathodic Protection System	2.1															
			Training Course	3.6															
		26 51 00	SD-02 Shop Drawings																
			Luminaire Drawings	1.5.1	G														
			Occupancy/Vacancy Sensor	1.5.2	G														
			Coverage Layout																
			SD-03 Product Data																
			Luminaires	2.2	G														
			Light Sources	2.4	G														

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		26 51 00	Drivers, Ballasts and Generators	2.3														
			LED Luminaire Warranty	1.6.1														
			Luminaire Design Data	1.5.4														
			Vacancy Sensors	2.5.3.2														
			Dimming Controllers (Dimmers)	2.5.2														
			Lighting Contactor	2.5.4														
			Timeswitch	2.5.5														
			Power Hook Luminaire Hangers	2.8														
			Exit Signs	2.6.1														
			LED Emergency Drivers	2.6.2														
			Occupancy Sensors	2.5.3.1														
			Ambient Light Level Sensor	3.1.8														
			Lighting Control Panel	2.5.6	G													
			SD-06 Test Reports															
			LED Luminaire - IES LM-79 Test	1.5.5														
			Report															
			LED Light Source - IES LM-80	1.5.6														
			Test Report															
			LED Light Source - IES TM-21	1.5.7														
			Test Report															
			Occupancy/Vacancy Sensor	1.5.8	G													
			Verification Tests															
			Energy Efficiency	1.5.11.3														
			SD-07 Certificates															
			Luminaire Useful Life Certificate	1.6.1.1	G													

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		26 51 00	LED Driver and Dimming Switch	1.5.3	G														
			Compatibility Certificate																
		26 56 00	SD-01 Preconstruction Submittals																
			Photometric Plan	1.5.3	G														
			LED Luminaire Warranty	1.7.1	G														
			SD-02 Shop Drawings																
			Luminaire drawings	1.5.2.1	G														
			Poles	1.5.2.2	G														
			SD-03 Product Data																
			LED Luminaires	2.2	G														
			Luminaire Light Sources	2.2.2	G														
			Luminaire Power Supply Units	2.2.3	G														
			(Drivers)																
			Lighting contactor	2.3.3															
			Time switch	2.3.2															
			Lighting Control Relay Panel	2.3.4	G														
			Motion Sensor	2.3.5															
			Photocell	2.3.1															
			Aluminum poles	2.4.1	G														
			SD-05 Design Data																
			Design Data for luminaires	1.5.4	G														
			SD-06 Test Reports																
			LED Luminaire - IES LM-79 Test	1.5.5															
			Report																
			LED Light Source - IES LM-80	1.5.6															
			Test Report																

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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)		(q)	(r)
		26 56 00	Operating test	3.2															
			SD-07 Certificates																
			Luminaire Useful Life Certificate	1.7.1															
			SD-10 Operation and Maintenance																
			Data																
			Operational Service	1.8															
		27 05 14.00 10	SD-02 Shop Drawings																
			Cable TV Premises Distribution	1.2															
			System																
			Installation	3.1															
			SD-03 Product Data																
			Spare Parts	1.7															
			Test Plan	3.4															
			Qualifications	1.4															
			SD-06 Test Reports																
			Testing	3.4															
			SD-07 Certificates																
			Materials and Equipment	2.1															
			SD-08 Manufacturer’s Instructions																
			Manufacturer's	3.1.1															
			Recommendations																
			SD-10 Operation and Maintenance																
			Data																
			Operation and Maintenance	3.5															
			Manuals																
		27 05 28.36	SD-02 Shop Drawings																

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		27 05 28.36	Fabrication Drawings	2.2	G													
			Installation Drawings	3.1.2	G													
			SD-03 Product Data															
			Cable Trays	2.1	G													
			Supports	2.3.1														
			SD-08 Manufacturer’s Instructions															
			Manufacturer's Instructions	3.1.1														
		27 10 00	SD-02 Shop Drawings															
			Telecommunications drawings	1.5.1.1	G													
			Telecommunications Space Drawings	1.5.1.2	G													
			SD-03 Product Data															
			Telecommunications cabling	2.3														
			Patch panels	2.4.3	G													
			Telecommunications outlet/connector assemblies	2.5														
			Equipment support frame	2.4.2														
			Connector blocks	3.1.6.1														
			Spare Parts	1.9.3	G													
			SD-06 Test Reports															
			Telecommunications cabling testing	3.5.1														
			SD-07 Certificates															
			Telecommunications Contractor	1.5.2.1														
			Key Personnel	1.5.2.2	G													
			Manufacturer Qualifications	1.5.2.3														

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		27 10 00	Test plan	1.5.3															
			SD-09 Manufacturer's Field																
			Reports																
			Factory reel tests	2.11.1	G														
			SD-10 Operation and Maintenance																
			Data																
			Telecommunications cabling and	1.9.1															
			pathway system																
			SD-11 Closeout Submittals																
			Record Documentation	1.9.2															
		27 13 23	SD-01 Preconstruction Submittals																
			Qualifications	1.3.1	G														
			Quality Assurance Plan	1.3.1	G														
			SD-02 Shop Drawings																
			Fiber Optic System Contract	1.3.1															
			Drawings																
			Detailed Shop Drawings	1.3.1															
			Record (As-Built) Drawings	3.3															
			SD-03 Product Data																
			Optical Fibers	1.3.1															
			Fiber Optic Cable Design	1.3.1															
			Splice Organizers	1.3.1															
			Pre-Connected Cable Assembly	1.3.1															
			Fiber Optic Terminal Cabinets	1.3.1															
			Fiber Optic Terminal Cabinets	2.2.5															
			Optical Patch Panel Assemblies	1.3.1															

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		27 13 23	Fiber Optic Media Types	1.3.1															
			Fiber Optic Terminations and	1.3.1															
			Connectors																
			Fiber Optic Enclosures	1.3.1															
			SD-06 Test Reports																
			Factory Test Certificates	2.4.2															
			Single and Multi-Mode OTDR	3.2.1.1															
			Test																
			End-to-End Attenuation Tests	3.2.1.2															
			End-to-End Bandwidth Tests	3.2.1.3															
			Fiber Optic Factory Test Plan	1.5.4															
			Fiber Optic Field Tests Plan	1.5.5															
			SD-07 Certificates																
			Fiber Optic Cable Installer and	1.3.1															
			Splicer Qualifications																
			Manufacturer's Qualifications	1.3.1															
			SD-08 Manufacturer’s Instructions																
			Fiber Optic System Instructions	1.3.1															
		27 51 16	SD-02 Shop Drawings																
			Detail Drawings	2.1.4	G														
			SD-03 Product Data																
			Spare Parts	1.4															
			SD-06 Test Reports																
			Approved Test Procedures	3.5															
			Acceptance Tests	3.5															
			SD-07 Certificates																

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		27 51 16	Components	2.2															
			SD-10 Operation and Maintenance																
			Data																
			Radio and Public Address	2.1	G														
			System																
		28 08 10	SD-05 Design Data																
			Test Plan	3.1	G														
			SD-06 Test Reports																
			Draft Test Report	3.2.2															
			Final Test Report	3.4	G														
			SD-07 Certificates																
			Qualifications	1.4.1															
		28 10 05	SD-02 Shop Drawings																
			ESS Components	1.3.3.1	G														
			Overall System Schematic	1.3.3.2	G														
			SD-03 Product Data																
			Access Control Unit	2.4.4	G														
			Access Control Devices	2.4.5	G														
			Cameras	2.5.1	G														
			Camera Lenses	2.5.1.2															
			Camera Housing and Mounts	2.5.1.4															
			Video Recording	2.5.4.3															
			Communications Interface	2.7															
			Devices																
			Network Switch	2.7.3															
			Video and ESS Transmission	2.7.4															

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		28 10 05	Uninterruptible Power Supply	2.9.1	G														
			(UPS)																
			Component Enclosure	2.11															
			Equipment Rack	2.12															
			SD-05 Design Data																
			Backup Battery Capacity	1.5.1	G														
			Calculations																
			Throughput Rates	2.4.2															
			CCTV Storage Calculations	1.5.2															
			SD-07 Certificates																
			Contractor Qualifications	1.3.4.1															
			Instructor Qualifications	1.3.4.2															
			SD-10 Operation and Maintenance																
			Data																
			Training Plan	3.6.1															
			Training Content	3.6															
			ESS Components	1.3.3.1															
			ESS Software	1.6															
			SD-11 Closeout Submittals																
			As-Built Drawings	1.7	G														
		28 31 49	SD-03 Product Data																
			Carbon monoxide detector	2.1															
			SD-06 Test Reports																
			Carbon monoxide detector test	3.2.1															
			SD-10 Operation and Maintenance																
			Data																

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		28 31 49	Carbon monoxide detector	2.1														
		28 31 76	SD-02 Shop Drawings															
			Nameplates	2.1.2														
			Instructions	2.14.9														
			Wiring Diagrams	3.3.1	G													
			System Layout	1.2.1	G													
			System Operation	2.3	G													
			Notification Appliances	2.18	G													
			Amplifiers	2.15														
			SD-03 Product Data															
			Technical Data And Computer	1.6														
			Software															
			Fire Alarm Control Unit and Mass	2.13														
			Notification Control Unit (FMCP)															
			Terminal Cabinets	3.3.2														
			Manual Stations	2.17														
			Transmitters	2.20														
			Batteries	2.12.1														
			Battery Chargers	2.12.2														
			Smoke Sensors	2.10														
			Notification Appliances	2.18	G													
			Addressable Interface Devices	2.7	G													
			Amplifiers	2.15														
			Tone Generators	2.15														
			Digitalized Voice Generators	2.15														

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		28 31 76	Remote Fire Alarm/Mass	2.14	G														
			Notification Control Units																
			Radio Transmitter and Interface	2.20.1	G														
			Panels																
			Digital Alarm Communicator	2.20.2	G														
			Transmitter (DACT)																
			Local Operating Console (LOC)	1.4.4	G														
			SD-05 Design Data																
			Battery Power	2.12.1.2	G														
			Battery Chargers	2.12.2	G														
			Voltage Drop Calculations	2.3.1															
			SD-06 Test Reports																
			Field Quality Control	3.6															
			Testing Procedures	3.6.1	G														
			Smoke Sensor Testing	2.10.3	G														
			SD-07 Certificates																
			Installer	1.7.1.4															
			Formal Inspection and Tests	3.6.2.2															
			Final Testing	3.6.2.3															
			Designer Qualifications	1.7.1.1	G														
			SD-09 Manufacturer's Field																
			Reports																
			System Operation	2.3															
			Fire Alarm/Mass Notification	1.7.2.2															
			System																

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		28 31 76	SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	3.9														
			(O&M) Instructions															
			Instruction of Government	3.7														
			Employees															
			SD-11 Closeout Submittals															
			As-Built Drawings	3.6.2.4														
		31 00 00	SD-01 Preconstruction Submittals															
			Shoring	3.2	G													
			Dewatering Work Plan	1.3.3	G													
			SD-03 Product Data															
			Utilization of Excavated Materials	3.6	G													
			Shoulder Construction	3.12														
			SD-06 Test Reports															
			Testing	3.14														
			Borrow Site Testing	2.1														
			SD-07 Certificates															
			Testing	3.14														
		31 11 00	SD-03 Product Data															
			Tree Wound Paint	2.1.1														
		32 01 19.61	SD-03 Product Data															
			Sealants	2.1	G													
			Manufacturer's	Part 3	G													
			Recommendations															

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		32 01 19.61	Manufacturer's	3.5.2	G													
			Recommendations															
			SD-04 Samples															
			Sealants	2.1														
			Blocking Media/Backup Materials	2.3.1														
			Backer Rod	3.3.3.1														
			Bond Breaking Tapes	2.3.2														
			SD-06 Test Reports															
			Sealant	1.3.1														
			SD-07 Certificates															
			Equipment List	3.1														
			SD-08 Manufacturer’s Instructions															
			Sealants	2.1														
		32 11 20	SD-03 Product Data															
			Plant, Equipment, and Tools	1.4	G													
			SD-06 Test Reports															
			Initial Tests	2.2.1	G													
			In-Place Tests	3.12.1	G													
		32 11 23	SD-03 Product Data															
			Plant, Equipment, and Tools	1.4	G													
			SD-06 Test Reports															
			Initial Tests	2.3.1	G													
			In-Place Tests	3.12.1	G													
		32 12 10	SD-06 Test Reports															
			Sampling and Testing	3.7														
		32 12 17	SD-04 Samples															

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		32 12 17	Bituminous pavement	1.6.1.6														
			SD-05 Design Data															
			Job-mix formula	1.3.2														
			Asphalt Cement Binder	2.2														
			Mix Design	2.3														
			SD-06 Test Reports															
			Specific gravity test of asphalt	2.4.1														
			Coarse aggregate tests	2.4.1														
			Percent of crushed pieces in gravel	2.4.1														
			Fine aggregate tests	2.4.1														
			Specific gravity of mineral filler	2.4.1														
			Bituminous mixture tests	2.4.1														
			Aggregates tests	3.5.2.1														
			Bituminous mix tests	3.5.2.2														
			Pavement courses	3.5.2.3														
		32 12 18	SD-04 Samples															
			Open Graded Asphalt Job Mix Formula	2.7.1														
			Job Mix Formula for Slurry Grout	2.7.2														
			SD-06 Test Reports															
			Coarse Aggregate	2.2.1	G													
			Coarse and Fine Aggregates	2.2	G													
			Open-Graded Mix Aggregate	2.2.3	G	ERDC												
			Bituminous Material	2.3	G													
			Slurry Grout Sand	2.2.4	G	ERDC												

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		32 12 18	Filler (Fly Ash)	2.2.5	G	ERDC													
			Job Mix Formula for Slurry Grout	2.7.2	G	ERDC													
			Contractor Quality Control	3.13	G														
			SD-07 Certificates																
			Cement	2.4	G														
			Cross Polymer Resin	2.5	G														
			Curing Compound	2.6	G														
		32 13 13.06	SD-01 Preconstruction Submittals																
			Joint, Dowel and Reinforcement	2.2.1	G														
			Layout Drawings																
			SD-03 Product Data																
			Curing Materials	2.1.6															
			Reinforcement	2.1.5.3															
			Epoxy Resin	2.1.8															
			Epoxy Resin	2.1.8															
			Dowel Bars	2.1.5.1															
			Expansion Joint Filler	2.1.9.1															
			Cementitious Materials	2.1.1															
			SD-04 Samples																
			Test Section	1.7.2	G														
			SD-05 Design Data																
			Mix Design Report	2.3.2	G														
			SD-06 Test Reports																
			Concrete Slump Tests	3.8.2	G														
			Concrete Uniformity	2.4.1	G														
			Flexural Strength	3.8.3	G														

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		32 13 13.06	Air Content	3.8.4	G														
			Surface Smoothness Report	3.8.5	G														
			Repair Recommendations Plan	3.7.1	G														
			SD-07 Certificates																
			Batch Tickets	1.5.3															
			NRMCA Certificate Of	1.5.1															
			Conformance																
			SD-08 Manufacturer’s Instructions																
			Diamond Grinding Plan	3.8.5.4															
		32 16 13	SD-03 Product Data																
			Concrete	2.1															
			Biodegradable Form Release	2.6.3															
			Agent																
			Biodegradable Form Release	3.2															
			Agent																
			SD-06 Test Reports																
			Field Quality Control	3.8															
		32 17 23	SD-03 Product Data																
			Surface Preparation Equipment	2.1.1	G														
			List																
			Application Equipment List	2.1.2	G														
			Exterior Surface Preparation	3.2															
			Safety Data Sheets	1.3.1	G														
			Reflective media for roads	2.2.7.1	G														
			Waterborne Paint	2.2.1	G														
			Solventborne Paint	2.2.2	G														

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		32 17 23	SD-06 Test Reports																
			Reflective Media for Roads	2.2.7.1	G														
			Waterborne Paint	2.2.1	G														
			Solventborne Paint	2.2.2	G														
			High Build Acrylic Coating	2.2.6	G														
			(HBAC)																
			Thermoplastic Compound	2.2.5	G														
			Test Reports	3.4.1															
			SD-07 Certificates																
			Qualifications	1.3.2	G														
			Reflective Media for Roads	2.2.7.1															
			Waterborne Paint	2.2.1															
			Solventborne Paint	2.2.2															
			Volatile Organic Compound	1.3.1	G														
			Volatile Organic Compound	2.2.6	G														
			SD-08 Manufacturer’s Instructions																
			Waterborne Paint	2.2.1	G														
			Solventborne Paint	2.2.2	G														
		32 31 13.53	SD-02 Shop Drawings																
			Fence Installation	1.3.2															
			Fence Installation	3.1															
			Installation Drawings	1.3.2															
			Location of gate, corner, end, and	1.3.2															
			pull posts																
			Gate Assembly	1.3.2															
			Gate Assembly	2.6.1															

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		32 31 13.53	Gate Assembly	2.6.1															
			Turnstiles	1.3.2															
			Gate Hardware and Accessories	1.3.2															
			Gate Hardware and Accessories	2.6.3															
			SD-03 Product Data																
			Fence Installation	1.3.2															
			Fence Installation	3.1															
			Gate Assembly	1.3.2															
			Gate Assembly	2.6.1															
			Gate Assembly	2.6.1															
			Gate Hardware and Accessories	1.3.2															
			Gate Hardware and Accessories	2.6.3															
			SD-04 Samples																
			Fabric	2.1.1															
			Posts	2.2															
			Post Caps	2.2.2															
			Braces	2.3															
			Line Posts	2.3															
			Bottom Rail	3.3															
			Tension Wire	2.4.3															
			Barbed Wire	2.4.2															
			Barbed Wire Supporting Arms	2.2.2															
			Stretcher Bars	2.1.1															
			Gate Posts	2.1.1															
			Gate Hardware and Accessories	1.3.2															
			Gate Hardware and Accessories	2.6.3															

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		32 31 13.53	Turnstiles	1.3.2															
			Padlocks	2.7															
			Wire Ties	2.4.1															
			SD-06 Test Reports																
			zinc coating	1.3.1															
			PVC coating	1.3.1															
			Aluminum Alloy Coating	1.3.1															
			SD-07 Certificates																
			Chain Link Fence	2.2.1															
			Reports	1.3.1															
			Zinc Coating	1.3.1															
			PVC coating	1.3.1															
			aluminum alloy coating	1.3.1															
			Fabric	2.1.1															
			Barbed Wire	2.4.2															
			Stretcher Bars	2.1.1															
			Gate Hardware and Accessories	1.3.2															
			Gate Hardware and Accessories	2.6.3															
			Concrete	2.5															
			Gate Operator	2.8															
			SD-08 Manufacturer’s Instructions																
			Fence Installation	1.3.2															
			Fence Installation	3.1															
			Gate Assembly	1.3.2															
			Gate Assembly	2.6.1															
			Gate Assembly	2.6.1															

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		32 31 13.53	Hardware Assembly	3.6															
			Accessories	1.3.1															
			SD-10 Operation and Maintenance																
			Data																
			Electro-Mechanical Locks	2.9															
			Gate Operator	2.8															
			operating and maintenance	3.6															
			instructions																
		33 08 55	SD-01 Preconstruction Submittals																
			Commissioning Plan	1.4	G														
			SD-06 Test Reports																
			Piping Flushing Checklist	3.4.3	G														
			Control Valve Checklist	3.5.1	G														
			Commissioning Report	1.6	G														
			SD-07 Certificates																
			Certification of Completion	1.5															
			Disposal of Waste Materials	1.7															
		33 11 00	SD-03 Product Data																
			Pipe, Fittings, Joints and	2.2	G														
			Couplings																
			Valves	2.3	G														
			Indicator Posts	2.3.3	G														
			Valve Boxes	2.3.4	G														
			Hydrants	2.4.1	G														
			Pipe Anchorage	2.2.4	G														
			Tapping Sleeves	2.5.1	G														

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		33 11 00	Fire Department Connections	2.5.7	G														
			SD-06 Test Reports																
			Bacteriological Samples	3.2.6	G														
			SD-07 Certificates																
			Pipe, Fittings, Joints and	2.2															
			Couplings																
			Lining	2.2.1.1															
			Lining for Fittings	2.2.2.1.1															
			Valves	2.3															
			Hydrants	2.4.1															
			Disinfection Procedures	3.2.6															
			SD-08 Manufacturer’s Instructions																
			Manufacturer's Instructions	3.2.1															
		33 30 00	SD-01 Preconstruction Submittals																
			Existing Conditions	1.6															
			Request For Field Support	3.1.1															
			Request For Pre-Connection	3.1.1															
			Inspection																
			SD-02 Shop Drawings																
			Drawings	1.4.2															
			Precast Concrete Manhole	2.3.1															
			Metal Items	2.3.4															
			Frames, Covers, and Gratings	2.3.4.1															
			SD-03 Product Data																
			Pipeline Materials	2.1															
			SD-06 Test Reports																

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		33 30 00	Reports	2.4															
			SD-07 Certificates																
			Portland Cement	2.2.2															
			Gaskets	2.1.3.2															
		33 40 00	SD-04 Samples																
			Pipe for Culverts and Storm Drains	2.1															
			SD-07 Certificates																
			Oil Resistant Gasket	2.3.7.1															
			Leakage Test	3.9.3.1															
			Hydrostatic Test on Watertight Joints	3.9.1.1															
			Determination of Density	3.9.1.2															
			Frame and Cover for Gratings	2.3.6															
			Post-Installation Inspection Report	3.9.2.1.2															
			SD-08 Manufacturer’s Instructions																
			Placing Pipe	3.3															
		33 51 13	SD-03 Product Data																
			Pressure Regulator	2.3.3	G														
			Valves	2.3															
			Risers	2.2.2															
			Transition Fittings	2.2.3															
			Gas Meter	2.4	G														
			SD-07 Certificates																
			Welder's Qualifications	1.3.1															

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		33 51 13	Welder's Identification Symbols	1.3.1															
		33 51 15	SD-02 Shop Drawings																
			Pipe, Fittings, and Associated	2.1															
			Materials																
			SD-03 Product Data																
			Materials and Equipment	2.1	G														
			Spare Parts	1.6	G														
			Pipe and Accessory Coatings	2.1	G														
			SD-05 Design Data																
			Connections to Existing Lines	3.12	G														
			Connection and Abandonment	1.4.2.2	G														
			Plan																
			SD-06 Test Reports																
			Pressure and Leak Tests	3.13.2															
			SD-07 Certificates																
			Welder's training, qualifications	1.4.1.1															
			and procedures																
			Jointing of Polyethylene Piping	1.4.1.2															
			Utility Work	3.12.1															
			SD-10 Operation and Maintenance																
			Data																
			Gas Distribution System and	3.14.1	G														
			Equipment Operation																
			Gas Distribution System	3.14.2	G														
			Maintenance																

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		33 51 15	Gas Distribution Equipment	3.14.3	G														
			Maintenance																
		33 56 10	SD-02 Shop Drawings																
			Grounding and Bonding	2.3.2															
			SD-03 Product Data																
			Aboveground Storage Tank	2.4	G														
			Tank Protective Coatings	2.5															
			Automatic Level Alarm System	2.7															
			Tank Gauges	2.8															
			Tank Mounted Fuel Dispensing	2.9															
			Unit																
			SD-06 Test Reports																
			Aboveground Storage Tank	3.2.1	G														
			Tightness Tests																
			Tank Manufacturer's Tests	3.2.2															
			Tank Fill Tests	3.4															
			SD-07 Certificates																
			Contractor Qualifications	1.4.1	G														
			Permitting	1.4.2.1															
			Registration	1.4.2.2															
			Licensed Personnel	1.4.2.3															
			Demonstrations	3.3															
			SD-08 Manufacturer’s Instructions																
			Aboveground Storage Tank	2.4															
			Automatic Level Alarm System	2.7															
			Tank Gauges	2.8															

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		33 56 10	SD-10 Operation and Maintenance																
			Data																
			Aboveground Storage Tank	2.4	G														
			Automatic Level Alarm System	2.7	G														
			Tank Gauges	2.8	G														
		33 58 00	SD-02 Shop Drawings																
			Leak Detection System	2.3	G														
			Electronic Monitoring/Alarm	2.4															
			Panel																
			SD-03 Product Data																
			Leak Detection System	2.3	G														
			Electronic Monitoring/Alarm	2.4															
			Panel																
			SD-06 Test Reports																
			Leak Detection System Test	3.2.1															
			SD-07 Certificates																
			Demonstrations	3.3															
			SD-08 Manufacturer’s Instructions																
			Leak Detection System	2.3															
			SD-10 Operation and Maintenance																
			Data																
			Leak Detection System	2.3	G														
			Electronic Monitoring/Alarm	2.4	G														
			Panel																
		33 71 02	SD-02 Shop Drawings																
			Aluminum conductors	2.2.1	G														

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		33 71 02	Precast underground structures	1.5.1	G														
			SD-03 Product Data																
			Medium voltage cable	2.5	G														
			Precast concrete structures	2.11.2.1	G														
			Sealing Material	2.11.2.4															
			Pulling-In Irons	3.5.3															
			Manhole frames and covers	2.11.3															
			Handhole frames and covers	2.11.4															
			Composite/fiberglass handholes	2.11.6	G														
			Cable supports	2.12															
			SD-06 Test Reports																
			Field Acceptance Checks and Tests	3.18.1	G														
			Arc-proofing test	2.17.1															
			Cable Installation Plan and Procedure	3.3															
			SD-07 Certificates																
			Cable Installer Qualifications	1.5.2															
		33 82 00	SD-02 Shop Drawings																
			Telecommunications Outside Plant	1.6.1.1	G														
			Telecommunications Entrance Facility Drawings	1.6.1.2	G														
			SD-03 Product Data																
			Wire and cable	2.8															
			Cable splices, and connectors	2.5															

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		33 82 00	Closures	2.3															
			Building protector assemblies	2.2.1	G														
			Protector modules	2.2.2	G														
			Cross-connect terminal cabinets	2.4															
			Spare Parts	1.8.2															
			SD-06 Test Reports																
			Pre-installation tests	3.5.1															
			Acceptance tests	3.5.2															
			Outside Plant Test Plan	1.6.3															
			SD-07 Certificates																
			Telecommunications Contractor	1.6.2.1	G														
			Key Personnel	1.6.2.2	G														
			Manufacturer's Qualifications	1.6.2.3															
			SD-08 Manufacturer’s Instructions																
			Building protector assembly	2.2.1	G														
			installation																
			Cable tensions	3.1.7.1															
			Fiber Optic Splices	3.1.8.2															
			SD-09 Manufacturer’s Field																
			Reports																
			Factory Reel Test Data	2.15.1															
			SD-10 Operation and Maintenance																
			Data																
			Telecommunications outside	1.6.1.1															
			plant (OSP)																
			SD-11 Closeout Submittals																

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		33 82 00	Record Documentation	1.8.1														
		41 22 13.13	SD-02 Shop Drawings															
			Overhead Electric Traveling	1.5.1	G													
			(OET) Crane(s)															
			Crane runway system	1.5.3	G													
			Complete schematic wiring	1.5.4	G													
			diagram															
			SD-03 Product Data															
			OET Design Criteria	1.3.2	G													
			Overhead Electric Traveling	1.5.1	G													
			(OET) Crane(s)															
			Load and Sizing Calculations	1.3.1	G													
			Festoon System	2.4.11.4	G													
			Runway Electrification System	1.5.4	G													
			Variable Frequency Drives	2.3.1	G													
			Bumpers	2.2.7	G													
			End Stops	2.2.7	G													
			Spare Parts	1.7	G													
			Framed Instructions	2.1.5	G													
			Nameplates	2.1.2	G													
			Pendant Control Station	2.4.6	G													
			Overloads	2.4.8.5	G													
			Limit Switches	2.4.9	G													
			SD-06 Test Reports															
			Acceptance Testing	3.3	G													
			Hook Assembly	1.5.2	G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
Ground Transportation Equipment Building (GTEB), Fort Huachuca

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)		(q)	(r)
		41 22 13.13	SD-07 Certificates																
			Overload Test Certificate	1.5.3	G														
			No Hazardous Material	1.5.3	G														
			Loss of Power Test	1.5.3	G														
			Crane Runway System	1.5.3	G														
			Certificate of Compliance	1.5.3	G														
			Wire Ropes	1.2	G														
			SD-10 Operation and Maintenance																
			Data																
			Operation and Maintenance	3.6	G														
			Manuals																

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SECTION 05 50 13

MISCELLANEOUS METAL FABRICATIONS

PART 1 GENERAL

1.1 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.

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 318	(2014; Errata 1-2 2014; Errata 3-5 2015; Errata 6 2016; Errata 7-9 2017) Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14)

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303	(2016) Code of Standard Practice for Steel Buildings and Bridges

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(2017) Minimum Design Loads for Buildings and Other Structures

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP A10.3	(2013) Safety Requirements for Powder-Actuated Fastening Systems American National Standard for Construction and Demolition Operations

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2015; Errata 1 2015; Errata 2 2016) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(2015) Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
ASME B18.6.2	(1998; R 2010) Slotted Head Cap Screws,

	Square Head Set Screws, and Slotted Headless Set Screws: Inch Series
ASME B18.6.3	(2013; R 2017) Machine Screws, Tapping Screws, and Machine Drive Screws (Inch Series)
ASME B18.21.1	(2009; R 2016) Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)
ASME B18.21.2M	(1999; R 2014) Lock Washers (Metric Series)
ASME B18.22M	(1981; R 2017) Metric Plain Washers

ASTM INTERNATIONAL (ASTM)

ASTM A29/A29M	(2016) Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2018; E 2018) Standard Specification for Ferritic Malleable Iron Castings
ASTM A48/A48M	(2003; R 2012) Standard Specification for Gray Iron Castings
ASTM A53/A53M	(2018) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A108	(2013) Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2016) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A475	(2003; R 2014) Standard Specification for Zinc-Coated Steel Wire Strand
ASTM A500/A500M	(2018) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A653/A653M	(2018) Standard Specification for Steel

	Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A786/A786M	(2015a) Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates
ASTM A924/A924M	(2018) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B26/B26M	(2014; E 2015) Standard Specification for Aluminum-Alloy Sand Castings
ASTM B108/B108M	(2015) Standard Specification for Aluminum-Alloy Permanent Mold Castings
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B209M	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B221M	(2013) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
ASTM C1513	(2018) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
ASTM D1187/D1187M	(1997; E 2011; R 2011) Asphalt-Base Emulsions for Use as Protective Coatings for Metal
ASTM E488/E488M	(2015) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
ASTM F1554	(2018) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
MASTER PAINTERS INSTITUTE (MPI)	
MPI 79	(2012) Primer, Alkyd, Anti-Corrosive for Metal
NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)	
NAAMM MBG 531	(2017) Metal Bar Grating Manual
NAAMM MBG 532	(2009) Heavy Duty Metal Bar Grating Manual

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3	(1982; E 2004) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2014) Safety and Health Requirements Manual

THE MASONRY SOCIETY (TMS)

TMS 402/602	(2016) Building Code Requirements and Specification for Masonry Structures

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Floor Gratings, Installation Drawings; G

Roof Walkways, Installation Drawings; G

Bollards/Pipe Guards; G

SD-03 Product Data

Floor Gratings; G

Roof Walkways; G

SD-07 Certificates

Certificates of Compliance; G

Certified Mill Test Reports for Chemistry and Mechanical Properties; G

SD-11 Closeout Submittals

Recycled Content; S

1.3 QUALIFICATION OF WELDERS

Qualify welders in accordance with AWS D1.1/D1.1M. Use procedures, materials, and equipment of the type required for the work.

1.4 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove

and replace damaged items with new items.

1.5 MISCELLANEOUS REQUIREMENTS

1.5.1 Fabrication Drawings

Submit fabrication drawings showing layout(s), connections to structural system, and anchoring details as specified in AISC 303.

1.5.2 Installation Drawings

Submit templates, erection, and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation in relation to the building construction.

PART 2 PRODUCTS

2.1 RECYCLED CONTENT

Provide products with recycled content and provide certificates of compliance in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

2.2 MATERIALS

Provide exposed fastenings of compatible materials (avoid contact of dissimilar metals). Coordinate color and finish with the material to which fastenings are applied. Submit the manufacturer's certified mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied materials.

2.2.1 Structural Carbon Steel

Provide in accordance with ASTM A36/A36M.

2.2.2 Structural Tubing

Provide in accordance with ASTM A500/A500M.

2.2.3 Steel Pipe

Provide in accordance with ASTM A53/A53M, Type E or S, Grade B.

2.2.4 Fittings for Steel Pipe

Provide standard malleable iron fittings in accordance with ASTM A47/A47M.

2.2.5 Gratings

a. Provide gray cast iron in accordance with ASTM A48/A48M, Class 40.

b. Provide metal plank grating, non-slip requirement, aluminum in accordance with ASTM B209M ASTM B209, 6061-T6.

c. Provide metal bar type grating in accordance with NAAMM MBG 531.

2.2.6 Floor Plates, Patterned

Provide floor plate in accordance with ASTM A786/A786M. Provide steel plate not less than 14 gage.

2.2.7 Anchor Bolts

Provide in accordance with ASTM F1554. Where exposed, provide anchor bolts of the same material, color, and finish as the metal to which they are applied.

2.2.7.1 Expansion Anchors

Provide 3/8 in. min diameter expansion anchors. Minimum concrete and masonry embedment of 3" in. Design values listed are as tested in accordance with ASTM E488/E488M.

a. Provide minimum allowable pullout capacity capable of resisting loads applied on anchor per ASCE 7. Calculate pullout capacity according to ACI 318, or TMS 402/602 as applicable.

b. Provide minimum allowable shear capacity capable of resisting loads applied on anchor per ASCE 7. Calculate shear capacity according to ACI 318, or TMS 402/602 as applicable.

2.2.7.2 Lag Screws and Bolts

Provide in accordance with ASME B18.2.1, type and grade best suited for the purpose.

2.2.7.3 Toggle Bolts

Provide in accordance with ASME B18.2.1.

2.2.7.4 Bolts, Nuts, Studs and Rivets

Provide in accordance with ASME B18.2.2 or ASTM A307.

2.2.7.5 Powder Actuated Fasteners

Follow safety provisions in accordance with ASSP A10.3.

2.2.7.6 Screws

Provide in accordance with ASME B18.2.1, ASME B18.6.2, ASME B18.6.3 and ASTM C1513.

2.2.7.7 Washers

Provide plain washers in accordance with ASME B18.22M, ASME B18.21.1. Provide beveled washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers in accordance with ASME B18.21.2M, ASME B18.21.1.

2.2.7.8 Welded Headed Shear Studs

Provide in accordance with ASTM A108 or ASTM A29/A29M-12.

2.2.8 Aluminum Alloy Products

Provide in accordance with ASTM B209M, ASTM B209 for sheet plate, ASTM B221M, ASTM B221M, ASTM B221 for extrusions and ASTM B26/B26M or ASTM B108/B108M for castings. Provide aluminum extrusions at least 1/8 inch thick and aluminum plate or sheet at least 0.050 inch thick.

2.3 FABRICATION FINISHES

2.3.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Provide galvanizing in accordance with ASTM A123/A123M, ASTM A153/A153M, ASTM A653/A653M or ASTM A924/A924M, Z275 G90.

2.3.2 Galvanize

Anchor bolts, grating fasteners, washers, and parts or devices necessary for proper installation, unless indicated otherwise.

2.3.3 Shop Cleaning and Painting

2.3.3.1 Surface Preparation

Blast clean surfaces in accordance with SSPC SP 6/NACE No.3. Surfaces that will be exposed in spaces above ceiling or in attic spaces, crawl spaces, furred spaces, and chases may be cleaned in accordance with SSPC SP 3 in lieu of being blast cleaned. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean. Steel to be embedded in concrete must be free of dirt and grease prior to embed. Do not paint or galvanize bearing surfaces, including contact surfaces within slip critical joints. Shop coat these surfaces with rust prevention.

2.3.3.2 Pretreatment, Priming and Painting

Apply pre-treatment, primer, and paint in accordance with manufacturer's printed instructions. On surfaces concealed in the finished construction or not accessible for finish painting, apply an additional prime coat to a minimum dry film thickness of 1.0 mil. Tint additional prime coat with a small amount of tinting pigment.

2.3.4 Nonferrous Metal Surfaces

Protect by plating, anodic, or organic coatings.

2.3.5 Aluminum Surfaces

2.3.5.1 Surface Condition

Before finishes are applied, remove roll marks, scratches, rolled-in scratches, kinks, stains, pits, orange peel, die marks, structural streaks, and other defects which will affect uniform appearance of finished surfaces.

2.3.5.2 Aluminum Finishes

Unexposed sheet, plate and extrusions may have mill finish as fabricated. Sandblast castings' finish, medium, AA DAF45. Unless otherwise specified,

provide all other aluminum items with a standard mill finish. Provide a coating thickness not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish for items used in exterior locations. Provide in accordance with AA DAF45. Provide a polished satin finish on items to be anodized.

2.4 FLOOR GRATINGS AND ROOF WALKWAYS

Design steel grating in accordance with NAAMM MBG 531 and NAAMM MBG 532 for bar type gratings, or in accordance with manufacturer's charts for plank grating. Galvanize steel floor gratings.

a. Design floor gratings to support a stress live load of 300 pounds per square foot for the spans indicated, with maximum deflection of L/240.

b. In accordance with NAAMM MBG 531, band edges of grating with bars of the same size as the bearing bars. Weld banding in accordance with the manufacturer's standard for trim . Design tops of bearing bars, cross or intermediate bars to be in the same plane and to match grating finish.

d. Provide slip resistant surface finishes.

e. Rooftop walkway: Minimum 2 feet wide, 14 gage, ASTM A653/A653M, G-90, steel with slip resistant surface. Furnish all brackets, connectors and other accessories. Support at minimum 5 foot intervals on hard rubber pads in accordance with manufacturer's instructions.

2.5 BOLLARDS/PIPE GUARDS

Provide 8 and 12 inch prime coatedextra strong weight steel pipe in accordance with ASTM A53/A53M. Anchor posts in concrete as indicated and fill solidly with concrete with minimum compressive strength of 2500 psi.

2.6 SECURITY GRILLES

Fabricate of channel frames with not less than two masonry anchors at each jamb and 1/2 inch hardened steel bars spaced not over 4 inches both ways and welded to frame. Provide 18 by 16 mesh screen and two layers of 1/4 inch hardware cloth clamped to frame.

2.7 GUY CABLES

Provide guy cables as pre-stretched, galvanized wire rope of sizes indicated. Provide wire rope in accordance with ASTM A475, high strength grade with Class A coating. Guys must have a factory attached clevis top-end fitting, a factory attached open-bridge strand socket bottom-end fitting, and must be complete with oval eye, threaded anchor rods. Provide hot-dip galvanized fittings and accessories.

2.8 ROOF HATCHES (SCUTTLES)

Provide aluminim or zinc-coated steel, per adjacent roof panel material, sheets not less than 14 gauge with 3 inch beaded flange, welded and ground at corners. Provide a minimum clear opening of 30 by 36 inches. Insulate

cover and curb with one inch thick rigid fiberboard insulation, covered and protected by aluminim or zinc-coated steel, per adjacent roof panel material, of not less than 26 gage. Provide with 12 inches high curb, formed with 3 inch mounting flanges with holes for securing to the roof deck.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated in accordance with manufacturer's instructions. Verify all field dimensions prior to fabrication. Include materials and parts necessary to complete each assembly, whether indicated or not. Miss-alignment and miss-sizing of holes for fasteners is cause for rejection. Conceal fastenings where practicable. Joints exposed to weather must be watertight.

3.2 WORKMANSHIP

Provide miscellaneous metalwork that is true and accurate in shape, size, and profile. Make angles and lines continuous and straight. Make curves consistent, smooth and unfaceted. Provide continuous welding along the entire area of contact except where tack welding is permitted. Do not tack weld exposed connections. Unless otherwise indicated and approved, provide a smooth finish on exposed surfaces. Provide countersuck rivets where exposed. Provide coped and mitered corner joints aligned flush and without gaps.

3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage as necessary, whether indicated or not, for fastening miscellaneous metal items securely in place. Include slotted inserts, expansion shields, powder-driven fasteners, toggle bolts (when approved for concrete), through bolts for masonry, headed shear studs, machine and carriage bolts for steel, through bolts, lag bolts, and screws for wood. Do not use wood plugs. Provide non-ferrous attachments for non-ferrous metal. Provide exposed fastenings of compatible materials (avoid contact of dissimilar metals), that generally match in color and finish the surfaces to which they are applied. Conceal fastenings where practicable. Provide all fasteners flush with the surfaces they fasten, unless indicated otherwise.

3.4 BUILT-IN WORK

Where necessary and not otherwise indicated, form built-in metal work for anchorage with concrete or masonry. Provide built-in metal work in ample time for securing in place as the work progresses.

3.5 WELDING

Perform welding, welding inspection, and corrective welding in accordance with AWS D1.1/D1.1M. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation. Provide welded headed shear studs in accordance with AWS D1.1/D1.1M, Clause 7, except as otherwise specified. Provide in accordance with the safety requirements of EM 385-1-1.

3.6 DISSIMILAR METALS

Where dissimilar metals are in contact, protect surfaces with a coating in accordance with MPI 79 to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, plaster, mortar, masonry, wood, or absorptive materials subject to wetting, protect in accordance with ASTM D1187/D1187M, asphalt-base emulsion. Clean surfaces with metal shavings from installation at the end of each work day.

3.7 PREPARATION

3.7.1 Material Coatings and Surfaces

Remove rust preventive coating just prior to field erection, using a remover approved by the metal manufacturer. Surfaces, when assembled, must be free of rust, grease, dirt and other foreign matter.

3.7.2 Environmental Conditions

Do not clean or paint surfaces when damp or exposed to foggy or rainy weather, when metallic surface temperature is less than minus 5 degrees F above the dew point of the surrounding air, or when surface temperature is below 45 degrees F or over 95 degrees F, unless approved by the Contracting Officer. Metal surfaces to be painted must be dry for a minimum of 48 hours prior to the application of primer or paint.

3.8 INSTALLATION OF BOLLARDS/PIPE GUARDS

Set bollards/pipe guards vertically in concrete piers. Fill hollow cores with concrete having a compressive strength of 3000 psi.

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DIVISION 08 - OPENINGS

SECTION 08 33 23

OVERHEAD COILING DOORS

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SECTION 08 33 23

OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(2017) Minimum Design Loads for Buildings and Other Structures

ASME INTERNATIONAL (ASME)

ASME B29.400	(2001; (R 2008) (R 2013) (R 2018)) Combination, "H" Type Mill Chains, and Sprockets

ASTM INTERNATIONAL (ASTM)

ASTM A153/A153M	(2016) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A27/A27M	(2017) Standard Specification for Steel Castings, Carbon, for General Application
ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A48/A48M	(2003; R 2012) Standard Specification for Gray Iron Castings
ASTM A53/A53M	(2018) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A653/A653M	(2018) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A666	(2015) Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
ASTM A780/A780M	(2009; R 2015) Standard Practice for

	Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A924/A924M	(2018) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM D2000	(2012; R 2017) Standard Classification System for Rubber Products in Automotive Applications
ASTM E330/E330M	(2014) Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
ASTM F568M	(2007) Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 2	(2000; R 2005; Errata 2008) Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 6	(1993; R 2016) Industrial Control and Systems: Enclosures
NEMA MG 1	(2016; SUPP 2018) Motors and Generators
NEMA ST 1	(1988; R 1994; R 1997) Specialty Transformers (Except General Purpose Type)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2; TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6; TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10; TIA 17-11; TIA 17-12; TIA 17-13; TIA 17-14; TIA 17-15; TIA 17-16; TIA 17-17) National Electrical Code

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Overhead Coiling Doors

Counterbalancing Mechanism

Manual Door Operators

Electric Door Operators

Bottom Bars

Guides

Mounting Brackets

Overhead Drum

Hood

Installation Drawings

SD-03 Product Data

Overhead Coiling Doors

Hardware

Counterbalancing Mechanism

Manual Door Operators

Electric Door Operators

Recycled Content For Steel Curtain Slats

SD-05 Design Data

Overhead Coiling Doors

Hardware

Counterbalancing Mechanism

Manual Door Operators

Electric Door Operators

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G

Materials

Devices

Procedures

Manufacture's Brochures

Parts Lists; G

SD-11 Closeout Submittals

Warranty; G

1.3 QUALITY CONTROL

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver doors to the jobsite wrapped in a protective covering with the brands and names clearly marked thereon. Store doors in an adequately ventilated dry location that is free from dirt and dust, water, or other contaminants. Store in a manner that permits easy access for inspection and handling.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Doors to be coiling type, with interlocking slats, complete with anchoring and door hardware, guides, hood, and operating mechanisms, and designed for use on openings as indicated. Use grease-sealed or self-lubricating bearings for rotating members.

2.1.1 Design Requirements

2.1.1.1 Overhead Coiling Door Detail Shop Drawings

Provide installation drawings for overhead coiling door assemblies which show: elevations of each door type, shape and thickness of materials, finishes, details of joints and connections, details of guides and fittings, rough opening dimensions, location and description of hardware, anchorage locations, and counterbalancing mechanism and door operator details. Show locations of replaceable fusible links on wiring diagrams for power, signal and controls. Include a schedule showing the location of each door with the drawings.

2.1.2 Performance Requirements

2.1.2.1 Wind Loading

Design and fabricate door assembly to withstand the wind loading pressure of at least 50 pounds per square foot with a maximum deflection of 1/120 of the opening width. Provide test data showing compliance with ASTM E330/E330M. Sound engineering principles may be used to interpolate or extrapolate test results to door sizes not specifically tested. Ensure complete assembly meets or exceeds the requirements of ASCE 7.

2.1.2.2 Operational Cycle Life

Design all portions of the door, hardware and operating mechanism that are subject to movement, wear, or stress fatigue to operate through a minimum number of 10 cycles per day . One complete cycle of door operation is defined as when the door is in the closed position, moves to the fully open position, and returns to the closed position.

2.2 COMPONENTS

2.2.1 Overhead Coiling Doors

2.2.1.1 Curtain Materials and Construction

~~Provide curtain slats fabricated from aluminum sheets conforming to ASTM B209, or ASTM B221 extrusions, alloy and tempering standard from manufacturer for type of use and finish indicated; with a thickness of 0.050 inch and as required to meet requirements. Provide slats filled with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84. Enclose insulation completely within slat faces on interior surface of slats.~~Provide curtain slats fabricated from Grade A steel sheets conforming to ASTM A653/A653M, with the additional requirement of a minimum yield point of 33,000 psi. Provide 18 gauge sheets, Grade 40 steel with galvanized steel zinc coating in conformance with ASTM A653/A653M and ASTM A924/A924M. Provide steel curtain slats containing a minimum of 20 percent recycled content. Submit data identifying percentage of recycled content for steel curtain slats.

Fabricate doors from interlocking cold-rolled slats, with section profiles as specified, designed to withstand the specified wind loading. Ensure the provided slats are continuous without splices for the width of the door.

2.2.1.2 Curtain Bottom Bar

Install curtain bottom bars as pairs of angles from the manufacturer's standard steel, stainless and aluminum extrusions not less than 2.0 by 2.0-inches by 0.188-inch. Ensure steel extrusions conform to ASTM A36/A36M. Stainless steel extrusions conforming to ASTM A666, Type 304. Aluminum extrusions conforming to ASTM B221. Galvanize angles and fasteners in accordance with ASTM A653/A653M and ASTM A924/A924M. Coat welds and abrasions with paint conforming to ASTM A780/A780M.

2.2.1.3 Insulated Curtains

Provide slats filled with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84. Enclose insulation completely within slat faces on interior surface of slats

2.2.1.4 Vision Panels

Provide complete manufacturer's standard vision panels assembly consisting of clear acrylic glazing panels or fire-rated glass as required for the type door. Set panels in a neoprene channel with a galvanized-steel frame not less than 0.0359-inch uncoated thickness.

2.2.1.5 Locks

Provide end and/or wind locks of Grade B cast steel conforming to ASTM A27/A27M, galvanized in accordance with ASTM A653/A653M, ASTM A153/A153M and ASTM A924/A924M. Secure locks at every other curtain slat.

2.2.1.6 Weather Stripping

Ensure weather-stripping at the door-head and jamb is 1/8-inch thick sheet of natural or neoprene rubber with air baffles. Secure weather stripping to the insides of hoods with galvanized-steel fasteners through continuous galvanized-steel pressure bars at least 5/8-inch wide and 1/8-inch thick.

Ensure threshold weather-stripping is 1/8-inch thick sheet natural or neoprene rubber secured to the bottom bars.

Provide weather-stripping of natural or neoprene rubber conforming to ASTM D2000.

2.2.1.7 Locking Devices

Ensure slide bolt engages through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

Provide a locking device assembly which includes cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

2.2.1.8 Safety Interlock

Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.2.1.9 Overhead Drum

Fabricate drums from nominal 0.040-inch thick aluminum sheet complying with ASTM B209. Aluminum of alloy and temper recommended by manufacturer. Select finish for type of use and finish indicated.

2.2.1.10 Slats

No. 5F, 18 gauge, Grade 40 steel, ASTM A653/A653M galvanized steel zinc coating.

2.2.2 Hardware

Ensure all hardware conforms to ASTM A153/A153M, ASTM A307, ASTM F568M, and ASTM A27/A27M.

2.2.2.1 Guides

Fabricate curtain jamb guides from the manufacturer's standard angles or channels of same material and finish as curtain slats unless otherwise indicated. Provide guides with sufficient depth and strength to retain curtain, and to withstand loading. Ensure curtain operates smoothly. Slot bolt holes for track adjustment.

2.2.2.2 Equipment Supports

Fabricate door-operating equipment supports from the manufacturer's standard steel shapes and plates conforming to ASTM A36/A36M, galvanized in accordance with ASTM A653/A653M and ASTM A924/A924M. Size the shapes and plates in accordance with the industry standards for the size, weight, and type of door installation.

2.2.2.3 Hood

Provide a hood with a minimum aluminum 22-gauge B&S sheet metal, flanged at top for attachment to header and flanged at bottom to provide longitudinal stiffness. The hood encloses the curtain coil and counterbalance mechanism.

Provide a 0.040-inch aluminum hood with reinforced top and bottom edges. Provide minimum 1/4-inch steel intermediate support brackets as required to prevent excessive sag.

2.2.3 Counterbalancing Mechanism

Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted, around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed or self-lubricating bearings for rotating members.

2.2.3.1 Brackets

Provide the manufacturer's standard mounting brackets with one located at each end of the counterbalance barrel conforming to ASTM A48/A48M. Provide brackets of either cast iron or cold-rolled steel.

2.2.3.2 Counterbalance Barrels

Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, conforming to ASTM A53/A53M. Ensure the barrel is of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats. Limit barrel deflection to not more than 0.03 inch per foot of span under full load.

a. Barrel

Provide steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot of width.

b. Spring Balance

Provide an oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door. Ensure that effort to operate manually operated units does not exceed 25 lbs. Provide wheel for applying and adjusting spring torque.

2.2.3.3 Spring Balance

Install one or more oil-tempered, heat-treated steel helical torsion springs within the barrel, capable of producing sufficient torque to assure easy operation of the door curtain. Provide and size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

2.2.3.4 Torsion Rod for Counter Balance

Fabricate rod from the manufacturer's standard cold-rolled steel, sized to

hold fixed spring ends and carry torsional load.

2.2.3.5 Counterbalance Shaft Assembly

a. Barrel

Provide steel pipe capable of supporting the curtain load with maximum deflection of 0.03 inches per foot of width.

b. Spring Balance

Provide an oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door. Ensure that maximum effort to operate does not exceed 25 pounds. Provide wheel for applying and adjusting spring torque.

2.2.4 Manual Door Operators

2.2.4.1 Manual Crank-Hoist Door Operators

Provide door operators which consist of crank and crank gearbox, steel crank drive shaft, and gear-reduction unit with a maximum 25 lbf force to turn crank. Fabricate gearbox to be oil tight and to completely enclose operating mechanism. Provide manufacturer's standard crank-locking device with a self-locking mechanism allowing the curtain to be stopped at any point in its upward or downward travel and remain in that position until moved to the fully open or closed position.

2.2.5 Electric Door Operators

Provide electrical wiring and door operating controls conforming to the applicable requirements of NFPA 70.

Electric door-operator assemblies needs to be the sizes and capacities recommended and provided by the door manufacturer for specified doors. Furnish complete assemblies with electric motors and factory-prewired motor controls, starter, gear reduction units, solenoid-operated brakes, clutch, remote-control stations, manual or automatic control devices, and accessories as required for proper operation of the doors.

Design the operators so that motors may be removed without disturbing the limit-switch adjustment and affecting the emergency auxiliary operators.

Provide a manual operator of crank-gear or chain-gear mechanisms with a release clutch to permit manual operation of doors in case of power failure. Arrange the emergency manual operator so that it may be put into and out of operation from floor level, and its use does not affect the adjustment of the limit switches. Provide an electrical or mechanical device that automatically disconnects the motor from the operating mechanism when the emergency manual operating mechanism is engaged.

2.2.5.1 Door-Operator Types

Provide an operator mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.

2.2.5.2 Electric Motors

Provide motors which are the high-starting-torque, reversible, constant-duty electrical type with overload protection of sufficient torque and horsepower to move the door in either direction from any position. Ensure they produce a door-travel speed of not less than 8 nor more than 12 inches per second without exceeding the horsepower rating.

Provide motors which conform to NEMA MG 1 designation, temperature rating, service factor, enclosure type, and efficiency to the requirements specified.

2.2.5.3 Motor Bearings

Select bearings with bronze-sleeve or heavy-duty ball or roller antifriction type with full provisions for the type of thrust imposed by the specific duty load.

Pre-lubricate and factory seal bearings in motors less than 1/2 horsepower.

Equip motors coupled to worm-gear reduction units with either ball or roller bearings.

Equip bearings in motors 1/2 horsepower or larger with lubrication service fittings. Fit lubrication fittings with color-coded plastic or metal dust caps.

In any motor, bearings that are lubricated at the factory for extended duty periods do not need to be lubricated for a given number of operating hours. Display this information on an appropriate tag or label on the motor with instructions for lubrication cycle maintenance.

2.2.5.4 Motor Starters, Controls, and Enclosures

Provide each door motor with: a factory-wired, unfused, disconnect switch; a reversing, across-the-line magnetic starter with thermal overload protection; 120-volt operating coils with a control transformer limit switch; and a safety interlock assembled in a NEMA ICS 6 type enclosure as specified herein. Ensure control equipment conforms to NEMA ICS 2.

Provide adjustable switches, electrically interlocked with the motor controls and set to stop the door automatically at the fully open and fully closed position.

2.2.5.5 Control Enclosures

Provide control enclosures that conform to NEMA ICS 6 for oil-tight and dust-tight NEMA Type 13.

2.2.5.6 Transformer

Provide starters with 230/460 to 115 volt control transformers with one secondary fuse when required to reduce the voltage on control circuits to 120 volts or less. Provide a transformer conforming to NEMA ST 1.

2.2.5.7 Safety-Edge Device

Provide each door with a pneumatic safety device extending the full width of the door and located within a U-section neoprene or rubber astragal,

mounted on the bottom rail of the bottom door section. Device needs to immediately stop and reverse the door upon contact with an obstruction in the door opening during downward travel and cause the door to return to full-open position. A safety device is not a substitute for a limit switch.

Connect safety device to the control circuit through a retracting safety cord and reel.

2.2.5.8 Remote-Control Stations

Provide interior remote control stations which are full-guarded, momentary-contact three-button, heavy-duty, surface-mounted NEMA ICS 6 type enclosures as specified. Mark buttons "OPEN," "CLOSE," and "STOP." Ensure the "CLOSE" button requires a constant pressure to maintain the closing motion of the door. When the door is in motion and the "STOP" button is pressed, ensure the door stops instantly and remains in the stopped position. From the stopped position, the door may then be operated in either direction.

2.2.5.9 Speed-Reduction Units

Provide speed-reduction units consisting of hardened-steel worm and bronze worm gear assemblies running in oil or grease and inside a sealed casing, coupled to the motor through a flexible coupling. Drive shafts need to rotate on ball- or roller-bearing assemblies that are integral with the unit.

Provide minimum ratings of speed reduction units in accordance with AGMA provisions for class of service.

Ground worm gears to provide accurate thread form; machine teeth for all other types of gearing. Surface harden all gears.

Provide antifriction type bearings equipped with oil seals.

2.2.5.10 Chain Drives

Provide roller chains that are a power-transmission series steel roller type conforming to ASME B29.400, with a minimum safety factor of 10 times the design load.

Heat-treat or otherwise harden roller-chain side bars, rollers, pins, and bushings.

Provide high-carbon steel chain sprockets with machine-cut hardened teeth, finished bore and keyseat, and hollow-head setscrews.

2.2.5.11 Brakes

Provide 360-degree shoe brakes or shoe and drum brakes. Ensure the brakes are solenoid-operated and electrically interlocked to the control circuit to set automatically when power is interrupted.

2.2.5.12 Clutches

Ensure clutches are either the 4-inch diameter, multiple face, externally adjustable friction type or adjustable centrifugal type.

2.2.5.13 Weather/Smoke Seal Sensing Edge

Provide automatic stop control by an automatic sensing switch within neoprene astragal extending the full width of door bottom bar.

Provide an electric sensing edge device. Ensure the door immediately stops downward travel when contact occurs before door fully closes. Provide a self-monitoring wireless sensing edge connection to the motor operator; eliminating the need for a physical traveling electric cord connection between bottom bar sensing edge device and motor operator. Supervised system alters normal door operation; preventing damage, injury or death due to an inoperable sensing edge system.

2.2.6 Surface Finishing

Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Noticeable variations in the same metal component are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

PART 3 EXECUTION

3.1 INSTALLATION

Install overhead coiling door assembly, anchors and inserts for guides, brackets, motors, switches, hardware, and other accessories in accordance with approved detail drawings and manufacturer's written instructions. Upon completion of installation, ensure doors are free from all distortion.

Install overhead coiling doors, motors, hoods, and operators at the mounting locations as indicated for each door in the contract documents and as required by the manufacturer.

Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility and as required by the manufacturer.

3.1.1 Field Painted Finish

Ensure field painted steel doors and frames are in accordance with Section 09 90 00 PAINTS AND COATINGS and manufacturer's written instructions. Protect weather stripping from paint. Ensure finishes are free of scratches or other blemishes.

3.2 ADJUSTING AND CLEANING

3.2.1 Acceptance Provisions

After installation, adjust hardware and moving parts. Lubricate bearings and sliding parts as recommended by manufacturer to provide smooth operating functions for ease movement, free of warping, twisting, or distortion of the door assembly.

Adjust seals to provide weather-tight fit around entire perimeter.

Engage a factory-authorized service representative to perform startup service and checks according to manufacturer's written instructions.

Test the door opening and closing operation when activated by controls or alarm-connected fire-release system. Adjust controls and safeties. Replace damaged and malfunctioning controls and equipment. Reset door-closing mechanism after successful test.

Test and make final adjustment of new doors at no additional cost to the Government.

3.2.1.1 Maintenance and Adjustment

Not more than 90 calendar days after completion and acceptance of the project, examine, lubricate, test, and re-adjust doors as required for proper operation.

3.2.1.2 Cleaning

Clean doors in accordance with manufacturer's approved instructions.

3.3 CLOSEOUT ACTIVITIES

3.3.1 Warranty

Furnish a written guarantee that the helical spring and counterbalance mechanism are free from defects in material and workmanship for not less than two years after completion and acceptance of the project.

Warrant that upon notification by the Government, any defects in material, workmanship, and door operation are immediately correct within the same time period covered by the guarantee, at no cost to the Government.

3.3.2 Operation And Maintenance

Submit 6 copies of the Operation and Maintenance Manuals 30 calendar days prior to testing the Overhead Coiling Door Assemblies. Update and resubmit data for final approval no later than 30 calendar days prior to contract completion.

Submit Operation and Maintenance Manuals for Overhead Coiling Door Assemblies, including the following items:

Materials

Devices

Manual Door Operators

Electric Door Operators

Hood

Counterbalancing Mechanism

Painting

Procedures

Manufacture's Brochures

Parts Lists

Provide operation and maintenance manuals which are consistent with manufacturer's standard brochures, schematics, printed instructions, operating procedures, and safety precautions. Provide test data that is legible and of good quality.

-- End of Section --

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DIVISION 08 - OPENINGS

SECTION 08 71 00

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3.2 FIRE DOORS AND EXIT DOORS
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-- End of Section Table of Contents --

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM E283	(2004; R 2012) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.1	(2016) Butts and Hinges
ANSI/BHMA A156.13	(2017) Mortise Locks & Latches Series 1000
ANSI/BHMA A156.14	(2013) Sliding and Folding Door Hardware
ANSI/BHMA A156.16	(2018) Auxiliary Hardware
ANSI/BHMA A156.18	(2016) Materials and Finishes
ANSI/BHMA A156.21	(2014) Thresholds
ANSI/BHMA A156.22	(2017) Door Gasketing and Edge Seal Systems
ANSI/BHMA A156.3	(2014) Exit Devices
ANSI/BHMA A156.4	(2013) Door Controls - Closers
ANSI/BHMA A156.5	(2014) Cylinder and Input Devices for Locks
ANSI/BHMA A156.6	(2015) Architectural Door Trim
ANSI/BHMA A156.7	(2016) Template Hinge Dimensions
ANSI/BHMA A156.8	(2015) Door Controls - Overhead Stops and Holders

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2018; TIA 18-1; TIA 18-2; TIA 18-3) Life Safety Code
NFPA 252	(2017) Standard Methods of Fire Tests of Door Assemblies

NFPA 72	(2019; TIA 19-1; ERTA 2019) National Fire Alarm and Signaling Code
NFPA 80	(2016; TIA 16-1) Standard for Fire Doors and Other Opening Protectives

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR A250.8	(2003; R2008) Recommended Specifications for Standard Steel Doors and Frames

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir	(updated continuously online) Building Materials Directory

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Hardware Schedule; G

Keying System; G

SD-03 Product Data

Hardware Items; G

SD-08 Manufacturer's Instructions

Installation

SD-10 Operation and Maintenance Data

Hardware Schedule Items, Data Package 1; G

SD-11 Closeout Submittals

Key Bitting

1.3 PRODUCT DATA

Indicate fire-ratings at applicable components.

1.4 HARDWARE SCHEDULE

Prepare and submit hardware schedule in the following form:

Hardware Item	Quantity	Size	Reference Publi-cation Type No.	Finish	Mfr Name and Catalog No.	Key Control Symbols	UL Mark (If fire-rated and listed)	BHMA Finish Desig-nation

In addition, submit hardware schedule data package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.5 KEY BITTING CHART REQUIREMENTS

1.5.1 Requirements

Submit key bitting charts to the Contracting Officer prior to completion of the work. Include:

a. Complete listing of all keys (e.g. AA1 and AA2).

b. Complete listing of all key cuts (AA1-123456, AA2-123458).

c. Tabulation showing which key fits which door.

d. Copy of floor plan showing doors and door numbers.

e. Listing of 20 percent more key cuts than are presently required in each master system.

1.6 QUALITY CONTROL

1.6.1 Hardware Manufacturers and Modifications

Provide, as far as feasible, locks, hinges, and closers of one lock, hinge, or closer manufacturer's make. Modify hardware as necessary to provide features indicated or specified.

1.6.2 Key Shop Drawings Coordination Meeting

Prior to the submission of the key shop drawing, the Contracting Officer, Contractor, Door Hardware Subcontractor, using Activity and Base Locksmith must meet to discuss and coordinate key requirements for the facility.

1.7 DELIVERY, STORAGE, AND HANDLING

Deliver hardware in original individual containers, complete with necessary appurtenances including fasteners and instructions. Mark each individual container with item number as shown on hardware schedule. Deliver permanent keys and removable cores to the Contracting Officer, either directly or by certified mail. Deliver construction master keys with the locks.

PART 2 PRODUCTS

2.1 TEMPLATE HARDWARE

Hardware applied to metal or to prefinished doors must be manufactured

using a template. Provide templates to door and frame manufacturers in accordance with ANSI/BHMA A156.7 for template hinges. Coordinate hardware items to prevent interference with other hardware.

2.2 HARDWARE FOR FIRE DOORS AND EXIT DOORS

Provide all hardware necessary to meet the requirements of NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, NFPA 252 for fire tests of door assemblies, ABA/ADA accessibility requirements, and all other requirements indicated, even if such hardware is not specifically mentioned in paragraph HARDWARE SCHEDULE. Provide Underwriters Laboratories, Inc. labels for such hardware in accordance with UL Bld Mat Dir or equivalent labels in accordance with another testing laboratory approved in writing by the Contracting Officer.

2.3 HARDWARE ITEMS

Clearly and permanently mark with the manufacturer's name or trademark, hinges, pivots, locks, latches, exit devices, bolts and closers where the identifying mark is visible after the item is installed. For closers with covers, the name or trademark may be beneath the cover. Coordinate electrified door hardware components with corresponding components specified in Division 28 ELECTRONIC SECURITY SYSTEMS (ESS).

2.3.1 Hinges

Provide in accordance with ANSI/BHMA A156.1. Provide hinges that are 4-1/2 by 4-1/2 inch unless otherwise indicated. Construct loose pin hinges for interior doors and reverse-bevel exterior doors so that pins are non-removable when door is closed. Other anti-friction bearing hinges may be provided in lieu of ball bearing hinges.

2.3.2 Locks and Latches

2.3.2.1 Mortise Locks and Latches

Provide in accordance with ANSI/BHMA A156.13, Series 1000, Operational Grade 1, Security Grade 2. Provide mortise locks with escutcheons not less than 7 by 2-1/4 inch with a bushing at least 1/4 inch long. Cut escutcheons to fit cylinders and provide trim items with straight, beveled, or smoothly rounded sides, corners, and edges. Provide knobs and roses of mortise locks with screwless shanks and no exposed screws.

2.3.3 Exit Devices

Provide in accordance with ANSI/BHMA A156.3, Grade 1. Provide adjustable strikes for rim type and vertical rod devices. Provide open back strikes for pairs of doors with mortise and vertical rod devices. Provide touch bars in lieu of conventional crossbars and arms. Provide escutcheons not less than 7 by 2-1/4 inch.

2.3.4 High Security Locks

A GSA-approved pedestrian door deadbolt meeting Federal Specification FF-L-2890.

2.3.5 Cylinders and Cores

Provide cylinders and cores with seven pin tumblers. Provide cylinders

from the products of one manufacturer, and provide cores from the products of one manufacturer. Rim cylinders, mortise cylinders, and knobs of bored locksets have interchangeable cores which are removable by special control keys. Stamp each interchangeable core with a key control symbol in a concealed place on the core.

2.3.6 Keying System

Provide master keying systeman extension of the existing keying system. Provide a construction master keying systemand a construction interchangeable cores.Provide key cabinet as specified.

2.3.7 Lock Trim

Provide cast, forged, or heavy wrought construction and commercial plain design for lock trim.

2.3.7.1 Lever Handles

Provide lever handles where indicated in the Hardware Schedule. Provide in accordance with ANSI/BHMA A156.3 for mortise locks of lever handles for exit devices. Provide lever handle locks with a breakaway feature (such as a weakened spindle or a shear key) to prevent irreparable damage to the lock when force in excess of that specified in ANSI/BHMA A156.13 is applied to the lever handle. Provide lever handles return to within 1/2 inch of the door face.

2.3.7.2 Texture

Provide knurled or abrasive coated knobs or lever handles for doors which are accessible to blind persons and which lead to dangerous areas.

2.3.8 Keys

Furnish one file key, one duplicate key, and one working key for each key change. Furnish one additional working key for each lock of each keyed-alike group. Furnisha quantity of key blanks equal to 20 percent of the total number of file keys. Stamp each key with appropriate key control symbol and "U.S. property - do not duplicate." Do not place room number on keys.

2.3.9 Door Bolts

Provide in accordance with ANSI/BHMA A156.16. Provide dustproof strikes for bottom bolts, except at doors having metal thresholds. Provide automatic latching flush bolts in accordance with ANSI/BHMA A156.3, Type 25.

2.3.10 Closers

Provide in accordance with ANSI/BHMA A156.4, Series C02000, Grade 1, with PT 4C. Provide with brackets, arms, mounting devices, fasteners, full size covers, except at storefront mounting, and other features necessary for the particular application. Size closers in accordance with manufacturer's printed recommendations, or provide multi-size closers, Sizes 1 through 6, and list sizes in the Hardware Schedule. Provide manufacturer's 10 year warranty.

2.3.10.1 Identification Marking

Engrave each closer with manufacturer's name or trademark, date of manufacture, and manufacturer's size designation in locations that will be visible after installation.

2.3.11 Overhead Holders

Provide in accordance with ANSI/BHMA A156.8.

2.3.12 Door Protection Plates

Provide in accordance with ANSI/BHMA A156.6.

2.3.12.1 Sizes of Kick Plates

2 inch less than door width for single doors; 1 inch less than door width for pairs of doors. Provide 16 inch kick plates for flush doors and1 inch less than height of bottom rail for panel doors.

2.3.13 Door Stops and Silencers

Provide in accordance with ANSI/BHMA A156.16. Silencers Type L03011. Provide three silencers for each single door, two for each pair.

2.3.14 Thresholds

Provide in accordance with ANSI/BHMA A156.21. Use J35100, with vinyl or silicone rubber insert in face of stop, for exterior doors opening out, unless specified otherwise.

2.3.15 Weatherstripping Gasketing

Provide in accordance with ANSI/BHMA A156.22. Provide the type and function designation where specified in paragraph HARDWARE SCHEDULE. Provide a set to include head and jamb seals, sweep strips, and, for pairs of doors, astragals. Air leakage of weatherstripped doors not to exceed 1.25 cubic feet per minute of air per square foot of door area when tested in accordance with ASTM E283. Provide weatherstripping with one of the following:

2.3.15.1 Extruded Aluminum Retainers

Extruded aluminum retainers not less than 0.050 inch wall thickness with vinyl, neoprene, silicone rubber, or polyurethane inserts. Provide clear (natural) anodized aluminum.

2.3.15.2 Interlocking Type

Zinc or bronze not less than 0.018 inch thick.

2.3.15.3 Spring Tension Type

Spring bronze or stainless steel not less than 0.008 inch thick.

2.3.16 Lightproofing and Soundproofing Gasketing

Provide in accordance with ANSI/BHMA A156.22. Provide adjustable doorstops at heads,jambs and automatic door bottoms in accordance with the

hardware set, of extruded aluminum, clear (natural) anodized, surface applied, with vinyl fin seals between plunger and housing. Provide doorstops with solid neoprene tube, silicone rubber, or closed cell sponge gasket. Provide door bottoms with adjustable operating rod and silicone rubber or closed cell sponge neoprene gasket. Provide doorstops that are mitered at corners. Provide type and function designation where specified in paragraph HARDWARE SETS.

2.3.17 Rain Drips

Provide in accordance with ANSI/BHMA A156.22. Provide extruded aluminum rain drips, not less than 0.08 inch thick, clear anodized finish. Provide the manufacturer's full range of color choices to the Contracting Officer for color selection Provide rain drips with a 4 inch overlap on each side of each exterior door that is not protected by an awning, roof, eave or other horizontal projection. Set drips in sealant and fasten with stainless steel screws.

2.3.17.1 Door Rain Drips

Approximately 1-1/2 inch high by 5/8 inch projection. Align bottom with bottom edge of door.

2.3.17.2 Overhead Rain Drips

Approximately 1-1/2 inch high by 2-1/2 inch projection. Align bottom with door frame rabbet.

2.3.18 Auxiliary Hardware (Other than locks)

Provide in accordance with ANSI/BHMA A156.16, Grade 1.

2.3.19 Sliding and Folding Door Hardware

Provide in accordance with ANSI/BHMA A156.14, Grade 1. Finishes to match other hardware specified herein.

2.3.20 Special Tools

Provide special tools, such as spanner and socket wrenches and dogging keys, as required to service and adjust hardware items.

2.4 FASTENERS

Provide fasteners of type, quality, size, and quantity appropriate to the specific application. Fastener finish to match hardware. Provide stainless steel or nonferrous metal fasteners in locations exposed to weather. Verify metals in contact with one another are compatible and will avoid galvanic corrosion when exposed to weather.

2.5 FINISHES

Provide in accordance with ANSI/BHMA A156.18. Provide hardware in BHMA 630 finish (satin stainless steel), unless specified otherwise. Provide items not manufactured in stainless steel in BHMA 626 finish (satin chromium plated) over brass or bronze, except prime coat finish for surface door closers, and except BHMA 600 finish (primed for painting) for steel hinges. Provide hinges for exterior doors in stainless steel with BHMA 630 finish or chromium plated brass or bronze with BHMA 626 finish.

Furnish exit devices in BHMA 626 finish in lieu of BHMA 630 finish except where BHMA 630 is specified under paragraph HARDWARE SETS. Match exposed parts of concealed closers to lock and door trim. Match hardware finish for aluminum doors to the doors.

2.6 KEY CABINET AND CONTROL SYSTEM

Provide in accordance with ANSI/BHMA A156.5, Type required to yield a capacity (number of hooks) 50 percent greater than the number of key changes used for door locks.

PART 3 EXECUTION

3.1 INSTALLATION

Provide hardware in accordance with manufacturers' printed installation instructions. Fasten hardware to wood surfaces with full-threaded wood screws or sheet metal screws. Provide machine screws set in expansion shields for fastening hardware to solid concrete and masonry surfaces. Provide toggle bolts where required for fastening to hollow core construction. Provide through bolts where necessary for satisfactory installation.

3.1.1 Weatherstripping Installation

Provide full contact, weathertight seals that allow operation of doors without binding the weatherstripping.

3.1.1.1 Stop Applied Weatherstripping

Fasten in place with color matched sheet metal screws not more than 9 inch on center after doors and frames have been finish painted.

3.1.1.2 Interlocking Type Weatherstripping

Provide interlocking, self adjusting type on heads and jambs and flexible hook type at sills. Nail weatherstripping to door 1 inch on center and to heads and jambs at 4 inch on center.

3.1.1.3 Spring Tension Type Weatherstripping

Provide spring tension type on heads and jambs. Provide bronze nails with bronze. Provide stainless steel nails with stainless steel. Space nails not more than 1-1/2 inch on center.

3.1.2 Lightproofing and Soundproofing Installation

Provide as specified for stop applied weatherstripping.

3.1.3 Threshold Installation

Extend thresholds the full width of the opening and notch end for jamb stops. Set thresholds in a full bed of sealant and anchor to floor with cadmium-plated, countersunk, steel screws in expansion sleeves.

3.2 FIRE DOORS AND EXIT DOORS

Provide hardware in accordance with NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, and NFPA 252 for fire tests of door

assemblies. .

3.3 HARDWARE LOCATIONS

Provide in accordance with SDI/DOOR A250.8, unless indicated or specified otherwise.

a. Kick and Armor Plates: Push side of single-acting doors. Both sides of double-acting doors.

b. Mop Plates: Bottom flush with bottom of door.

3.4 KEY CABINET AND CONTROL SYSTEM

Locate where directed . Tag one set of file keys and one set of duplicate keys. Place other keys in appropriately marked envelopes, or tag each key. Provide complete instructions for setup and use of key control system. On tags and envelopes, indicate door and room numbers or master or grand master key.

3.5 FIELD QUALITY CONTROL

After installation, protect hardware from paint, stains, blemishes, and other damage until acceptance of work. Submit notice of testing 15 days before scheduled, so that testing can be witnessed by the Contracting Officer. Adjust hinges, locks, latches, bolts, holders, closers, and other items to operate properly. Demonstrate that permanent keys operate respective locks, and give keys to the Contracting Officer. Correct, repair, and finish, errors in cutting and fitting and damage to adjoining work.

3.6 HARDWARE SETS

Provide hardware for aluminum doors under this section. Deliver Hardware templates and hardware, except field applied hardware, to the aluminum door and frame manufacturer for use in fabricating doors and frames.

FINISH	FINISH DESCRIPTION	BASE METAL
600	PRIMED FOR PAINTING	STEEL
619	SATIN NICKEL	BRASS/BRONZE
626	SATIN CHROMIUM	BRASS/BRONZE
630	STAINLESS STEEL	STAINLESS STEEL
646	SATIN NICKEL	STEEL
689	PAINT	ALUMINUM
715	PRIMED FOR PAINTING	ALUMINUM
719	MILL FINISH UNCOATED	ALUMINUM

HW-1 (Door 101A,101B,103B FIRE RATED)IF OPTION 3 IS NOT AWARDED~~.~~, DOOR 103B IS OMITTED IN HW-1 AND INCLUDED IN HW-4.

6	EA	HINGES, A5111 (4-1/2 X 4-1/2)	630
1	EA.	LOCKSET, F04 (W/ LEVER HANDLE)	626
1	EA	LEVER EXTENSION FLUSH BOLTS, L04081 (ONE AT TOP AND ONE AT BOTTOM OF INACTIVE LEAF)	646
2	EA	CLOSER, C02021 (PARALLEL ARM MOUNT) (PAINT TO MATCH ADJACENT DOOR FRAME)	600
1	EA	METAL ASTRAGAL (PAINT TO MATCH DOOR)	600
1	EA	COORDINATOR	
1	SET	SEAL (HEAD AND JAMB), R0Y154	
1	EA	THRESHOLD, J36133	719

HW-2 (101C,101H,101J,101O,109B,~~111,~~ 114B,114C,103C,103D,125,301B,301D,401A EXIT DOORS) DOOR 114B, 114C ~~IS~~ OMITTED IF OPTION 3 IS NOT AWARDED. DOOR 109~~12~~C IS INCLUDED IN HW-2 AND OMITTED IN HW-21 IF OPTION 3 IS NOT AWARDED.
DOOR 401A IS OMITTED IF OPTION 6 AND 7 IS NOT AWARDED.
DOOR 301B,301D IS OMITTED IF OPTION 8 IS NOT AWARDED

3 EA.	HINGES, A5111 (4-1/2 X 4-1/2 NRP)	630
1	EXIT DEVICE, TYPE 1/F08 (WITH LEVER HANDLE)	626**
1	CLOSER, C02021 (PARALLEL ARM MOUNT) (PAINT TO MATCH ADJACENT DOOR FRAME)	600
1 SET	WEATHERSTRIPPING	
1 EA.	THRESHOLD, J32130	719
1 EA	DOOR SWEEP, ROY435	
1 EA	RAIN DRIP (TOP)	

**EXIT DEVICE MANUFACTURER SHALLL PROVIDE ALLL NECESSARY TRIM (ESCUTCHEON PLATES, LEVER HANDLES, LOCK CYLINDERS, ETC.) FOR A COMPLETE AND USABLE EXIT DEVICE.

HW-3 (OVERHEAD DOORS
101D,101E,101F,101G,101K,101L,101M,101N,122B,127B,301A,301C,301E,401B)DOOR 401B IS OMITTED IF OPTION 6 AND 7 IS NOT AWARDED.
DOOR 301A,301C,301E IS OMITTED IF OPTION 8 IS NOT AWARDED.

ALL HARDWARE SHALL BE PROVIDED BY THE OVERHEAD COILINNG DOOR MANUFACTURER TO INCLUDE WEATHERSTRIPPING AND LOCKING DEVICE. ALL LOCKSETS SHALL HAVE INTERCHANGEABLE CORES THAT ARE COMPATIBLE WITH ALL OTHER DOOR LOCKSETS.

DOORS SHALL BE ELECTRIC OPERATION WITH MANUAL OPERATOR AS BACKUP (SEE SECTION 08 33 23).

HW-4 (Door 102,114A) DOOR 114A IS OMITTED IF OPTION 3 IS NOT AWARDED. ADDITIONALLY, DOOR 103B WILL BECOME AN EGRESS DOOR AND TO BE INCLUDED IN HW-4 IF OPTION 3 IS NOT AWARDED.

6	EA	HINGES, A5111 (4-1/2 X 4-1/2) NRP	630
1	EA	EXIT DEVICE, TYPE 3/F08 (W/ LEVER HANDLE) (AT ACTIVE LEAF)	626
1	EA	EXIT DDEVICE TYPE 8/F08 (W/LEVER HANDLE) (AT INACTIVE LEAF)	646
2	EA	CLOSER, C02021 (PARALLEL ARM MOUNT) (PAINT TO MATCH ADJACENT DOOR FRAME)	600
1	EA	METAL ASTRAGAL (PAINT TO MATCH DOOR)	600
1	EA	COORDINATOR	
1	SET	WEATHERSTRIPPING	
1	EA	THRESHOLD, J36133	719
2	EA	SWEEP SEAL (BOTTOM)	719

**EXIT DEVICE MANUFACTURER SHALLL PROVIDE ALLL NECESSARY TRIM (ESCUTCHEON PLATES, LEVER HANDLES, LOCK CYLINDERS, ETC.) FOR A COMPLETE AND USABLE EXIT DEVICE.

HW-5 (Door 103A,

6	EA	HINGES, A5111 (4-1/2 X 4-1/2) NRP	630
2	EA	EXIT DEVICE, TYPE 8/F08 (W/ LEVER HANDLE)	626
2	EA	CLOSER, C02021 (PARALLEL ARM MOUNT) (PAINT TO MATCH ADJACENT DOOR FRAME)	600
1	SET	SEAL (HEAD AND JAMB) ROY154	

**EXIT DEVICE MANUFACTURER SHALLL PROVIDE ALLL NECESSARY TRIM (ESCUTCHEON PLATES, LEVER HANDLES, LOCK CYLINDERS, ETC.) FOR A COMPLETE AND USABLE EXIT DEVICE.

HW-6 (104,106,115,116 RESTROOMS) DOOR 115,116 IS OMITTED IF OPTION 3 IS NOT AWARDED

3	EA	HINGES, A5111 (4-1/2 X 4-1/2)	630
1	EA	PUSH PLATE, J301	630
1	EA	PULL PLATE, J405	630
1	EA	DOOR STOP, L02251	630
1	EA	CLOSER, C02011 (HINGE SIDE MOUNT) (PAINT TO MATCH ADJACENT DOOR FRAME)	600
3	EA	SILENCERS, L03011	
1	EA	KICK PLATE	630

HW-7 (107 WOMEN SHOWER)

3	EA	HINGES, A5111 (4-1/2 X 4-1/2)	630
1	EA	LOCKSET, F02 (W/ LEVER HANDLE)	626
1	CLOSER, C02021 (PARALLEL ARM MOUNT) (PAINT TO MATCH ADJACENT DOOR FRAME)		600
1	EA	DOOR STOP, L02251 (DRS 111 & 310 ONLY)	630

3 EA SILENCERS, L03011

HW-8 (105 MEN SHOWER)
3 EA HINGES, A5111 (4-1/2 X 4-1/2) 630
1 EA LATCHSET, F01 (W/ LEVER HANDLE) 626
1 CLOSER, C02021 (PARALLEL ARM MOUNT) 600
(PAINT TO MATCH ADJACENT DOOR FRAME)
1 EA DOOR STOP, L02251 630
3 EA SILENCERS, L03011

HW-9 (110 NURSING MOTHER'S ROOM)
3 EA HINGES, A5111 (4-1/2 X 4-1/2) 630
1 EA LOCKSET, F02 (W/ LEVER HANDLE) 626
1 CLOSER, C02021 (PARALLEL ARM MOUNT) 600
(PAINT TO MATCH ADJACENT DOOR FRAME)
1 EA DOOR STOP, L02251 (DRS 111 & 310 ONLY) 630
3 EA SILENCERS, L03011

HW-10 (108 JANITOR)
3 EA HINGES, A5111 (4-1/2 X 4-1/2) 630
1 EA LOCKSET, F07 (W/ LEVER HANDLE) 626
1 EA DOOR STOP, L02251 630
3 EA SILENCERS, L03011

HW-11 (109A)
3 EA HINGES, A5111 (4-1/2 X 4-1/2) 630
1 EA LATCHSET, F01 (W/ LEVER HANDLE) 626
1 CLOSER, C02021 (PARALLEL ARM MOUNT) 600
(PAINT TO MATCH ADJACENT DOOR FRAME)
1 EA DOOR STOP, L02251 630
3 EA SILENCERS, L03011

HW-12 (111~~2B~~)
3 EA HINGES, A5111 (4-1/2 X 4-1/2) 630
1 EA LOCKSET, F06 (W/ LEVER HANDLE) 626
1 CLOSER, C02021 (PARALLEL ARM MOUNT) 600
(PAINT TO MATCH ADJACENT DOOR FRAME)
1 EA DOOR STOP, L02251 630
3 EA SILENCERS, L03011

HW-13 (117) DOOR 117 IS OMITTED IF OPTION 3 IS NOT AWARDED
3 EA HINGES, A5111 (4-1/2 X 4-1/2) 630
1 EA LOCKSET, F07 (W/ LEVER HANDLE) 626
1 EA DOOR STOP, L02251 630
3 EA SILENCERS, L03011

HW-14 (SIPR DOOR 119)
2 EA HINGES, A5111 (4-1/2 X 4-1/2) NRP 630
** 1 EA CDX-09 DOOR LOCK
1 EA CLOSER, C02021 (PARALLEL ARM MOUNT) 600
(PAINT TO MATCH ADJACENT DOOR FRAME)
1 EA AUTOMATIC DOOR BOTTOM, ROY336
1 SET SEAL (HEAD AND JAMB), R0Y156

1	EA	THRESHOLD, J32130	719

** X-09 SHALL MEET FEDERAL SPECIFICATION FF-L-2890

HW-15 (131)

6	EA	HINGES, A5111 (4-1/2 X 4-1/2) NRP	630
1	EA	LOCKSET, F07 (W/ LEVER HANDLE)	626
2	EA	LEVER EXTENSION FLUSH BLOTS, L04081 (ONE AT TOP AND ONE AT BOTTOM OF INACTIVE LEAF)	646
2	EA	CLOSER, C02021 (PARALLEL ARM MOUNT) (PAINT TO MATCH ADJACENT DOOR FRAME)	600
1	EA	METAL ASTRAGAL (PAINT TO MATCH DOOR)	600
1	EA	COORDINATOR	
1	SET	WEATHERSTRIPPING	
1	EA	THRESHOLD, J32130	719
1	EA	DOOR SWEEP, ROY435	
1	EA	RAIN DRIP (TOP)	

HW-16 (~~111,~~120)

3	EA	HINGES, A5111 (4-1/2 X 4-1/2 NRP)	630
1	EA	LOCKSET, F07 (W/ LEVER HANDLE)	626
1	SET	WEATHERSTRIPPING	
1	EA	THRESHOLD, J32130	719
1	EA	DOOR SWEEP, ROY435	
1	EA	RAIN DRIP (TOP)	

HW-17 (121,128A)

3	EA	HINGES, A5111 (4-1/2 X 4-1/2)	630
1	EA	LOCKSET, F04 (W/ LEVER HANDLE)	626
1	EA	CLOSER, C02021 (PARALLEL ARM MOUNT) (PAINT TO MATCH ADJACENT DOOR FRAME)	600
1	EA	DOOR STOP, L02251	630
3	EA	SILENCERS, L03011	

HW-18 (122A,128B)

6	EA	HINGES, A5111 (4-1/2 X 4-1/2)	630
1	EA	LOCKSET , F04 (W/ LEVER HANDLE)	626
1	EA	LEVER EXTENSION FLUSH BLOTS, L04081 (ONE AT TOP AND ONE AT BOTTOM OF INACTIVE LEAF)	646
2	EA	CLOSER, C02021 (PARALLEL ARM MOUNT) (PAINT TO MATCH ADJACENT DOOR FRAME)	600
1	EA	METAL ASTRAGAL (PAINT TO MATCH DOOR)	600
1	EA	COORDINATOR	
3	EA	SILENCERS, L03011	
1	EA	THRESHOLD, J32130	719

HW-19 (126)

6	EA	HINGES, A5111 (4-1/2 X 4-1/2)	630
1	EA	PUSH PLATE, J301	630
1	EA	PULL PLATE, J405	630
2	EA	CLOSER, C02021 (PARALLEL ARM MOUNT) (PAINT TO MATCH ADJACENT DOOR FRAME)	600
1	SET	SEAL (HEAD AND JAMB), ROY154	

HW-20 (129,130 OFFICE)

3 EA	HINGES, A5111 (4-1/2 X 4-1/2)	630
1 EA	LOCKSET, F04 (W/ LEVER HANDLE)	626
1 EA	DOOR STOP, L02251	630
3 EA	SILENCERS, L03011	

HW-21 (10912C,123,127A FIRE RATED)IF OPTION 3 IS NOT AWARDED. DOOR 10912C IS OMITTED IN HW-21 AND INCLUDED IN HW-2.

3 EA	HINGES, A5111 (4-1/2 X 4-1/2)	630
1 EA	LOCKSET, F07 (W/ LEVER HANDLE)	626
1 EA	DOOR STOP, L02251	630
3 EA	SILENCERS, L03011	
1 EA	CLOSER, C02021 (PARALLEL ARM MOUNT) (PAINT TO MATCH ADJACENT DOOR FRAME)	600
1 SET	SEAL (HEAD AND JAMB), R0Y154	

HW-22 (124)

3 EA	HINGES, A5111 (4-1/2 X 4-1/2)	630
1 EA	LOCKSET, F07 (W/ LEVER HANDLE)	626
1 EA	DOOR STOP, L02251	630
3 EA	SILENCERS, L03011	
1 EA	CLOSER, C02021 (PARALLEL ARM MOUNT) (PAINT TO MATCH ADJACENT DOOR FRAME)	600
1 SET	SEAL (HEAD AND JAMB), R0Y154	
1 SET	WEATHERSTRIPPING	
1 EA	THRESHOLD, J32130	719
1 EA	DOOR SWEEP, ROY435	
1 EA	RAIN DRIP (TOP)	

HW-23 (301F,302,303,304)
DOOR 301F,302,303,304 IS OMITTED IF OPTION 8 IS NOT AWARDED.

6	EA	HINGES, A5111 (4-1/2 X 4-1/2) NRP	630
1	EA	EXIT DEVICE, TYPE 3/F08 (W/ LEVER HANDLE) (AT ACTIVE LEAF)	626
1	EA	LEVER EXTENSION FLUSH BOLTS, L04081 (ONE AT TOP AND ONE AT BOTTOM OF INACTIVE LEAF)	646
2	EA	CLOSER, C02021 (PARALLEL ARM MOUNT) (PAINT TO MATCH ADJACENT DOOR FRAME)	600
1	SET	WEATHERSTRIPPING	
1	EA	THRESHHOLD, J36133	719
1	EA	RAINDRIP (TOP)	
1	EA	METAL ASTRAGAL (PAINT TO MATCH DOOR)	600
1	EA	COORDINATOR	

**EXIT DEVICE MANUFACTURER SHALLL PROVIDE ALLL NECESSARY TRIM (ESCUTCHEON PLATES, LEVER HANDLES, LOCK CYLINDERS, ETC.) FOR A COMPLETE AND USABLE EXIT DEVICE.

-- End of Section --

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SECTION 32 01 19.61

SEALING OF JOINTS IN RIGID PAVEMENT

PART 1 GENERAL

1.1 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 C1016	(2014) Standard Test Method for Determination of Water Absorption of Sealant Backing (Joint Filler) Material
ASTM D5249	(2010; R 2016) Standard Specification for Backer Material for Use with Cold-and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints
ASTM D5893/D5893M	(2016) Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Sealants; G

Submit catalog cuts, specifications, Safety Data Sheets and other information documenting conformance to Contract requirements.

Manufacturer's Recommendations; G

SD-04 Samples

Sealants

Provide for possible Government testing a 5-gal sample of each sealant with associated primer to the Contracting Officer a minimum of 60 days prior to its use on the job. Provide factory-sealed containers with a factory applied label showing the following information:

Name of sealant

Identification of component, or primer

Specification number and type

Manufacturer's name

Manufacturer's lot and batch number

Date of Manufacture (month and year)

Shelf life retest date (month and year)

List of hazardous components

Quantity of material in container (volume)

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SD-06 Test Reports

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Sealants

Provide instructions that include, but not limited to: storage requirements, ambient temperature and humidity ranges, and moisture condition of joints for successful installation; requirements for preparation of joints; safe heating temperature; mixing instructions; installation equipment and procedures; application and disposal requirements; compatibility of sealant with filler material; curing requirements; and restrictions to be adhered to in order to reduce hazards to personnel or to the environment. Submit instructions at least 30 days prior to use.

1.3 QUALITY ASSURANCE

1.3.1 Test Requirements

Test the sealant and backup or separating material for conformance with the referenced material specification. Perform testing of the materials in an approved independent or Manufacturer laboratory and submit certified copies of the sealant test reports for approval 60 days prior to the use of the materials at the job site. Submit samples to be retained by the Government for possible future testing if the materials appear defective

during or after application. Conformance with the requirements of the laboratory tests specified does not constitute final acceptance of the materials. Base final acceptance on the performance of the in-place materials. Submit samples of the materials (sealant, primer if required, and backup material), in sufficient quantity for testing and approval 90 days prior to the beginning of work. Do not use material until it has been approved.

1.3.2 Trial Joint Sealant Installation

Prior to cleaning and sealing the joints for the entire project, prepare a test section in location approved by the Contracting Officer and at least 100 ft long using the specified materials and approved equipment, so as to demonstrate the proposed joint preparation and sealing of the types of joints in the project. Following the completion of the test section and before any other joint is sealed, inspect the test section to determine that the materials and installation meet the requirements specified. Inspect joint seal test section. Correct deficiencies and obtain approval of test section prior to installing joint seals. If it is determined that the materials or installation do not meet the requirements, remove the materials, and reclean and reseal the joints at no cost to the Government. Permit the test section meeting the requirements to be incorporated into the permanent work. Prepare and seal other joints in the manner approved for sealing the test section. Notify the Contracting Officer upon completion of the test section.

1.4 DELIVERY, STORAGE, AND HANDLING

Inspect materials delivered to the site for visible damage, and unload and store with a minimum of handling. Deliver joint materials in original sealed containers and protect from freezing or overheating. Provide jobsite storage facilities capable of maintaining temperature ranges within manufacturers recommendations.

1.5 ENVIRONMENTAL REQUIREMENTS

Do not proceed with work when weather conditions detrimentally affect the quality of cleaning joints or applying sealants. Proceed with joint preparation and sealing only when weather conditions are in accordance with manufacturer's instructions. Install joint sealant to dry surfaces and protect sealant and bond breakers from moisture.

1.6 TRAFFIC CONTROL

Do not permit vehicular or heavy equipment traffic on the pavement in the area of the joints being sealed during the protection and curing period of the sealant. Permit traffic on the pavement at the end of the curing period.

PART 2 PRODUCTS

2.1 SEALANTS

All areas indicated in the drawings that will not receive preformed compression seals, shall be sealed with non-sag silicone conforming to ASTM D5893/D5893M.

2.2 PRIMERS

Use primers in accordance with the recommendation of the manufacturer.

2.3 BOND BREAKERS

2.3.1 Blocking Media/Backup Materials

Provide backup (joint filler) material that is a compressible, nonshrinking, nonstaining, nonabsorbing, nonreactive material with the sealant. Use backup material compliant with ASTM D5249. Use material with a water absorption of not more than 5 percent of the sample weight when tested in accordance with ASTM C1016. Use backup (joint filler) material that is 25 plus or minus 5 percent larger in diameter than the nominal width of the crack. Use blocking media consistent with the sealant manufacturer's installation instructions.

2.3.2 Bond Breaking Tapes

Provide a bond breaking tape or separating material that is a flexible, nonshrinkable, nonabsorbing, nonstaining, and nonreacting adhesive-backed tape. Use bond breaker tape approximately 1/8 in wider than the nominal width of the joint and that does not bond to the sealant. Use bond breaking tape shall be consistent with the sealant manufacturer's installation instructions.

PART 3 EXECUTION

Joint preparation and sealant storage and installation shall be performed in accordance with the drawings and specifications and as modified by the joint sealant Manufacturer's recommendations.

3.1 EXECUTING EQUIPMENT

Submit equipment list and description of the equipment to be used and a statement from the supplier of the sealant that the proposed equipment is acceptable for installing the specified sealant. Use equipment for heating, mixing, and installing seals in accordance with the instructions provided by the sealant manufacturer. Provide equipment, tools, and accessories necessary to clean existing joints and install liquid joint sealants. Maintain machines, tools, and other equipment in proper working condition. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, 60 days prior to use on the project.

3.1.1 Joint Cleaning Equipment

3.1.1.1 Tractor-Mounted Routing and Plowing Tool

Use equipment capable of maintaining accurate cutting depth and width control. Use a joint plow equipped with a spring or hydraulic mechanism to release pressure on the tool prior to spalling the concrete. Do not permit the use of V-shaped tools or rotary impact routing devices. Permit the use of hand-operated spindle routing devices to clean and enlarge random cracks.

3.1.1.2 Concrete Saw

Provide a self-propelled power saw, with water-cooled diamond or abrasive

saw blades, for cutting joints to the depths and widths specified, for refacing joints, cleaning sawed joints where sandblasting does not provide a clean joint, widening, or deepening existing joints as specified without damaging the sides, bottom, or top edge of joints. Permit single or gang type blades with one or more blades mounted in tandem for fast cutting. Select saw adequately powered and sized to cut specified opening with not more than two passes of the saw through the joint.

3.1.1.3 Sandblasting Equipment

Include with the sandblasting equipment an air compressor, hose, and long-wearing venturi-type nozzle of proper size, shape and opening. Do not permit the maximum nozzle opening to exceed 1/4 in. Use a portable air compressor capable of providing not less than 150 cfm and maintaining a line pressure of not less than 90 psi at the nozzle while in use. Demonstrate compressor capability, under job conditions, before approval. Use a compressor equipped with traps that maintain the compressed air free of oil and water. Use a nozzle with an adjustable guide that holds the nozzle aligned with the joint approximately 1 in above the pavement surface. Adjust the height, angle of inclination and the size of the nozzle to secure satisfactory results.

3.1.1.4 Waterblasting Equipment

Include with the waterblasting equipment a trailer-mounted water tank, pumps, high-pressure hose, wand with safety release cutoff control, nozzle, and auxiliary water resupply equipment. Provide water tank and auxiliary resupply equipment of sufficient capacity to permit continuous operations. Use a nozzle with an adjustable guide that holds the nozzle aligned with the joint approximately 1 in above the pavement surface. Adjust the height, angle of inclination and the size of the nozzle to obtain satisfactory results. Use a pressure gauge mounted at the pump that shows the pressure in psi at which the equipment is operating.

3.1.1.5 Air Compressor

Use a portable air compressor capable of operating the sandblasting equipment and capable of blowing out sand, water, dust adhering to sidewalls of concrete, and other objectionable materials from the joints. Use a compressor that provides air at a pressure not less than 90 psi and a minimum rate of 150 cubic ft of air per minute at the nozzles and free of oil.

3.1.1.6 Vacuum Sweeper

Use a self-propelled, vacuum pickup sweeper capable of completely removing loose sand, water, joint material, and debris from pavement surface.

3.1.1.7 Hand Tools

Permit the use of hand tools, such as brooms and chisels, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces.

3.1.2 Sealing Equipment

Use joint sealing equipment of a type required by the sealant manufacturer's installation instructions. Use equipment capable of installing sealant to the depths, widths and tolerances indicated. Do not

proceed with joint sealing when malfunctions are noted until the malfunctions are corrected.

3.1.2.1 Cold-Applied, Single-Component Sealing Equipment

Use equipment for installing ASTM D5893/D5893M single component joint sealants that consists of an extrusion pump, air compressor, following plate, hoses, and nozzle for transferring the sealant from the storage container into the joint opening. Use a nozzle with dimensions that allows the tip of the nozzle to extend into the joint to allow sealing from the bottom of the joint to the top. Maintain the initially approved equipment in good working condition, serviced in accordance with the supplier's instructions, and unaltered in any way without obtaining prior approval. Use Teflon-lined hoses and seals to prevent premature curing and moisture penetration and to withstand pumping pressures. Use equipment free of contamination from previously used or other type sealant. Permit use of small hand-held air-powered equipment (i.e., caulking guns) for small applications.

3.2 SAFETY

Do not place sealant within 25 ft of LOX equipment, LOX storage, or LOX piping. Clean joints in this area and leave them unsealed.

In accordance with the provisions of the Contract respecting "Accident Prevention," take appropriate measures to control worker exposure to toxic substances during the work. Provide personnel protective equipment as required. Make Material Safety Data Sheets (Department of Labor Form OSHA-20 or comparable form) available on the site.

Perform sandblasting operations in accordance to applicable provisions inparagraph entitled "Abrasive Blasting" of Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS.

3.3 PREPARATION OF JOINTS

Do not proceed with final cleaning operations by more than one working day in advance of sealant. Clean joints by removing existing joint sealing compound, bond-breakers, dirt, laitance, curing compound, filler, and protrusions of hardened concrete from the sides and upper edges of the joint space to be sealed and other foreign material with the equipment. Do not permit cleaning procedures that damage joints or previously repaired patches by chipping or spalling. Precise shape and size of existing joints vary, and conditions of joint walls and edges vary and include but are not limited to rounding, square edges, sloping, chips, voids, depressions, and projections.

3.3.1 Sawing

3.3.1.1 Facing of Joints

Accomplish facing of joints using a concrete saw as specified in paragraph EQUIPMENT to saw through sawed and filler-type joints to loosen and remove material until the joint is clean and open to the full specified width and depth. Provide exposure of newly clean concrete through removal. Remove burrs and irregularities from sides of joint faces. Stiffen the blade with a sufficient number of dummy (used) blades or washers. Clean, immediately following the sawing operation, the joint opening using a water jet to remove saw cuttings and debris and adjacent concrete

surface. Protect adjacent previously cleaned joint spaces from receiving water and debris during the cleaning operation.

a. Joint Widening (Except Expansion Joints): Saw joints having grooves less than 3/8 in wide and less than 1 in deep to a minimum width and to the minimum depth, as indicated.

3.3.1.2 Refacing of Random Cracks

Accomplish sawing of the cracks using a power-driven concrete saw as specified in paragraph EQUIPMENT. Use a saw blade 6 in or less in diameter to enable the saw to follow the trace of the crack. Stiffen the blade with dummy (or used) blades or washers. Immediately following the sawing operation, clean the crack opening using a water jet to remove saw cuttings and debris.

3.3.2 Final Cleaning of Joints

3.3.2.1 Sandblasting

Following removal of existing sealant, and sawing, and immediately before resealing, clean newly exposed concrete joint faces and pavement surface extending to a mimimum of 1/2 in up to 2 in from each joint edge by sandblasting until concrete surfaces in the joint space are free of sealants, dust, dirt, water and other foreign materials that prevent bonding of new sealants to the concrete. Use sand particles of the proper size and quality for the work. Perform sandblasting with specified nozzles, air compressor, and other appurtenant equipment. Position nozzles to clean the joint faces. Make at least two passes; one for each joint face. Make as many passes as required for proper cleaning. Immediately prior to sealing the joint, blow out the joint spaces with compressed air until completely free of sand, water, and dust. Install joint sealants to dry joints. Replace expansion joint filler material damaged in performing the work with new materials of the same type and dimensions as the existing material, or with appropriate blocking media.

3.3.3 Bond Breaker

At the time the joints receive the final cleaning and are dry, install bond breaker material as indicated with a steel wheel or other approved device.

3.3.3.1 Blocking Media (Backer Rod) (Except for Expansion Joints)

When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a blocking media/back-up material to prevent the entrance of the sealant below the specified depth. Take care to ensure that the blocking media/backup material is placed at the specified depth and is not stretched or twisted during installation.

3.3.3.2 Bond Breaking Tape

Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond breaker separating tape to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Bond the tape to the bottom of the joint opening to prevent it from floating up into the new sealant.

3.3.4 Rate of Progress of Joint Preparation

Limit the stages of joint preparation, including sandblasting, air pressure cleaning and placing of the back-up material to only that lineal footage that can be sealed during the same day.

3.3.5 Disposal of Debris

Sweep pavement surface to remove excess joint material, dirt, water, sand, and other debris by vacuum sweepers or hand brooms. Remove the debris immediately and properly dispose of off Government property.

3.4 PREPARATION OF SEALANT

3.4.1 Single-Component, Cold-Applied Sealants

Inspect the ASTM D5893/D5893M sealant and containers prior to use. Reject materials that contain water, hard caking of any separated constituents, nonreversible jell, or materials that are otherwise unsatisfactory. Do not reject sealants that exhibit settlement of constituents in a soft mass that can be readily and uniformly remixed in the field with simple tools.

3.5 INSTALLATION OF SEALANT

3.5.1 Time of Application

After approval of the test section, seal joints immediately following final cleaning and placing of bond breakers. Commence sealing joints when walls are dust free and dry, and when weather conditions meet sealant manufacturer's instructions. If the above conditions cannot be met, or when rain interrupts sealing operations, reclean and permit the joints to dry prior to installing the sealant.

3.5.2 Sealing Joints

Do not install joint sealant until joints to be sealed have been inspected and approved. Install bond breaker just prior to pouring sealant. Fill the joints with sealant from bottom up until joints are uniformly filled solid from bottom to top using the specified equipment for the type of sealant required. Fill joints to 1/4 in plus or minus 1/16 in below top of pavement, and without formation of voids or entrapped air. Do not permit gravity methods or pouring pots to be used to install the sealant material. Except as otherwise permitted, tool the sealant immediately after application to provide firm contact with the joint walls and to form the indicated sealant profile below the pavement surface. Remove excess sealant that has been inadvertently spilled on the pavement surface. Do not permit traffic over newly sealed pavement until authorized. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's recommendations. Check sealed joints frequently to ensure that newly installed sealant is cured to a tack-free condition within the specified time. Protect new sealant from rain during curing period.

3.6 INSPECTION/FIELD QUALITY CONTROL

3.6.1 Joint Cleaning

Inspect joints during the cleaning process to correct improper equipment

and cleaning techniques that damage the concrete pavement in any manner. Approve cleaned joints prior to installation of the separating or back-up material and joint sealant.

3.6.2 Sampling Sealant

Obtain a one gal sample of each type of sealant on the project from material used for each 10,000 linear ft or less of joints sealed. Store samples according to sealant manufacturer's instructions. Retain samples until final acceptance of the work.

3.6.3 Sealant Application Equipment

Inspect the application equipment to ensure conformance to temperature requirements, proper proportioning and mixing (if two-component sealant) and proper installation. Suspend operations if there is evidences of bubbling, improper installation, or failure to cure or set until causes of the deficiencies are determined and corrected.

3.6.4 Joint Sealant

Inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Remove sealants exhibiting these deficiencies prior to the final acceptance of the project from the joint, wasted, and replace at no additional cost to the Government. Obtain approval for each joint seal installation.

3.7 ACCEPTANCE

Reject sealer that fails to cure properly, or fails to bond to joint walls, or reverts to the uncured state, or fails in cohesion, or shows excessive air voids, blisters, surface defects, swelling, or other deficiencies, or is not properly recessed within indicated tolerances. Remove rejected sealer and reclean and reseal joints. Perform removal and reseal work promptly by and at the expense of the Contractor.

3.8 CLEAN-UP

Upon completion of the project, remove unused materials from the site and leave the pavement in a clean condition.

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SECTION 32 13 13.06

PORTLAND CEMENT CONCRETE PAVEMENT FOR ROADS AND SITE FACILITIES

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 211.1	(1991; R 2009) Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete
ACI 305R	(2010) Guide to Hot Weather Concreting
ACI 306R	(2016) Guide to Cold Weather Concreting
ACI 330R	(2008; E 2016) Guide for the Design and Construction of Concrete Parking Lots
ACI 325.12R	(2002; R 2013) Guide for Design of Jointed Concrete Pavements for Streets and Local Roads

ASTM INTERNATIONAL (ASTM)

ASTM A184/A184M	(2019) Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615/A615M	(2020) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A966/A966M	(2015; R 2020) Standard Test Method for Magnetic Particle Examination of Steel Forgings Using Alternating Current
ASTM C31/C31M	(2019a) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33/C33M	(2018) Standard Specification for Concrete Aggregates
ASTM C42/C42M	(2020) Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C78/C78M	(2018) Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)

ASTM C88	(2018) Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C94/C94M	(2020) Standard Specification for Ready-Mixed Concrete
ASTM C143/C143M	(2015) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150/C150M	(2020) Standard Specification for Portland Cement
ASTM C171	(2016) Standard Specification for Sheet Materials for Curing Concrete
ASTM C172/C172M	(2017) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C231/C231M	(2017a) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260/C260M	(2010a; R 2016) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	(2011) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494/C494M	(2019) Standard Specification for Chemical Admixtures for Concrete
ASTM C618	(2019) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C881/C881M	(2015) Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C989/C989M	(2018a) Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1017/C1017M	(2013; E 2015) Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1077	(2017) Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1260	(2014) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1542/C1542M	(2019) Standard Test Method for Measuring

	Length of Concrete Cores
ASTM C1567	(2013) Standard Test Method for Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM C1602/C1602M	(2018) Standard Specification for Mixing Water Used in Production of Hydraulic Cement Concrete
ASTM D1751	(2004; E 2013; R 2013) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D1752	(2018) Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D2995	(1999; R 2009) Determining Application Rate of Bituminous Distributors
ASTM E1274	(2018) Standard Test Method for Measuring Pavement Roughness Using a Profilograph

NATIONAL READY MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA QC 3	(2015) Quality Control Manual: Section 3, Plant Certifications Checklist: Certification of Ready Mixed Concrete Production Facilities

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-250-01	(2016) Pavement Design For Roads And Parking Areas

1.2 DESIGN

This materials and construction specification is intended to be used on projects where the design was completed using UFC 3-250-01 Pavement Design for Roads, Streets, Walks, and Open Storage Areas, ACI 330R, Guide for the Design and Construction of Concrete Parking Lots or ACI 325.12R, Guide for Design of Jointed Concrete Pavements for Streets and Local Roads, or equivalent.

1.3 RELATED SECTIONS

Portland cement concrete pavement must use Section 32 11 23 AGGREGATE BASE COURSE and Section 32 11 23 AGGREGATE SUBBASE COURSE, in addition to this section.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When

used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Joint, Dowel and Reinforcement Layout Drawings; G

SD-03 Product Data

Curing Materials

Reinforcement

Epoxy Resin

Dowel Bars

Expansion Joint Filler

Cementitious Materials

SD-04 Samples

Test Section; G

SD-05 Design Data

Mix Design Report; G

SD-06 Test Reports

Concrete Slump Tests; G

Concrete Uniformity; G

Flexural Strength; G

Air Content; G

Surface Smoothness Report; G

Repair Recommendations Plan; G

SD-07 Certificates

Batch Tickets

NRMCA Certificate Of Conformance

SD-08 Manufacturer's Instructions

Diamond Grinding Plan

1.5 QUALITY CONTROL

1.5.1 NRMCA Certificate of Conformance

Provide a batching and mixing plant consisting of a stationary-type central mix plant, including permanent installations and portable or relocatable plants installed on stable foundations. Provide a plant designed and operated to produce concrete within the specified tolerances, with a minimum capacity of 250 cubic yards per hour. Submit NRMCA Certificate of Conformance that conforms to the requirements of NRMCA QC 3 including provisions addressing:

1. Material Storage and Handling
2. Batching Equipment
3. Central Mixer
4. Ticketing System
5. Delivery System

1.5.2 Qualifications

1.5.2.1 Laboratory Accreditation

Perform sampling and testing using an approved commercial testing laboratory or on-site facilities that are accredited in accordance with ASTM C1077 and that meets all applicable requirements in SECTION 01 45 00 QUALITY CONTROL. Do not start work requiring testing until the facilities have been inspected and approved. The Government will inspect all laboratories requiring validation for equipment and test procedures prior to the start of any concreting operations for conformance to ASTM C1077. Schedule and provide payment for laboratory inspections. Additional payment or a time extension due to failure to acquire the required laboratory validation is not allowed. Maintain this certification for the duration of the project.

1.5.2.2 Field Technicians

Provide field technicians meeting one of the following criteria:

a. Have at least one National Ready Mixed Concrete Association (NRMCA) certified concrete craftsman and at least one American Concrete Institute (ACI) Flatwork Finisher Certified craftsman on site, overseeing each placement crew during all concrete placement.

b. Have no less than three NRMCA certified concrete installers and at least two American Concrete Institute (ACI) Flatwork Finisher Certified installers on site working as members of each placement crew during all concrete placement.

1.5.3 Batch Tickets

Submit batch tickets for each load of ready-mixed concrete in accordance with ASTM C94/C94M.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver concrete paving in accordance with ASTM C94/C94M.

1.7 ACCEPTANCE

1.7.1 Tolerances

Acceptance of Portland cement concrete pavement is based on compliance with the tolerances presented in Table 1. Remove and replace concrete pavement represented by the failing tests or submit repair plan for approval.

Table 1

Measurement	Tolerance
PLASTIC CONCRETE	
Slump	plus 0, minus 1.5 inches
Air Content	plus/minus 1.5 percent
Flexural Strength	No individual specimen less than 100 psi below specified strength.
HARDENED CONCRETE	
Grade	plus/minus 0.05 feet from plan
Smoothness	No abrupt change exceeding 1/8 inch
Straightedge	Not more than 1/8 in for roads. Not more than 1/4 in for open storage areas.
Profilograph	Not more than 9 inches/mile
Thickness	minus 3/4 inch for pavement equal to/greater than 8 inches thick, minus 1/2 inch for pavement less than 8 inches thick.
Edge Slump	85 percent less than 1/4 inch and 100 percent less than 3/8 inch.

1.7.2 Test Section

Construct a minimum 400 square feet test section to demonstrate typical joints, surface finish, texture, color, thickness, and standard of workmanship using the mixture proportions, materials, and equipment as proposed for the project. Location of test section shall be approved by the Contracting Officer. Test in accordance with requirements in FIELD QUALITY CONTROL.

When a test section does not meet one or more of the tolerances in Table 1, remove and reconstruct the test section. If the test section is acceptable, it may be incorporated into the project.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Cementitious Materials

Cementitious materials in concrete mix must be 20 to 50 percent non-portland cement pozzolanic materials or slag by weight.

2.1.1.1 Portland Cement

Conforming to ASTM C150/C150M, Type I or II or V low alkali.

2.1.1.2 Fly Ash and Pozzolan

Conforming to ASTM C618, Type F, with a loss on ignition not exceeding 6 percent. Include test results in accordance with ASTM C618.

2.1.1.3 Slag

Conforming to ASTM C989/C989M, Slag Cement (formerly Ground Granulated Blast Furnace Slag) Grade 100 or 120. Include test results in accordance with ASTM C989/C989M.

2.1.1.4 Supplementary Cementitious Materials (SCM) Content

Include one of the SCMs listed in Table 2 within the range specified therein, whether or not the aggregates are found to be reactive in accordance with the paragraph Alkali Reactivity Test.

TABLE 2
SUPPLEMENTARY CEMENTITIOUS MATERIALS CONTENT

Supplementary Cementitious Material	Minimum Content (percent)	Maximum Content (percent)
Class F Fly Ash		
SiO2 + Al2O3 + Fe2O3 greater than 70 percent	25	35
SiO2 + A12O3 + Fe2O3 greater than 80 percent	20	35
SiO2 + A12O3 + Fe2O3 greater than 90 percent	15	35
GGBF Slag	40	50

2.1.2 Water

Water conforming to ASTM C1602/C1602M.

2.1.3 Aggregate

2.1.3.1 Durability

Evaluate and test all fine and coarse aggregates to be used in all concrete for durability in accordance with ASTM C88. Provide fine and coarse aggregates with a maximum of 18 percent loss when subjected to 5 cycles using Magnesium Sulfate or a maximum of 12 percent loss when subjected to 5 cycles of Sodium Sulfate.

2.1.3.2 Alkali Reactivity Test

Evaluate and test fine and coarse aggregates to be used in all concrete for alkali-aggregate reactivity. Test all size groups and sources proposed for use.

a. Evaluate the fine and coarse aggregates separately, using ASTM C1260. Reject individual aggregates with test results that indicate an expansion of greater than 0.08 percent after 28 days of immersion in 1N NaOH solution, or perform additional testing as follows: utilize the proposed low alkali portland cement or SCM in combination with each individual aggregate. Test in accordance with ASTM C1567. Determine the quantity that meets all the requirements of these specifications and that lowers the expansion equal to or less than 0.08 percent after 28 days of immersion in a 1N NaOH solution. Base the mixture proportioning on the highest percentage of SCM required to mitigate ASR-reactivity.

b. If any of the above options does not lower the expansion to less than 0.08 percent after 28 days of immersion in a 1N NaOH solution, reject the aggregate(s) and submit new aggregate sources for retesting. Submit the results of testing for evaluation and acceptance.

2.1.3.3 Fine Aggregates

Conforming to the quality and gradation of ASTM C33/C33M.

2.1.3.4 Coarse Aggregates

Coarse aggregate consisting of crushed or uncrushed gravel, crushed stone, or a combination thereof. Provide aggregates, as delivered to the mixers, consisting of clean, hard, uncoated particles. Wash coarse aggregate sufficient to remove dust and other coatings. Provide fine aggregate consisting of natural sand, manufactured sand, or a combination of the two, and composed of clean, hard, durable particles. Provide both coarse and fine aggregates meeting the requirements of ASTM C33/C33M.

a. Gradation: Provide coarse aggregate with a nominal maximum size of 1.5 inches. Grade and provide the individual aggregates in two or more size groups meeting the individual grading requirements of ASTM C33/C33M, Size No. 4 (1.5 to 0.75 inch) and Size No. 67 (0.75 inch to No. 4).

b. Quality: Conforming to ASTM C33/C33M, Class 4M.

2.1.4 Chemical Admixtures

2.1.4.1 Water Reducing Admixtures

Provide admixture conforming to ASTM C494/C494M: Type A, water reducing; Type B, retarding; Type D, water-reducing and retarding; and Type E, water-reducing and accelerating admixture. Do not use calcium chloride admixtures. ASTM C494/C494M Type S specific performance admixtures and ASTM C1017/C1017M flowable admixtures are not allowed.

2.1.4.2 Air Entraining Admixture

Conforming to ASTM C260/C260M: Air-entraining.

2.1.5 Reinforcement

2.1.5.1 Dowel Bars

Dowel bars conforming to ASTM A615/A615M, Grade 60 for plain billet-steel bars of the size and length indicated. Remove all burrs and projections from the bars.

2.1.5.2 Tie Bars

Billet or axle steel deformed bars conforming to ASTM A615/A615M or ASTM A966/A966M Grade 60.

2.1.5.3 Reinforcement

Deformed steel bar mats conforming to ASTM A184/A184M. Bar reinforcement conforming to ASTM A615/A615M, Grade 60.

2.1.6 Curing Materials

Provide curing materials consisting of:

2.1.6.1 White-Burlap-Polyethylene Sheet

Conforming to ASTM C171, 0.004 inch thick white opaque polyethylene bonded to 10 oz/linear yard (40 inch) wide burlap.

2.1.6.2 Liquid Membrane-Forming Compound

Conforming to ASTM C309, white pigmented, Type 2, Class B, free of paraffin or petroleum.

2.1.7 Joint Fillers and Sealants

Provide as specified in Section 32 01 19.61 SEALING OF JOINTS IN RIGID PAVEMENT.

2.1.8 Epoxy Resin

Provide epoxy-resin materials that consist of two-component materials conforming to the requirements of ASTM C881/C881M, Class as appropriate for each application temperature to be encountered, except that in addition, the materials meet the following requirements:

a. Type IV, Grade 3, for use for embedding dowels and anchor bolts.

b. Type III, Grade as approved, for use as patching materials for complete filling of spalls and other voids and for use in preparing epoxy resin mortar.

c. Type IV, Grade 1, for use for injecting cracks.

d. Type V, Grade as approved, for bonding freshly mixed portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete.

2.1.9 Joint Materials

2.1.9.1 Expansion Joint Materials

Provide preformed expansion joint filler material conforming to ASTM D1751 or ASTM D1752. Provide expansion joint filler that is 3/4 inch thick, unless otherwise indicated, and provided in a single full depth piece.

2.1.9.2 Slip Joint Material

Provide slip joint material that is 1/4 inch thick expansion joint filler, unless otherwise indicated, conforming to paragraph EXPANSION JOINT MATERIAL.

2.2 CONCRETE PAVEMENT

2.2.1 Joint, Dowel and Reinforcement Layout Drawings

Submit joint, dowel, and reinforcement layout drawings to the Contracting Officer for approval. No work must be allowed to start until the drawings are approved. The drawings must indicate and describe in detail the proposed jointing and doweling plan for contraction joints, expansion joints, and construction joints in accordance with UFC 3-250-01 Chapter 16, and the proposed reinforcing plan for odd-shaped slabs in accordance with UFC 3-250-01 Chapter 14, and the following:

a. Indicate locations of contraction joints, construction joints, and expansion joints. Spacing between contraction joints must not exceed 15 feet.

b. The larger dimension of a panel must not be greater than 125% of the smaller dimension.

c. The minimum angle between two intersecting joints must be 80 degrees, unless noted otherwise or approved by the Contracting Officer.

d. Joints must intersect pavement-free edges at a 90 degree angle the pavement edge and must extend straight for a minimum of 1.5 feet from the pavement edge, where possible.

e. Align joints of adjacent panels.

f. Align joints in attached curbs with joints in pavement when possible.

g. Ensure joint depth, widths, and dimensions are specified.

h. Minimum contraction joint depth must be 1/4 of the pavement thickness. The minimum joint width must be 1/8 inch.

i. Use expansion joints only where pavement abuts buildings, foundations, manholes, and other fixed objects.

2.3 MIX DESIGN

Proportion concrete mix in accordance with ACI 211.1 except as modified herein.

2.3.1 Specified Concrete Properties

2.3.1.1 Flexural Strength

Provide concrete with a minimum flexural strength of 650 psi at 28 days of age.

2.3.1.2 Air Entrainment

Provide an entrained air content of 5.5 percent.

2.3.1.3 Slump

For fixed form and hand placement, provide a maximum slump of 3 inches. For slipformed pavement, at the start of the project, select a maximum allowable slump which will produce in-place pavement meeting the specified tolerances for control of edge slump. The selected slump is applicable to both pilot and fill-in lanes.

2.3.1.4 Water/Cementitious Materials Ratio

Maximum allowable water-cementitious material ratio is 0.40. The water-cementitious material ratio is based on absolute volume equivalency, where the ratio is determined using the weight of cement for a cement only mix, or using the total volume of cement plus pozzolan converted to an equivalent weight of cement by the absolute volume equivalency method described in ACI 211.1.

2.3.2 Mix Design Report

Perform trial design batches, mixture proportioning studies, testing, and include test results demonstrating that the proposed mixture proportions produce concrete of the qualities indicated. An existing mix design may be submitted if developed within the previous 12 months. Submit test results in a mix design report to include:

a. Coarse and fine aggregate gradations and plots.

b. Coarse and fine aggregate quality test results, include deleterious materials and ASR testing.

c. Mill certificates for cement and supplemental cementitious materials.

d. Certified test results for all proposed admixtures.

e. Specified flexural strength, slump, and air content.

f. Recommended proportions and volumes for proposed mixture and each of three trial water-cementitious materials ratios.

g. Individual beam breaks.

h. Flexural strength summaries and plots.

i. Historical record of test results, documenting production standard deviation (if available).

j. Narrative discussing methodology on how the mix design was developed.

2.3.3 Mix Verification

Mix verification tests may be performed by the Government. Provide quantities of cementitious materials, aggregates and admixtures as requested.

2.4 EQUIPMENT

2.4.1 Batching and Mixing

Provide stationary mixers or truck mixers as applicable. Provide a batch plant conforming to ASTM C94/C94M and as specified. Do not weigh water or measure cumulatively with another ingredient. Batch all concrete materials in accordance with ASTM C94/C94M requirements. Verify batching, mixers, mixing time, permitted reduction of mixing time, and concrete uniformity in accordance with the requirements of ASTM C94/C94M, and document in the initial weekly QC Report. Do not use truck mixers for mixing slipformed concrete. Provide only truck mixers designed for mixing or transporting paving concrete with extra large blading and rear opening specifically for low-slump paving concrete and conforming to the requirements of ASTM C94/C94M.

2.4.2 Transporting Equipment

Provide transporting equipment in conformance with ASTM C94/C94M and as specified herein. Transport concrete to the paving site in rear-dump trucks, in truck mixers designed with extra large blading and rear opening specifically for low slump concrete, or in agitators. Do not permit bottom-dump trucks for delivery of concrete.

2.4.3 Delivery Equipment

When concrete transport equipment cannot operate on the paving lane, provide side-delivery transport equipment consisting of self-propelled moving conveyors to deliver concrete from the transport equipment and discharge it in front of the paver. Do not permit front-end loaders, dozers, or similar equipment to distribute the concrete.

2.4.4 Paver-Finisher

Provide a heavy-duty, self-propelled paver-finisher machine designed specifically for paving and finishing high quality pavement and capable of spreading, consolidating, and shaping the plastic concrete to the desired cross section in one pass. Equip the paver-finisher with a full width "knock-down" auger, capable of operating in both directions, which will evenly spread the fresh concrete in front of the screed or extrusion plate. Gang-mount immersion vibrators at the front of the paver on a frame equipped with suitable controls so that all vibrators can be operated at any desired depth within the slab or completely withdrawn from the concrete. Automatically control the vibrators so they will be

immediately stopped as forward motion of the paver ceases. Space the immersion vibrators across the paving lane as necessary to properly consolidate the concrete, but limit the clear distance between vibrators not to exceed 30 inches, and the outside vibrators not to exceed 12 inches from the edge of the lane. For pavements less than 10 inches thick, operate vibrators at mid-depth parallel with or at a slight angle to the underlying base or subbase. Vibrators may be pneumatic, gas driven, or electric, and operated at frequencies within the concrete between 6,000 and 7,000 vibrations per minute, with an amplitude of vibration such that noticeable vibrations occur at 1.5 foot radius when the vibrator is inserted in the concrete to the depth specified. Equip the paver-finisher with a transversely oscillating screed or an extrusion plate to shape, compact, and smooth the surface.

2.4.4.1 Paver-Finisher with Fixed Forms

Equip the paver-finisher with wheels designed to ride the forms, keep it aligned with the forms, and to prevent deformation of the forms.

2.4.4.2 Slipform Paver-Finisher

Provide a track-mounted slipform paver-finisher with automatic controls and padded tracks. Electronically reference horizontal alignment to a taut wire guideline. Electronically reference vertical alignment on both sides of the paver to a taut wire guideline, to an approved laser control system, or to a ski operating on a completed lane. Do not control from a slope-adjustment control or from the underlying material.

2.4.4.3 Other Types of Finishing Equipment

Bridge deck finishers are permitted for pavements 10 inches or less in thickness. Heavy duty vibratory truss screeds may be approved for use if successfully demonstrated on the test section to consolidate the slab full depth and without segregation. Clary screeds, rotating tube floats, or laser screeds will not be allowed on the project. Provide hand floats that are not less than 12 feet long and 6 inches wide and stiffened to prevent flexing and warping.

2.4.4.4 Work Bridge

Provide a self-propelled work bridge capable of spanning the paving lane and supporting the workmen without excessive deflection.

2.4.5 Texturing Equipment

Provide texturing equipment as specified below.

2.4.5.1 Fabric Drag

Clean, reasonably new burlap measuring from 3 to 10 feet long, 2 feet wider than the width of the pavement, and securely attached to a separate wheel mounted frame spanning the paving lane or to one of the other similar pieces of equipment. Select dimension of burlap drag so that at least 3 feet of the material is in contact with the pavement.

2.4.6 Curing Equipment

Provide equipment for applying membrane-forming curing compound mounted on a self-propelled frame that spans the paving lane. Constantly agitate the

curing compound reservoir mechanically (not air) during operation and provide a means for completely draining the reservoir. Provide a spraying system that consists of a mechanically powered pump which maintains constant pressure during operation, an operable pressure gauge, and either a series of spray nozzles evenly spaced across the lane to provide uniformly overlapping coverage or a single spray nozzle which is mounted on a carriage which automatically traverses the lane width at a speed correlated with the forward movement of the overall frame. Protect all spray nozzles with wind screens. Calibrate the spraying system in accordance with ASTM D2995, Method A, for the rate of application required in subpart CURING AND PROTECTION. Provide hand-operated sprayers powered by compressed air supplied by a mechanical air compressor. Immediately replace curing equipment if it fails to apply an even coating of compound at the specified rate.

2.4.7 Sawing Equipment

Provide equipment for sawing joints and for other similar sawing of concrete consisting of standard diamond-type concrete saws mounted on a wheeled chassis which can be easily guided to follow the required alignment. Provide diamond tipped blades. If demonstrated to operate properly, abrasive blades may be used. Provide spares as required to maintain the required sawing rate. Early-entry saws may be used, subject to demonstration and approval. No change to the initial sawcut depth is permitted.

2.4.8 Straightedge

Furnish one 12 foot straightedge constructed of aluminum or magnesium alloy, having blades of box or box-girder cross section with flat bottom, adequately reinforced to insure rigidity and accuracy. Provide handles for operation on the pavement.

PART 3 EXECUTION

3.1 PREPARATION FOR PAVING

3.1.1 Weather Limitations

When windy conditions during paving appear probable, have equipment and material at the paving site to provide windbreaks, shading, fogging, or other action to prevent plastic shrinkage cracking or other damaging drying of the concrete.

3.1.1.1 Inclement Weather

Do not commence placing operations when heavy rain or other damaging weather conditions appear imminent. At all times when placing concrete, maintain on-site sufficient waterproof cover and means to rapidly place it over all unhardened concrete or concrete that might be damaged by rain. Suspend placement of concrete whenever rain, high winds, or other damaging weather commences to damage the surface or texture of the placed unhardened concrete, washes cement out of the concrete, or changes the water content of the surface concrete. Immediately cover and protect all unhardened concrete from the rain or other damaging weather. Completely remove and replace any slab damaged by rain or other weather full depth, by full slab width, to the nearest original joint.

3.1.1.2 Hot Weather

Maintain required concrete temperature in accordance with ACI 305R to prevent evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing, place concrete during cooler night time hours, or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Water is not allowed to be added after the initial introduction of mixing water except, when on arrival at the job site, the slump is less than specified and the water-cement ratio is less than that given as a maximum in the approved mixture. Additional water may be added to bring the slump within the specified range provided the approved water-cement ratio is not exceeded. Inject water into the head of the mixer (end opposite the discharge opening) drum under pressure, and turn the drum or blades a minimum of 30 additional revolutions at mixing speed. The addition of water to the batch at any later time is not allowed. After placement, use fog spray, apply monomolecular film, or use other suitable means to reduce the evaporation rate. Start curing when surface of fresh concrete is sufficiently hard to permit curing without damage. Cool underlying material by sprinkling lightly with water before placing concrete. Follow practices found in ACI 305R.

3.1.1.3 Prevention of Plastic Shrinkage Cracking

During weather with low humidity, and particularly with high temperature and appreciable wind, develop and institute measures to prevent plastic shrinkage cracks from developing. If plastic shrinkage cracking occurs, halt further placement of concrete until protective measures are in place to prevent further cracking. Periods of high potential for plastic shrinkage cracking can be anticipated by use of ACI 305R. In addition to the protective measures specified in the previous paragraph, the concrete placement may be further protected by erecting shades and windbreaks and by applying fog sprays of water, the addition of monomolecular films, or wet covering. Apply monomolecular films after finishing is complete, do not use in the finishing process. Immediately commence curing procedures when such water treatment is stopped.

3.1.1.4 Cold Weather

Do not place concrete when ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. When authorized, when concrete is likely to be subjected to freezing within 24 hours after placing, heat concrete materials so that temperature of concrete when deposited is between 65 and 80 degrees F. Methods of heating materials are subject to approval. Do not heat mixing water above 165 degrees F. Remove lumps of frozen material and ice from aggregates before placing aggregates in mixer. Follow practices found in ACI 306R.

3.1.2 Conditioning of Underlying Material

Verify the underlying material, upon which concrete is to be placed is clean, damp, and free from debris, waste concrete or cement, frost, ice, and standing or running water. Prior to setting forms or placement of concrete, verify the underlying material is well drained and has been satisfactorily graded by string-line controlled, automated, trimming machine and uniformly compacted in accordance with the applicable Section of these specifications. Test the surface of the underlying material to crown, elevation, and density in advance of setting forms or of concrete

placement using slip-form techniques. Trim high areas to proper elevation. Fill and compact low areas to a condition similar to that of surrounding grade, or fill with concrete monolithically with the pavement. Low areas filled with concrete are not to be cored for thickness to avoid biasing the average thickness used for evaluation and payment adjustment. Rework and compact any underlying material disturbed by construction operations to specified density immediately in front of the paver. If a slipform paver is used, continue the same underlying material under the paving lane beyond the edge of the lane a sufficient distance that is thoroughly compacted and true to grade to provide a suitable trackline for the slipform paver and firm support for the edge of the paving lane.

3.1.3 Forms

Use steel forms, except that wood forms may be used for curves having a radius of 150 feet or less, and for fillets. Forms may be built up with metal or wood, added only to the base, to provide an increase in depth of not more than 25 percent. Provide forms with the base width not less than eight-tenths of the vertical height of the form, except that for forms 8 inches or less in vertical height, provide forms with a base width not less than the vertical height of the form. Provide wood forms adequate in strength and rigidly braced for curves and fillets. Set forms on firm material cut true to grade so that each form section when placed will be firmly in contact with the underlying layer for its entire base. Do not set forms on blocks or on built-up spots of underlying material. Before placing the concrete, coat the contact surfaces of forms with a non-staining mineral oil, non-staining form coating compound, biodegradable form release agent, or two coats of nitro-cellulose lacquer. Check and correct grade elevations and alignment of the forms immediately before placing concrete.

3.1.4 Reinforcement

3.1.4.1 Dowel Bars

Install dowels with horizontal and vertical alignment plus or minus 1 inch. Except as otherwise specified, maintain location of dowels within a skew alignment of 1/4 inch over 1 foot length. Omit Dowels and tie bars when the center of the dowel or tie bar is located within a horizontal distance from an intersecting joint equal to or less than one-fourth of the slab thickness. Maintain dowels in position during concrete placement and curing. Before concrete placement, thoroughly grease the entire length of each dowel secured in a dowel basket or fixed form.

3.1.4.2 Tie Bars

Install bars, accurately aligned horizontally and vertically, and to the tolerances shown on the approved joint layout shop drawings, at indicated locations. For slipform construction, insert bent tie bars by hand or other approved means.

3.1.4.3 Setting Slab Reinforcement

Position reinforcement on suitable chairs prior to concrete placement. At expansion, contraction and construction joints, place the reinforcement as indicated on the approved joint layout shop drawings. Clean reinforcement free of mud, oil, scale or other foreign materials. Place reinforcement accurately and wire securely. Lap splices 12 inches minimum. Maintain

the bar spacing from ends and sides of slabs and joints as indicated.

3.2 MEASURING, MIXING, CONVEYING, AND PLACING CONCRETE

3.2.1 Measuring

Conform to ASTM C94/C94M.

3.2.2 Mixing

Conform to ASTM C94/C94M, except as modified herein. Begin mixing within 30 minutes after cement has been added to aggregates. When the air temperature is greater than 85 degrees F, place concrete within 60 minutes. With approval, a hydration stabilizer admixture meeting the requirements of ASTM C494/C494M Type D, may be used to extend the placement time to 90 minutes. Additional water may be added to bring slump within required limits as specified in ASTM C94/C94M, provided that the specified water-cement ratio is not exceeded.

3.2.3 Conveying

Conform to ASTM C94/C94M.

3.2.4 Placing

Do not exceed a free vertical drop of 5 feet from the point of discharge. Deposit concrete either directly from the transporting equipment or by conveyor on to the pre-wetted subgrade or subbase, unless otherwise specified. Deposit the concrete between the forms to an approximately uniform height. Place concrete continuously at a uniform rate, without damage to the grade and without unscheduled stops except for equipment failure or other emergencies. If an unscheduled stop occurs within 10 feet of a previously placed expansion joint, remove concrete back to joint, repair any damage to grade, install a construction joint and continue placing concrete only after cause of the stop has been corrected.

3.3 PAVING

Construct pavement with paving and finishing equipment utilizing fixed forms or slipforms as approved.

3.3.1 Paving Plan

Submit for approval a paving plan identifying the following items:

a. A description of the placing and protection methods proposed when concrete is to be placed in or exposed to hot, cold, or rainy weather conditions.

b. A detailed paving sequence plan and proposed paving pattern showing all planned construction joints.

c. Plan and equipment proposed to control alignment of formed or sawn joints within the specified tolerances.

3.3.2 Required Results

Operate the paver-finisher to produce a thoroughly consolidated slab throughout, true to line and grade within specified tolerances. Adjust

the paver-finishing operation to produce a surface finish free of irregularities, tears, voids of any kind, and other discontinuities, with only a minimum of paste at the surface. Do not permit multiple passes of the paver-finisher. Produce a finished surface requiring no hand finishing, other than the use of cutting straightedges, except in very infrequent instances. Do not apply water, other than true fog sprays (mist), to the concrete surface during paving and finishing.

3.3.3 Operation

When the paver is operated between or adjacent to previously constructed pavement fill-in lanes, make provisions to prevent damage to the previously constructed pavement, including keeping the existing pavement surface free of debris, and placing rubber mats beneath the paver tracks. Operate transversely oscillating screeds and extrusion plates to overlap the existing pavement the minimum possible, but in no case more than 8 inches.

3.3.4 Consolidation

Immediately after spreading concrete, consolidate full depth with internal type vibrating equipment along the boundaries of all slabs regardless of slab thickness, and interior of all concrete slabs. For pavements less than 10 inches thick, operate vibrators at mid-depth parallel with or at a slight angle to the base course. For thicker pavements, angle vibrators toward the vertical, with vibrator tip preferably about 2 inches above the base course, and top of vibrator a few inches below pavement surface. Automatically control the vibrators or tamping units in front of the paver so that they stop immediately as forward motion ceases. Limit duration of vibration to that necessary to produce consolidation of concrete. Do not permit excessive vibration. Vibrate concrete in small, odd-shaped slabs or in locations inaccessible to the paver mounted vibration equipment with a hand-operated immersion vibrator operated from a bridge spanning the area. Do not operate vibrators at one location for more than 15 seconds. Do not use vibrators to transport or spread the concrete.

3.3.5 Fixed Form Paving

Spread and strike off concrete with with the paver. Shape the concrete to the specified and indicated cross section in one pass, and finish the surface and edges so that only a very minimum amount of hand finishing is required. Use single spud hand vibrators to consolidate the concrete adjacent to fixed forms as required to achieve a void-free formed edge. Do not allow vibrators to contact reinforcement, forms, or the grade during vibration.

3.3.6 Slipform Paving

Shape the concrete to the specified and indicated cross section in one pass, and finish the surface and edges so that only a very minimum amount of hand finishing is required. Do not install dowels by dowel inserters attached to the paver or by any other means of inserting the dowels into the plastic concrete. If a keyway is required, install a 26 gauge thick metal keyway liner as the keyway is extruded. Protect the keyway liner to remain in place and become part of the joint.

3.4 JOINTS

3.4.1 General Requirements for Joints

Construct joints that conform to the locations and details indicated on the approved joint layout shop drawings and are perpendicular to the finished grade of the pavement. Provide joints that are straight and continuous from edge to edge or end to end of the pavement with no abrupt offset and no gradual deviation greater than 1/2 inch. Where any joint fails to meet these tolerances, remove and replace the slabs adjacent to the joint at no additional cost to the Government. Change from the jointing pattern shown on the drawings is not allowed without written approval. Seal joints immediately following curing of the concrete or as soon thereafter as weather conditions permit as specified in Section 32 01 19.61 SEALING OF JOINTS IN RIGID PAVEMENT.

3.4.2 Longitudinal Construction Joints

Install dowels in the longitudinal construction joints, or thicken the edges as indicated. Install dowels as specified above. After the end of the curing period, saw longitudinal construction joints to provide a groove at the top for sealant conforming to the details and dimensions indicated.

3.4.3 Transverse Construction Joints

Install transverse construction joints at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for 30 minutes or longer. Install the transverse construction joint at a planned transverse joint. Provide transverse construction joints by utilizing headers or by paving through the joint, then full-depth sawcutting the excess concrete. Construct pavement with the paver as close to the header as possible, with the paver run out completely past the header. Provide transverse construction joints at a planned transverse joint constructed as shown or, if not shown otherwise, dowelled in accordance with paragraph DOWELS INSTALLED IN HARDENED CONCRETE.

3.4.4 Expansion Joints

Provide expansion joints where indicated on the approved joint layout shop drawings, and about any structures and features that project through or into the pavement, using joint filler of the type, thickness, and width indicated, and installed to form a complete, uniform separation between the structure and the pavement or between two pavements. Attach the filler to the original concrete placement with adhesive and mechanical fasteners and extend the full slab depth. After placement and curing of the adjacent slab, sawcut the sealant reservoir depth from the filler. Tightly fit adjacent sections of filler together, with the filler extending across the full width of the paving lane or other complete distance in order to prevent entrance of concrete into the expansion space. Finish edges of the concrete at the joint face with an edger with a radius of 1/8 inch.

3.4.5 Contraction Joints

Construct transverse and longitudinal contraction joints by sawing an initial groove in the concrete with a 1/8 inch blade to the indicated depth. During sawing of joints, and again 24 hours later, the CQC team is

required to inspect all exposed lane edges for development of cracks below the saw cut, and immediately report results. If there are more than six consecutive uncracked joints after 48 hours, saw succeeding joints 25 percent deeper than originally indicated at no additional cost to the Government. The time of initial sawing varies depending on existing and anticipated weather conditions and be such as to prevent uncontrolled cracking of the pavement. Commence sawing of the joints as soon as the concrete has hardened sufficiently to permit cutting the concrete without chipping, spalling, or tearing. The sawed faces of joints will be inspected for undercutting or washing of the concrete due to the early sawing, and sawing delayed if undercutting is sufficiently deep to cause structural weakness or excessive roughness in the joint. Continue the sawing operation as required during both day and night regardless of weather conditions. Saw the joints at the required spacing consecutively in the sequence of the concrete placement. Provide adequate lighting for night work. Illumination using vehicle headlights is not permitted. Provide a chalk line or other suitable guide to mark the alignment of the joint. Before sawing a joint, examine the concrete closely for cracks, and do not saw the joint if a crack has occurred near the planned joint location. Discontinue sawing when a crack develops ahead of the saw cut. Immediately after the joint is sawed, thoroughly flush the saw cut and adjacent concrete surface with water and vacuumed until all waste from sawing is removed from the joint and adjacent concrete surface. Respray the surface with curing compound as soon as free water disappears. Take necessary precautions to insure that the concrete is properly protected from damage and cured at sawed joints. Tightly seal the top of the joint opening and the joint groove at exposed edges with cord backer rod before the concrete in the region of the joint is resprayed with curing compound, and be maintained until removed immediately before sawing the joint sealant reservoir. Seal the exposed saw cuts on the faces of pilot lanes with bituminous mastic or masking tape. After expiration of the curing period, widen the upper portion of the groove by sawing with ganged diamond saw blades to the width and depth indicated for the joint sealer. Center the reservoir over the initial sawcut.

3.4.6 Thickened Edge Joints

Construct thickened edge joints as indicated on the approved joint layout shop drawings. Grade the underlying material in the transition area as shown and meet the requirements for smoothness and compaction specified for all other areas of the underlying material.

3.4.7 Dowels Installed In Hardened Concrete

Install by bonding the dowels into holes drilled into the hardened concrete. Before drilling commences, cure the concrete for 7 days or until it has reached a minimum flexural strength of 450 psi. Drill holes into the hardened concrete approximately 1/8 inch greater in diameter than the dowels. Bond the dowels in the drilled holes using epoxy resin 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 is not permitted. Hold the dowels in alignment at the collar of the hole, after insertion and before the epoxy resin hardens, by means of a suitable metal or plastic collar fitted around the dowel. Check the vertical alignment of the dowels by placing the straightedge on the surface of the pavement over the top of the dowel and measuring the vertical distance between the straightedge and the beginning and ending point of the exposed part of the dowel. Where tie bars are required in longitudinal construction joints of

slipform pavement, install bent tie bars at the paver, in front of the transverse screed or extrusion plate. If tie bars are required, construct a standard keyway and install the bent tie bars into the plastic concrete through a 26 gauge thick metal keyway liner. Do not install tie bars in preformed holes. Protect the keyway liner and maintain in place and become part of the joint. Before placement of the adjoining paving lane, straighten the tie bars, without spalling the concrete around the bar.

3.5 FINISHING CONCRETE

Start finishing operations immediately after placement of concrete. Use finishing machine, except hand finishing may be used in emergencies and for concrete slabs in inaccessible locations or of such shapes or sizes that machine finishing is impracticable. Immediately halt any operations which produce more than 1/8 inch of mortar-rich surface (defined as deficient in plus U.S. No. 4 sieve size aggregate) and modify the equipment, mixture, or procedures. Finish pavement surface on both sides of a joint to the same grade. Finish formed joints from a securely supported transverse bridge. Provide hand finishing equipment for use at all times.

3.5.1 Machine Finishing

Strike off and screed concrete to the required crown or slope and cross-section by a power-driven transverse finishing machine. A transverse rotating tube or pipe is not permitted. Maintain elevation of concrete such that, when consolidated and finished, pavement surface will be adequately consolidated and at the required grade. Equip finishing machine with a screed which is readily and accurately adjustable for changes in pavement crown or slope and compensation for wear and other causes. Do not permit excessive operation over an area, which will result in an excess of mortar and water being brought to the surface.

3.5.1.1 Equipment Operation

Maintain the travel of machine on the forms without lifting, wobbling, or other variation of the machine which tend to affect the precision of concrete finish. Keep the tops of the forms clean by a device attached to the machine. Maintain a uniform ridge of concrete ahead of the front screed for its entire length.

3.5.1.2 Joint Finish

Before concrete is hardened, correct edge slump of pavement, exclusive of edge rounding, in excess of 0.25 inches. Finish concrete surface on each side of construction joints to the same plane, and correct deviations before newly placed concrete has hardened.

3.5.1.3 Hand Finishing

Strike-off and screed surface of concrete to elevations slightly above finish grade so that when concrete is consolidated and finished, the pavement surface is at the indicated elevation. Vibrate entire surface until required compaction and reduction of surface voids is secured with a strike-off template. After initial finishing, further smooth and consolidate concrete by means of hand-operated longitudinal floats.

3.5.2 Texturing

Before the surface sheen has disappeared and before the concrete hardens, provide a texture to the surface of the pavement as described herein. After curing is complete, thoroughly broom all textured surfaces to remove all debris. Finish the concrete in areas of recesses for tie-down anchors, lighting fixtures, and other outlets in the pavement to provide a surface of the same texture as the surrounding area.

3.5.2.1 Burlap Drag Finish

Before concrete becomes non-plastic, finish the surface of the slab by dragging a strip of clean, wet burlap on the surface. Drag the surface so as to produce a finished surface with a fine granular or sandy texture without leaving disfiguring marks. Keep the burlap clean and saturated during use.

3.5.3 Edging

At the time the concrete has attained a degree of hardness suitable for edging, carefully finish slab edges, including edges at formed joints, with an edge having a maximum radius of 1/8 inch. Clean by removing loose fragments and soupy mortar from corners or edges of slabs which have crumbled and areas which lack sufficient mortar for proper finishing. Refill voids solidly with a mixture of suitable proportions and consistency and refinish. Remove unnecessary tool marks and edges. Smooth remaining edges true to line.

3.6 CURING AND PROTECTION

Protect concrete adequately from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks and oil stains, and do not allow it to dry out from the time it is placed until the expiration of the minimum curing periods specified herein. Do not use membrane-forming compound on surfaces where its appearance would be objectionable, on surfaces to be painted, where coverings are to be bonded to concrete, or on concrete to which other concrete is to be bonded.

3.6.1 White-Burlap-Polyethylene Sheet

Wet entire exposed surface thoroughly with a fine spray of water, saturate burlap but do not have excessive water dripping off the burlap and then cover concrete with White-Burlap-Polyethylene Sheet, burlap side down. Lay sheets directly on concrete surface and overlap 12 inches. Make sheeting not less than 18 inches wider than concrete surface to be cured, and weight down on the edges and over the transverse laps to form closed joints. Repair or replace sheets when damaged during curing. Check daily to assure burlap has not lost all moisture. If moisture evaporates, resaturate burlap and re-place on pavement (limit re-saturation and re-placing to less than 10 minutes per sheet). Leave sheeting on concrete surface to be cured for at least 7 days.

3.6.2 Liquid Membrane-Forming Compound Curing

Apply compound immediately after surface loses its water sheen and has a dull appearance and before joints are sawed. Agitate curing compound thoroughly by mechanical means during use and apply uniformly in a two-coat continuous operation by suitable power-spraying equipment. Apply a total coverage for the two coats at least one gallon of undiluted

compound per 200 square feet to produce a uniform, continuous, coherent film that will not check, crack, or peel and free from pinholes or other imperfections. The application of curing compound by hand-operated, mechanical powered pressure sprayers is permitted only on odd widths or shapes of slabs and on concrete surfaces exposed by the removal of forms. When the application is made by hand-operated sprayers, apply a second coat in a direction approximately at right angles to the direction of the first coat. Apply an additional coat of compound immediately to areas where film is defective. Respray concrete surfaces that are subject to heavy rainfall within 3 hours after curing compound has been applied in the same manner.

3.6.3 Protection of Treated Surfaces

After the initial saw cut is complete and the slurry has been removed, respray the area with curing compound or restore the white burlap polyethylene sheet to maintain a continuous curing environment in the area of the sawn joints. Keep concrete surfaces to which liquid membrane-forming compounds have been applied free from vehicular traffic and other sources of abrasion for not less than 72 hours. Foot traffic is allowed after 24 hours for inspection purposes. Maintain continuity of coating for entire curing period and repair damage to coating immediately.

3.7 REPAIR, REMOVAL AND REPLACEMENT OF NEWLY CONSTRUCTED SLABS

3.7.1 General Criteria

Repair or remove and replace new pavement slabs as specified at no cost to the Government. Removal of partial slabs is not permitted. Prior to any repairs, submit a Repair Recommendations Plan detailing areas exceeding the specified limits as well as repair recommendations required to bring these areas within specified tolerances.

3.7.2 Slabs with Cracks

The Government may require cores to be taken over cracks to determine depth of cracking. Such cores are to be drilled with a minimum diameter of 6 inches, and be backfilled with an approved non-shrink concrete. Perform drilling of cores and filling of holes at no expense to the Government. Clean cracks that do not exceed 2 inches in depth; then pressure injected full depth with epoxy resin, Type IV, Grade 1. Remove and replace slabs containing cracks deeper than 2 inches.

3.7.3 Removal and Replacement of Full Slabs

Remove and replace slabs containing more than 15.0 percent of any longitudinal or transverse joint edge spalled. Where it is necessary to remove full slabs, remove in accordance with paragraph REMOVAL OF EXISTING PAVEMENT SLAB below. Remove and replace full depth, by full width of the slab, and the limit of removal normal to the paving lane and extend to each original joint. Compact and shape the underlying material as specified in the appropriate section of these specifications, and clean the surfaces of all four joint faces of all loose material and contaminants and coated with a double application of membrane forming curing compound as bond breaker. Install dowels of the size and spacing as specified for other joints in similar pavement by epoxy grouting them into holes drilled into the existing concrete using procedures as specified in paragraph Dowel Bars above. Provide dowels for all four edges of the new slab. Cut off original damaged dowels flush with the

joint face. Lightly oil or grease protruding portions of new dowels. Place concrete as specified for original construction. Take care to prevent any curing compound from contacting dowels. Prepare and seal the resulting joints around the new slab as specified for original construction.

3.7.4 Repairing Spalls Along Joints

Repair spalls along joints to be sealed to a depth to restore the full joint-face support prior to placing adjacent pavement. Where directed, repair spalls along joints of new slabs, along edges of adjacent existing concrete, and along parallel cracks by first making a vertical saw cut at least 3 inches outside the spalled area and to a depth of at least 2 inches. Provide saw cuts consisting of straight lines forming rectangular areas without sawing beyond the intersecting saw cut. Chip out the concrete between the saw cut and the joint, or crack, to remove all unsound concrete and into at least 1/2 inch of visually sound concrete. Thoroughly clean the cavity thus formed with high pressure water jets supplemented with oil-free compressed air to remove all loose material. Immediately before filling the cavity, apply a prime coat to the dry cleaned surface of all sides and bottom of the cavity, except any joint face. Apply the prime coat in a thin coating and scrubbed into the surface with a stiff-bristle brush. Provide prime coat for portland cement repairs consisting of a neat cement grout and for epoxy resin repairs consisting of epoxy resin, Type III, Grade 1. Fill the prepared cavity with material identified in the following table based on the cavity volume.

Spall Repairs	
Volume of Prepared Cavity After Removal Operations	Material
less than 0.03 cubic foot	epoxy resin mortar or epoxy resin or latex modified mortar
0.03 cubic foot and 1/3 cubic foot	Portland cement mortar
more than 1/3 cubic foot	Portland cement concrete or latex modified mortar

Provide portland cement concretes and mortars that consist of very low slump mixtures, 1/2 inch slump or less, proportioned, mixed, placed, consolidated by tamping, and cured, all as directed. Provide epoxy resin mortars made with Type III, Grade 1, epoxy resin, using proportions and mixing and placing procedures as recommended by the manufacturer and approved. Proprietary patching materials may be used, subject to Government approval. Place the epoxy resin materials in the cavity in layers with a maximum thickness of 2 inches. Provide adequate time between placement of additional layers such that the temperature of the epoxy resin material does not exceed 140 degrees F at any time during hardening. Provide mechanical vibrators and hand tampers to consolidate the concrete or mortar. Remove any repair material on the surrounding surfaces of the existing concrete before it hardens. Where the spalled area abuts a joint, provide an insert or other bond-breaking medium to prevent bond at the joint face. Saw a reservoir for the joint sealant to the dimensions required for other joints. Thoroughly clean the reservoir and then sealed with the sealer specified for the joints. In lieu of

sawing, spalls not adjacent to joints and popouts, both less than 6 inches in maximum dimension, may be prepared by drilling a core 2 inches in diameter greater than the size of the defect, centered over the defect, and 2 inches deep or 1/2 inch into sound concrete, whichever is greater. Repair the core hole as specified above for other spalls.

3.7.5 Repair of Weak Surfaces

Weak surfaces are defined as mortar-rich, rain-damaged, uncured, or containing exposed voids or deleterious materials. Diamond grind slabs containing weak surfaces less than 1/4 inch thick to remove the weak surface. Diamond grind in accordance with paragraph Diamond Grinding. All diamond ground areas are required to meet the thickness, smoothness and grade criteria specified in PART 1 GENERAL. Remove and replace slabs containing weak surfaces greater than 1/4 inch thick.

3.7.6 Repair of Pilot Lane Vertical Faces

Repair excessive edge slump and joint face deformation while concrete is in a plastic state by approved methods.

3.8 FIELD QUALITY CONTROL

3.8.1 Sampling

Collect samples of fresh concrete in accordance with ASTM C172/C172M during each working day as required to perform tests specified herein. Make test specimens in accordance with ASTM C31/C31M.

3.8.2 Consistency Tests

Perform concrete slump tests in accordance with ASTM C143/C143M. Take samples for slump determination from concrete during placement. Perform tests at the beginning of a concrete placement operation and for each batch (minimum) or every 20 cubic yards (maximum) of concrete to ensure that specification requirements are met. In addition, perform tests each time test beams are made. When slump is outside target limits, test every load until two consectuive tests indicate that the slump is within target limits.

3.8.3 Flexural Strength Tests

Test for flexural strength in accordance with ASTM C78/C78M. Fabricate and cure four test specimens in accordance with ASTM C31/C31M for each set of tests. Test two specimens at 7 days, and the other two at 28 days. Concrete strength will be considered satisfactory when the minimum of the 28-day test results equals or exceeds the specified 28-day flexural strength, and no individual strength test is less than the tolerance indicated on Table 1. If the ratio of the 7-day strength test to the specified 28-day strength is less than 65 percent, make necessary adjustments for conformance. Fabricate, cure and test a minimum of one set of four beams for each shift of concrete placement. Remove concrete which is determined to be defective, based on the strength acceptance criteria therein, and replace with acceptable concrete.

3.8.4 Air Content Tests

Test air-entrained concrete for air content at the same frequency as specified for slump tests. Determine percentage of air in accordance with

ASTM C231/C231M on samples taken during placement of concrete in forms. When air content is outside target limits, test every load until two consectuive tests indicate that the air content is within target limits.

3.8.5 Surface Testing

Surface testing for surface smoothness, edge slump and plan grade must be performed as indicated below by the Testing Laboratory. The measurements must be properly referenced in accordance with paving lane identification and stationing, and a report given to the Contracting Officer within 24 hours after measurement is made. Use the profilograph method for all longitudinal testing, except for paving lanes less than 200 feet in length. Use the straightedge method for transverse testing, for longitudinal testing where the length of each pavement lane is less than 200 feet, and at the ends of the paving limits for the project. Smoothness requirements do not apply over crowns, drainage structures, or similar penetrations. A final Surface Smoothness Report of surface testing, signed by a Registered Engineer, containing all surface measurements and a description of all actions taken to correct deficiencies, must be provided to the Contracting Officer upon conclusion of surface testing..

3.8.5.1 Straightedge Testing Method

Test the surface of the pavement with the straightedge to identify all surface irregularities exceeding the tolerances specified in Table 1. Test the entire area of the pavement in both a longitudinal and a transverse direction on parallel lines approximately 15 feet apart. Hold the straightedge in contact with the surface and move ahead one-half the length of the straightedge for each successive measurement. Determine the amount of surface irregularity by placing the straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length and measuring the maximum gap between the straightedge and the pavement surface, in the area between these two high points.

3.8.5.2 Profilograph Testing Method

Perform profilograph testing using approved California profilograph and procedures described in ASTM E1274. Utilize electronic recording and automatic computerized reduction of data equipment to indicate "must-grind" bumps and the Profile Index for each 0.1 mile segment of the day's paving. Accommodate grade breaks on parking lots by breaking the profile segment into short sections and repositioning the blanking band on each section. Provide the "blanking band" of 0.2 inch wide and the "bump template" span 1 inch with an offset of 0.4 inch. Count the profilograph testing of the last 30 feet of a paving lane in the longitudinal direction from each day's paving operation on the following day's continuation lane. Compute the profile index for each pass of the profilograph (3 per lane) in each 0.1 mile segment. The profile index for each segment is the average of the profile indices for each pass in each segment. Scale and proportion profilographs of unequal lengths to an equivalent 0.1 mile as outlined in the ASTM E1274. Submit a copy of the reduced tapes to the Government at the end of each day's testing.

3.8.5.3 "Bumps" (Must Grind Areas)

Reduce any bumps ("must grind" areas) shown on the profilograph trace which exceed 0.4 inch in height by diamond grinding in accordance with subparagraph Diamond Grinding until they do not exceed 0.3 inch when

retested. Taper such diamond grinding in all directions to provide smooth transitions to areas not requiring diamond grinding.

3.8.5.4 Diamond Grinding

Those performing diamond grinding are required to have a minimum of three years experience in diamond grinding of rigid concrete pavements. In areas not meeting the specified limits for surface smoothness and plan grade, reduce high areas to attain the required smoothness and grade, except as depth is limited below. Reduce high areas by diamond grinding the hardened concrete with an approved equipment after the concrete is at a minimum age of 14 days. Perform diamond grinding by sawing with an industrial diamond abrasive which is impregnated in the saw blades. Assemble the saw blades in a cutting head mounted on a machine designed specifically for diamond grinding that produces the required texture and smoothness level without damage to the concrete pavement or joint faces. Provide diamond grinding equipment with saw blades that are 1/8-inch wide, a minimum of 60 blades per 12 inches of cutting head width, and capable of cutting a path a minimum of 3 ft wide. Diamond grinding equipment that causes ravels, aggregate fractures, spalls or disturbance to the joints is not permitted. The maximum area corrected by diamond grinding the surface of the hardened concrete is 10 percent of the total area of a day's production. The maximum depth of diamond grinding is 1/4 inch. Provide diamond grinding machine equipped to flush and vacuum the pavement surface. Dispose of all debris from diamond grinding operations off Government property. Prior to diamond grinding, submit a Diamond Grinding Plan for review and approval. At a minimum, include the daily reports for the deficient areas, the location and extent of deficiencies, corrective actions, and equipment. Remove and replace all pavement areas requiring plan grade or surface smoothness corrections in excess of the limits specified in Table 1. All areas in which diamond grinding has been performed are subject to the thickness tolerances specified in Table 1.

3.8.6 Plan Grade Testing and Conformance

Within 5 days after each day's paving, test the finished surface of the pavement area by running lines of levels at intervals corresponding with every longitudinal and transverse joint to determine the elevation at each joint intersection. Record the results of this survey and submit a copy to the Government at the completion of the survey.

3.8.7 Edge Slump

Test the pavement surface to determine edge slump immediately after the concrete has hardened sufficiently to permit walking thereon. Perform testing with a minimum 12 foot straightedge to reveal irregularities exceeding the edge slump tolerance specified in Table 1. Determine the vertical edge slump at each free edge of each slipformed paving lane constructed. Place the straightedge transverse to the direction of paving and the end of the straightedge located at the edge of the paving lane. Record measurements at 5 to 10 foot spacings, as directed, commencing at the header where paving was started. Initially record measurements at 5 foot intervals in each lane. When no deficiencies are present after 5 measurements, the interval may be increased. The maximum interval is 10 feet. When any deficiencies exist, return the interval to 5 feet. In addition to the transverse edge slump determination above, at the same time, record the longitudinal surface smoothness of the joint on a continuous line 1 inch back from the joint line using the minimum 12 foot straightedge advanced one-half its length for each reading. Perform other

tests of the exposed joint face to ensure that a uniform, true vertical joint face is attained. Properly reference all recorded measurements in accordance with paving lane identification and stationing, and submit a report within 24 hours after measurement is made. Identify areas requiring replacement within the report.

3.8.8 Test for Pavement Thickness

Take full depth cores of 4 inch diameter of concrete pavement every 4000 square feet in accordance with ASTM C42/C42M. Measure thickness in accordance with ASTM C1542/C1542M. Record and submit testing, inspection, and evaluation of each core for surface paste, uniformity of aggregate distribution, segregation, voids, cracks, and depth of reinforcement or dowel (if present). Moisten the core with water to visibly expose the aggregate and take a minimum of three photographs of the sides of the core, rotating the core approximately 120 degrees between photographs. Include a ruler for scale in the photographs. Submit plan view of location for each core.

3.8.9 Reinforcement

Inspect reinforcement prior to installation to verify it is free of loose flaky rust, loose scale, oil, mud, or other objectionable material.

3.8.10 Dowels

Inspect dowel placement prior to placing concrete to verify that dowels are of the size indicated, and are spaced, aligned and painted and oiled as specified. Do not permit dowels to exceed the tolerances shown in paragraph: DOWEL BARS.

-- End of Section --

Pavement Thickness Report
U.S. Army Corps of Engineers
PCASE Version 2.09.06
Date : 10/27/2020

Design Name :	COMPOUND PCC
Design Type :	Roads
Pavement Type :	Rigid
Road Type :	Road
Terrain Type :	Flat
Analysis Type :	K
Depth of Frost (in) :	0
Wander Width (in) :	33.35
% Load Transfer :	0
Effective K (pci) :	262
Reduced Sub Effective K (pci) :	0
Joint Spacing :	10 to 15 ft
Dowel Spacing :	12.00 in
Dowel Length :	16.00 in
Dowel Diameter:	.75 in

Use 7.5" PCC on 6" ABC on 6" Subbase on Compacted Subgrade

NOTE: the M1070 Tractor with M1000 Trailer carrying an M1A1 Abrams tank governs the design
.
NOTE: car & pickup traffic are irrelevant to the result, therefore were not listed.

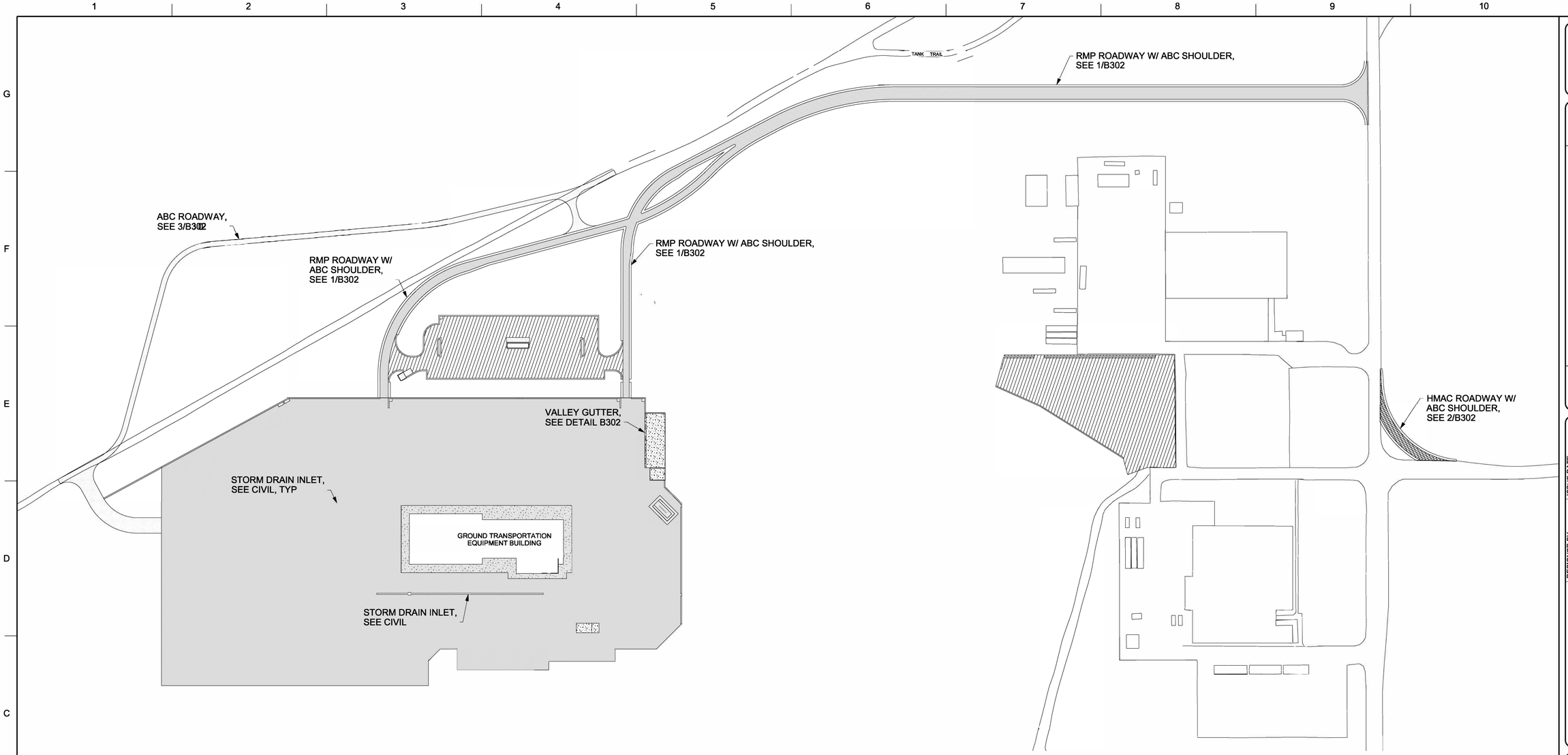
NOTE: Design subgrade K=150 is conservative, and based on limited CBR testing; PCASE model run with historical value of k=200 results in 7.14" PCC

Layer Information

Layer Type	Material Type	Frost Code	Moisture Content	Dry Unit Weight (lb/ft^3)	Flexural Strength (lb/ft^3)	CbCr (psi)	% Steel	Analysis	Non frost Design Thickness (in)	K Strength (pci)
PCC	NA	NFS	0	145	650	0	0	Compute	7.38	0
BASE	BASCA	NFS	5	135	0	0	0	Manual	12	0
SUBG	COHCUT	F3/F4	18	100	0	0	0	Manual	0	150

Traffic Information

Pattern Name	**FIO'S FGR**		
Vehicles	**Weight (lb)**	**Passes per Life Span"**	**Equivalent Passes**
M1070 HET TRACTOR W/M1000	229750	403000	403000
M1074 LOAD SYSTEM W/CRANE	140859	403000	19494
M1A1, MAIN TANK TRACKED	126000	403000	42631
M2A3, BRADLEY VEHICLE TRA	58200	403000	1322
P-23 CRASH TRUCK (FIRE TR	77880	300	142
STRYKER, RECON VEHICLE	43352	403000	310
M1070 HET TRACTOR W/M1000 TRL W/M1A1 TANK	229750		466899



GENERAL NOTES

1. SEE SHEETS B301 AND B302 FOR TYPICAL PAVEMENT SECTIONS AND DETAILS AND TYPICAL ROAD SECTIONS.
2. VERIFY SLOPE AND SLOPE DIRECTION OF ALL PAVEMENTS WITH CIVIL DRAWINGS
3. CONTRACTOR SHALL DEVELOP AND SUBMIT A JOINT LAYOUT PLAN FOR GOVERNMENT APPROVAL FOR ALL PCC PAVEMENTS ON THE PROJECT. ALL PCC PAVEMENT SHALL BE JOINTED IN ACCORDANCE WITH UFC 3 250 01 2016 AND THE FOLLOWING REQUIREMENTS:.
   A) JOINT SPACING SHALL BE 10' MINIMUM TO 15' MAXIMUM.
   B) ASPECT RATIO OF PCC PANELS SHALL NOT EXCEED 1.25.
   C) PCC PANELS NOT MEETING THE ABOVE REQUIREMENTS SHALL BE REINFORCED W/ #4 @ 18" OC EACH WAY.
   D) A THICKENED EDGE, 1.25 x PAVEMENT THICKNESS, SHALL BE PROVIDED AROUND THE PERIMETER OF ALL PCC PAVED AREAS. SEE DETAIL B-501.
   E) JOINTS SHALL BE IN ACCORDANCE WITH THE DETAILS SHOWN ON B-501.

N

PAVEMENT PLAN BASE BID - OVERALL

SCALE: 1" = 100'-0"

LEGEND

- RESIN MODIFIED HOT MIX ASPHALT PAVEMENT (RMP) SEE TYPICAL SECTIO B301 . SEE DRWG B101.OP FOR PCC OPT/ON.
- LIGHT DUTY HOT MIX ASPHALT PAVEMENT (HMAC) SEE TYPICAL SECTION B301
- HEAVY DUTY HOT MIX ASPHALT PAVEMENT (HMAC) SEE TYPICAL SECTION B301
- AGGREGATE BASE COURSE (ABC) ROADWAY SEE TYPICAL SECTION B301
- PORTLAND CEMENT CONCRETE (PCC) PAVEMENT SEE TYPICAL SECTION B301

AMENDMENT 4

1" = 100'-0" 0' 50' 100' 200' 300'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: F. FUENTES
DRAWN BY: M. MILLS
CHECKED BY: M. BONNER
SUBMITTED BY: ####
SIZE: ANSI D
ISSUE DATE: 21 FEB 2020
SOLICITATION NO.: ##########
CONTRACT NO.: ##########
DESIGN FILE NO: ######
FILE NAME: fr08c-101.dgn
SPEC NO: ####

U.S. ARMY CORPS OF ENGINEERS

AZ

GROUND TRANSPORT EQUIPMENT BUILDING

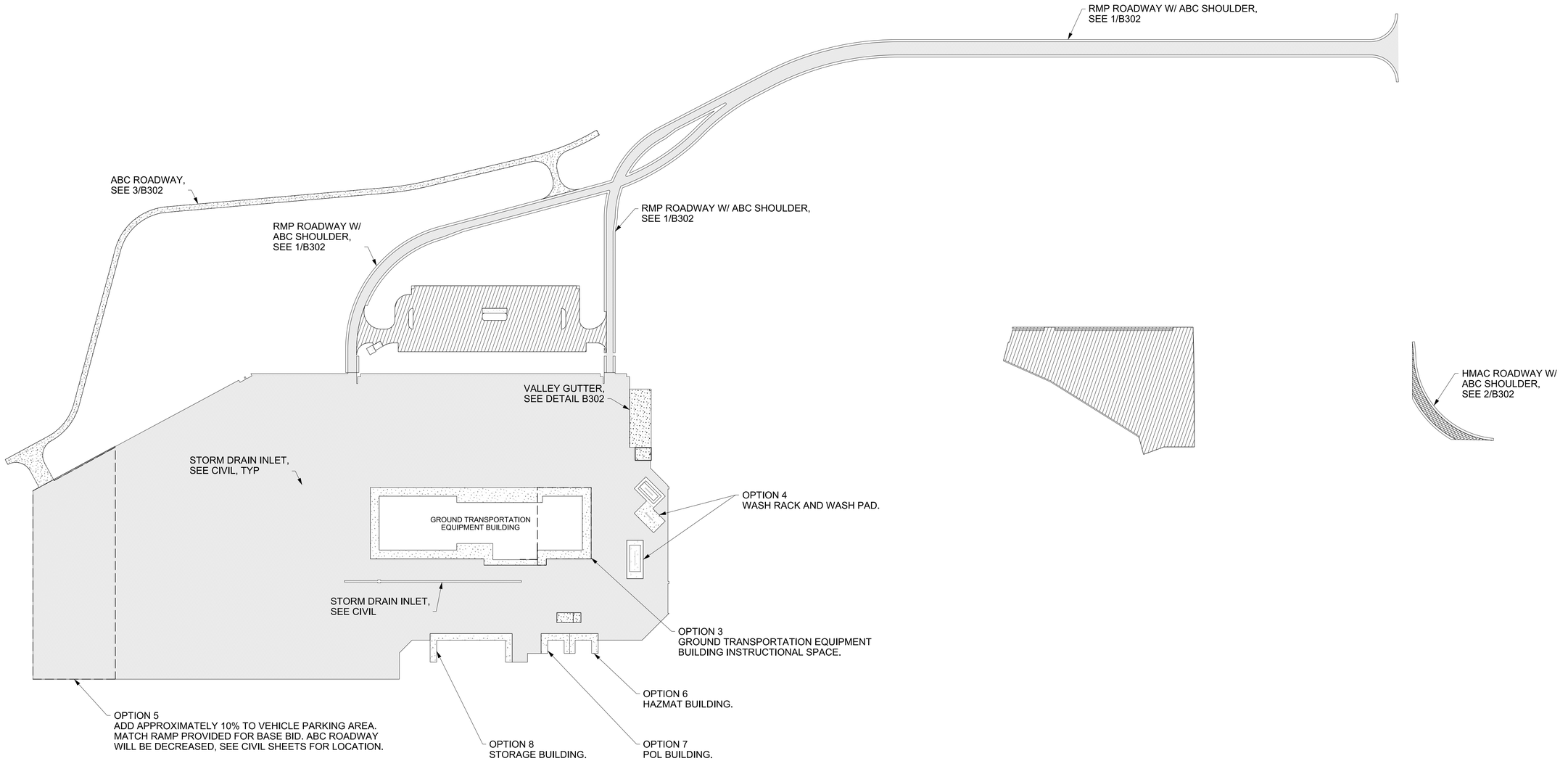
PAVEMENT PLAN BASE BID OVERALL

FT HUACHUCA

SHEET ID

B101

RTA



GENERAL NOTES

1. SEE SHEETS B301 AND B302 FOR TYPICAL PAVEMENT SECTIONS AND DETAILS AND TYPICAL ROAD SECTIONS.
2. VERIFY SLOPE AND SLOPE DIRECTION OF ALL PAVEMENTS WITH CIVIL DRAWINGS
3. CONTRACTOR SHALL DEVELOP AND SUBMIT A JOINT LAYOUT PLAN FOR GOVERNMENT APPROVAL FOR ALL PCC PAVEMENTS ON THE PROJECT. ALL PCC PAVEMENT SHALL BE JOINTED IN ACCORDANCE WITH UFC 3 250 01 2016 AND THE FOLLOWING REQUIREMENTS:.
   A) JOINT SPACING SHALL BE 10' MINIMUM TO 15' MAXIMUM.
   B) ASPECT RATIO OF PCC PANELS SHALL NOT EXCEED 1.25.
   C) PCC PANELS NOT MEETING THE ABOVE REQUIREMENTS SHALL BE REINFORCED W/ #4 @ 18" OC EACH WAY.
   D) A THICKENED EDGE, 1.25 x PAVEMENT THICKNESS, SHALL BE PROVIDED AROUND THE PERIMETER OF ALL PCC PAVED AREAS. SEE DETAIL B-501.
   E) JOINTS SHALL BE IN ACCORDANCE WITH THE DETAILS SHOWN ON B-501.

PAVEMENT PLAN - OVERALL OPTIONS

SCALE: 1" = 100'-0"

PCC NOTE 1

CONTRACTOR SHALL HAVE OPTION OF USING PCC OR RMP PAVMENT. SEE APPENDIX 3 -PCC DETAILS. SPEC 31 11 20 SUBASES FOR FLEXIBLE PAVING SHALL BE USED FOR PCC PAVMENT. SEE NEW SPEC SECTIONS 32 01 19.61 & 32 13 13.06 ADDED VIA AMENDMENT 4.

PCC SECTION

7.5-INCHES PCC ON
6-INCHES AGREEGATE BASE ON
6-INCHES SUBBASE ON
COMPACTED SUBGRADE

LEGEND

- RESIN MODIFIED HOT MIX ASPHALT PAVEMENT (RMP) SEE TYPICAL SECTION B301 OR PORTLAND CEMENT CONCRETE PAVEMENT (PCC). SEE PCC NOTE 1.
- LIGHT DUTY HOT MIX ASPHALT PAVEMENT (HMAC) SEE TYPICAL SECTION B301
- HEAVY DUTY HOT MIX ASPHALT PAVEMENT (HMAC) SEE TYPICAL SECTION B301
- AGGREGATE BASE COURSE (ABC) ROADWAY SEE TYPICAL SECTION B301
- PORTLAND CEMENT CONCRETE (PCC) PAVEMENT SEE TYPICAL SECTION B301

AMENDMENT 4

1" = 100'-0" (0' 50' 100' 200' 300')

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY:	F. FUENTES
DRAWN BY:	M. MILLS
CHECKED BY:	M. BONNER
SUBMITTED BY:	#####
SIZE:	ANSI D
ISSUE DATE:	21 FEB 2020
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FILE NAME:	fy08c101.dgn
SPEC NO:	####

U.S. ARMY CORPS OF ENGINEERS

AZ

GROUND TRANSPORT EQUIPMENT BUILDING

PAVEMENT PLAN - OVERALL OPTIONS

FT HUACHUCA

SHEET ID

B101.OP

RTA

NOTE: UNITS DESIGNATED WITH (*) SHALL BE PROVIDED IN PLACE OF COUNTERPART IF OPTION 3 IS NOT EXERCISED.

HOT WATER BOILER SCHEDULE

MARK	LOCATION (ROOM)	TYPE	FUEL TYPE	MAX INPUT (MBH)	MIN OUTPUT (MBH)	RATED EFFICIENCY (%)	GPM	EWT (°F)	LWT (°F)	MAX P.D. (FT H2O)	MIN GPM	AIR INTAKE DIA. (IN)	VENT DIA. (IN)	ELECTRICAL	NOTES
B-1	MECHANICAL 131	CONDENSING WATERTUBE	NG	700	568	94	32	108	140	10	20	4	6	120/1/60	1, 2, 3, 5
B-1*	MECHANICAL 131	CONDENSING FIRE-TUBE	NG	285	185	94	11	110	140	10	1.5	3	3	120/1/60	1, 2, 3, 4

1. PROVIDE WITH CONDENSATE NEUTRALIZING FILTER KIT ROUTED TO NEARBY FLOOR SINK.
2. SIZE INTAKE AND VENT DIAMETERS BASED ON CHOSEN MANUFACTURER'S WRITTEN RECOMMENDATIONS.
3. MINIMUM OUTPUT SHOWN ASSUMES BOILER MUST BE DE-RATED 2% PER 1,000 FT ABOVE SEA LEVEL. PROJECT ELEVATION = 4,900 FT.
4. PROVIDE UNIT IF OPTION 3 IS NOT EXERCISED.
5. PROVIDE UNIT IF OPTION 3 IS EXERCISED.

1

VAV TERMINAL UNIT SCHEDULE

MARK	AIRFLOW				REHEAT COIL						CONTROL VALVE	VALVE CV	NOTES
	COOLING (CFM)	HEATING (CFM)	MAX AIR PRESSURE DROP (IN. W.G.)	INLET SIZE (IN)	MIN COIL CAPACITY (MBH)	ENTERING AIR TEMP (°F)	LEAVING AIR TEMP (°F)	GPM	MAX WATER PRESSURE DROP (FT. H2O)	EWT (°F)			
ATU-101	210	120	0.35	4	5.5	55	105	0.5	4	140	2-WAY	1.8	
ATU-102	910	470	0.35	10	21.6	55	105	1.1	4	140	2-WAY	2.7	
ATU-103	280	230	0.35	5	10.6	55	105	0.9	4	140	2-WAY	1.6	
ATU-104	880	440	0.35	8	19.9	55	105	1.6	4	140	2-WAY	4.5	
ATU-105	140	70	0.35	4	3.2	55	105	0.6	4	140	2-WAY	1.2	
ATU-106	840	420	0.35	8	19.1	55	105	1.5	4	140	3-WAY	4.3	
ATU-107	1070	535	0.35	10	24.5	55	105	1.3	4	140	2-WAY	2.7	
ATU-108	650	325	0.35	8	14.6	55	105	1.0	4	140	3-WAY	4.1	
ATU-109	1500	1160	0.90	12	52.5	55	105	3.9	4	140	2-WAY	5.3	1
ATU-110	1740	1280	0.90	12	57.9	55	105	4.8	4	140	3-WAY	5.4	1
ATU-111	1500	1160	0.90	12	52.5	55	105	3.9	4	140	2-WAY	5.3	1
ATU-112	1500	1160	0.90	12	52.5	55	105	3.9	4	140	2-WAY	5.3	1

1. PROVIDE UNIT IF OPTION 3 IS EXERCISED.

1

AIR-COOLED CHILLER SCHEDULE

MARK	LOCATION	MIN CAPACITY (TONS)	MIN IPLV (EER)	EVAPORATOR DATA						CONDENSER DATA			COMPRESSOR TYPE	COMPRESSOR QTY	MAX POWER (KW)	ELECTRICAL	WEIGHT (LBS)	NOTES
				GPM	EWT (°F)	LWT (°F)	MAX. P.D. (FT H2O)	MIN GPM	% GLYCOL	AMBIENT TEMP (°F)	FAN QTY	REFRIGERANT TYPE						
CH-1	MECHANICAL YARD	47.5	14	100	54	42	15	68	20	100	6	R410A	SCROLL	4	70	460/3/60	5,000	1, 3
CH-1*	MECHANICAL YARD	16.6	14	35	54	42	15	24	20	100	2	R410A	SCROLL	2	25	460/3/60	2,200	1, 2

1. MINIMUM CAPACITY SHOWN IS REQUIRED AFTER TAKING INTO ACCOUNT PERFORMANCE AT 4,900 FT ELEVATION. SELECT UNIT THAT CAN MEET OUTPUT BASED ON MANUFACTURER'S RECOMMENDATIONS FOR ELEVATION LOSSES.
2. PROVIDE UNIT IF OPTION 3 IS NOT EXERCISED.
3. PROVIDE UNIT IF OPTION 3 IS EXERCISED.

HYDRONIC WATER PUMP SCHEDULE

MARK	TYPE	SERVICE	GPM	HEAD (FT H2O)	PROPYLENE GLYCOL (%)	MOTOR			MIN. EFFICIENCY	VFD / ECM	NOTES
						RPM	HP	ELECTRICAL			
BP-1	CLOSE COUPLED IN-LINE CENTRIFUGAL	PRIMARY HOT WATER	32	15	0	1800	1/3	120/1/60	60	NO	
BP-1*	CLOSE COUPLED IN-LINE CENTRIFUGAL	PRIMARY HOT WATER	11	15	0	1800	1/3	120/1/60	49	NO	1
HWP-1	BASE MOUNTED END SUCTION	SECONDARY HOT WATER	32	50	0	3600	1.5	460/60/3	55	YES	
HWP-1*	IN-LINE	SECONDARY HOT WATER	11	42	0	3600	1/2	460/60/3	--	YES	1
HWP-2	BASE MOUNTED END SUCTION	SECONDARY HOT WATER	32	50	0	3600	1.5	460/60/3	55	YES	
HWP-2*	IN-LINE	SECONDARY HOT WATER	11	42	0	3600	1/2	460/60/3	--	YES	1
CWP-1	BASE MOUNTED END SUCTION	PRIMARY CHILLED WATER	100	68	20	3600	5	460/60/3	70	YES	
CWP-1*	BASE MOUNTED END SUCTION	PRIMARY CHILLED WATER	35	68	20	3600	2	460/60/3	61	YES	1
CWP-2	BASE MOUNTED END SUCTION	PRIMARY CHILLED WATER	100	68	20	3600	5	460/60/3	70	YES	
CWP-2*	BASE MOUNTED END SUCTION	PRIMARY CHILLED WATER	35	68	20	3600	2	460/60/3	61	YES	1

1. PROVIDE UNIT IF OPTION 3 IS EXERCISED.

HYDRONIC EXPANSION TANK SCHEDULE

MARK	LOCATION (ROOM)	SERVICE	TYPE	MIN VOLUME (GAL)	MIN ACCEPT. VOLUME (GAL)	CHARGE PRESSURE (PSI)	MAX OPERATING TEMP (°F)	MAX OPERATING PRESSURE (PSI)	NOTES
ET-1	MECHANICAL 131	HOT WATER	PRESSURIZED DIAPHRAGM	5.3	1.9	12	240	100	
ET-2	MECHANICAL 131	CHILLED WATER	PRESSURIZED DIAPHRAGM	4	1.5	12	240	100	

AIR SEPARATOR SCHEDULE

MARK	LOCATION (ROOM)	GPM	MAX. WATER PRESSURE DROP (FT WC)	SERVICE	NOTES
AST-1	MECHANICAL 131	32	2	HOT WATER	
AST-1*	MECHANICAL 131	11	2	HOT WATER	1
AST-2	MECHANICAL 131	100	4	CHILLED WATER	
AST-2*	MECHANICAL 131	35	4	CHILLED WATER	1

1. PROVIDE UNIT IF OPTION 3 IS EXERCISED.

CHILLED WATER BUFFER TANK SCHEDULE

MARK	LOCATION	CAPACITY (GAL)	TYPE	SYSTEM	NOTES
BT-1	MECHANICAL 131	120	VERTICAL	CHILLED WATER	1

1. ASME STAMPED, 125 PSI RATED WORKING PRESSURE.

US Army Corps of Engineers ®

MARK	DESCRIPTION	DATE	APPR.
1	AM-04: REVISED SCHEDULE NOTES.	26 OCT 2020	

Designed by: J. STONE | Drawn By: J. STONE | Submittal Status: RTA | Reviewed by: S. BARMANN | Submitted by: /s/ Timothy A. Lee, P.E. Chief, Mechanical Design Section

Date: 13 JUL 2020 | Rev: | Spec No: 2145 | Project No: | File No: 233-25-0665 | File Name: W65M_GTEB | Size: 22" x 34" | Plot Scale: | Plot Date: 10/26/2020 10:22:33 AM

US ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN-HOUSE DESIGN
1325 J STREET
SACRAMENTO, CA 95814

FT. HUACHUCA AZ

GROUND TRANSPORT EQUIPMENT BUILDING

HVAC SCHEDULES

SHEET IDENTIFICATION
M-602

FIBERQUANT ANALYTICAL SERVICES

Polarized Light Microscope (PLM) Analysis for Asbestos in Bulk Sample

JobNumber:	**202009616**

Client: **FACILITY SERVICES MANAGEMENT**

CLARKSTON RD BLDG 30033

FT HUACHUCA, AZ 85613-0000

Office Phone: (520) 533-5906

FAX:

 # Samples: 4 PLM **Rec:** 10/21/2020 **Method:** EPA 600/R-93/116 The "New" Method; see below

Client Job: 1-9625624 **PO Number:** 68048

Report Date: 10/26/2020 **Date Analyzed:** 10/26/2020 **Routing Number:** -

Method and Analysis Information: **Fiberquant Internal SOP:** PLMn

Each bulk sample is first dissected under a 7-30x magnification stereo-microscope. This examination is used to determine the general type of sample, how many and what type of layers it has, and initial estimates of fiber types and quantities. Second, liquid media mounts are made of each layer - such mounts may be of selected fibers (used solely for identification purposes) or may be representative of the layer as a whole (used for quantitation purposes). The mounts may be made in a synthetic Canadian balsam, one of several solvents, or in refractive index oils (media of known refractive index). Generally, a variety of different mounts are made: some optimized for fiber visibility, some optimized for fiber identification, and some optimized for fiber quantitation. The mounted slides are then examined at 50-400x magnification on a Nikon Labphot-pol microscope. Optical characteristics are used to identify each observed fiber type; the optical data are contained for each sample on its detail analysis sheet, attached.

Current EPA and NESHAP regulations designate a result of ≤1 % asbestos as "negative" or "non-regulated"and >1 % asbestos as "positive" or "regulated." Samples containing layers that have been determined to be "positive" may have to be handled differently during a renovation or demolition than samples whose layers have been determined to be "negative." OSHA under CFR 1926.1101 regulates work done involving any detectable concentration of asbestos.

The method of fiber identification and quantitation is the "Standard Operating Procedures for the Analysis of Asbestos in Bulk Samples using Polarized Light Microscopy", Chapter 7 of the Quality Assurance and Management Manual. This SOP and its associated reporting have been designed to satisfy all requirements in both EPA Method 600/M4-82-020 (The Interim Method) and EPA Method 600/R-93/116 (The New Method). The Interim Method is the required method for AHERA (US EPA 40 CFR Pt. 763), but this method calls for the reporting of composited results of multi-layered samples that is no longer an acceptable reporting practice in most circumstances. Current EPA rules, such as NESHAP (US EPA 40 CFR Pt. 61), as well as NVLAP accreditation policies, call for separate reporting for each layer of multi-layered samples. The New Method contains the same procedures for identification and quantification of asbestos as does the Interim Method, except that multi-layered samples are reported to comply with the latest US EPA rule. Fiberquant not only reports the asbestos content of each layer of multi-layered samples separately (satisfying current EPA and NVLAP reporting requirements), but Fiberquant also reports what percentage of the sample each layer comprises. Therefore, the results may be arithmetically composited to satisfy the reporting requirements of the Interim Method. The method of fiber quantitation is an estimation technique in which the analysts quantitation is routinely calibrated by reference quantitation standards, and which has been shown to be equivalent in precision and accuracy to point counting. Friability is estimated for the purposes of deciding when to point count. Friabilities determined in the field take precedence over those determined in the laboratory. Those sample layers which are friable and estimated by the analyst to contain <= 1% asbestos are point counted using 400 points. Such point counting is required by NESHAP (National Emission Standards for Hazardous Air Polutants, Nov. 1990) in order to rely on analytical results that are ≤ 1%. The coefficient of variation for the estimation quantitation technique is 100% in the range 0-5%. This means that PLM analysis is not capable of conclusively determining whether a layer containing close to 1% asbestos is actually "positive" or "negative". For this reason, Fiberquant refers to results where asbestos was detected but ≤ 1% as "borderline negative", and results where asbestos was >1 % but <= 2% as "borderline positive" to indicate the uncertainty in assigning a "positive" or "negative" label. In the sample summary, "ND" means that no asbestos was detected during the analysis. A "Tr" or "Trace" of asbestos reported is defined for our purposes as the detection of several asbestos fibers during the analysis; this level would be right at the limit of detection for the method. Trace is only reported on the analysis detail - in the summary a trace would be reported as <=1%. The limit of detection (the smallest % of asbestos that can be detected) varies greatly depending on the matrix in which the asbestos is found. As little as 0.001% asbestos can be detected in favorable samples, while detection in unfavorable samples may approach the detection limit of 1% stated in the method. During the analysis, the analyst, for Fiberquant identification purposes only, determines the "apparent sample type" and "apparent layer types." It must be emphasized that these types are only what is apparent. Often, different materials appear similar or identical after sampling, so the analyst may assign a type other than what was sampled.

Floor tiles present a special problem for PLM asbestos analysis. Floor tile can contain chrysotile fibers so thin that they cannot be resolved by optical methods. In such a case, we may observe a percentage of asbestos which is lower than the actual percentage, or not observe asbestos at all when some is present. For this reason, floor tiles reported as negative should be confirmed to be negative using transmission electron microscope (TEM) analysis. Likewise, vermiculite insulation materials containing traces of asbestiform asbestos present a problem for routine PLM analysis - the amphiboles are sometimes present in trace amounts inhomogeneously distributed. For this reason, loose vermiculite samples reported as negative should be confirmed to contain no amphibole using hydroseparation techniques.

The samples were analyzed under the following ongoing quality assurance program: Blank samples are routinely analyzed to maintain contamination-free materials. Each analyst has at least a bachelor's degree in physical science, and has also completed extensive training specific to asbestos analysis for 1-3 months before being allowed to analyze client samples. Qualitative reference samples are routinely analyzed to assure that analysts

can identify asbestos and asbestos-look-alike fibers. Quantitative reference samples are routinely analyzed to calibrate and characterize the estimation procedure. Microscope alignment is checked each day. Refractive index oils are calibrated at least quarterly. At least 10% of client samples are re-analyzed from scratch by a different analyst than the original, and any discrepancies are resolved for the sample and similar sample types before the results are reported. All quality checks performed for these samples were in control except as detailed in the "Analytical Notes" below. All analysts participate in interlab round robins and proficiency testing to assure competence. Fiberquant is accredited by NVLAP (Lab code #101031) for the analysis of bulk samples for asbestos using PLM. Accreditation does not imply endorsement by the EPA, any other United States governmental agency or any private agency or association. Each lab analysis refers only to the sample tested, and may not, due to the sampling process, be representative of the material sampled. This report may not be reproduced except in full, without the approval of Fiberquant Analytical Services.

Some results may have been calculated using client supplied data, such as volume or area sampled, for which Fiberquant assumes no liability for accuracy.

Job Analysis Notes:

PLM Analysis Summary: **Job Number: 202009616** 1-9625624

Sample Number / Layer	Color	Apparent Layer Type *	Lab Number / *Asbestos Results*	Apparent Sample Type *	Asbestos Detected Yes or No
Sample # **68048-01**			2020-09616- 1	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **68048-02**			2020-09616- 2	Insulation	Asbestos Detected? No
Layer # 1	off-white	insulation wrap	*no asbestos detected*		
Layer # 2	yellow	insulation	*no asbestos detected*		
Sample # **68048-03**			2020-09616- 3	Wall System	Asbestos Detected? No
Layer # 1	various	paint	*no asbestos detected*		
Layer # 2	white	texture/joint compound	*no asbestos detected*		
Layer # 3	tan	paper/cardboard	*no asbestos detected*		
Layer # 4	white	drywall core	*no asbestos detected*		
Sample # **68048-04**			2020-09616- 4	Miscellaneous	Asbestos Detected? No
Layer # 1	tan	base cove	*no asbestos detected*		
Layer # 2	off-white	mastic	*no asbestos detected*		

* Apparent Sample Types and Apparent Layer Types are as they appeared to the analyst. Since many types of materials appear similar after sampling damage, the apparent type of material may not be the actual type of material.

Sample 68048-01 **Lab Number** 2020-09616- 1 **Sampled:** 10/20/2020 **Condition:** acceptable

Analyzed By MCJ 10/26/2020 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid

Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No

Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note

Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample 68048-02 **Lab Number** 2020-09616- 2 **Sampled:** 10/20/2020 **Condition:** acceptable

Analyzed By MCJ 10/26/2020 **An?** OK **Apparent Smp Type** Insulation Fibrous Mat

Homogeneous No **# Layers** 2 **Asbestos Detected?** No

Non-Fibrous Components (in approx. decreasing order): polymer, powder, metal

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	insulation wrap	50	off-white	2	40-50%	5-10%	-	-	-	-
2	insulation	50	yellow	3	n.d.	90-100%	-	-	-	-
	Total %	100		**Overall %**	20-30%	50-60%	-	-	-	-
				Fiber Identification:	cellulose fiber	glass fiber				

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	cellulose fiber	W	F	N	N	H	+	U					
2	glass fiber	CL	D	Y									
3													
4													
5													
6													

Sample Analytical Note

Procedure: tweased apart using forceps. Procedure: dissolution of polymer matrix using solvent.

Sample 68048-03 **Lab Number** 2020-09616- 3 **Sampled:** 10/20/2020 **Condition:** acceptable

Analyzed By MCJ 10/26/2020 **An?** OK **Apparent Smp Type** Wall System Fibrous Solid

Homogeneous No **# Layers** 4 **Asbestos Detected?** No

Non-Fibrous Components (in approx. decreasing order): powder, binder,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	paint	1	various	1	n.d.	n.d.	-	-	-	-
2	texture/joint compound	15	white	3	n.d.	n.d.	-	-	-	-
3	paper/cardboard	5	tan	2	90-100%	n.d.	-	-	-	-
4	drywall core	79	white	3	n.d.	<=1%	-	-	-	-
	Total %	100		**Overall %**	2-5%	<=1%	-	-	-	-
				Fiber Identification:	cellulose fiber	cellulose fiber				

Fibers

		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	cellulose fiber	W	F	N	N	H	+	U					
2	cellulose fiber	W	F	N	N	H	+	U					
3													
4													
5													
6													

Sample Analytical Note

Procedure: tweased apart using forceps. Procedure: dissolution of paint matrix using solvent. Procedure: dissolution of joint compound/texture matrix using acid.

Sample 68048-04 **Lab Number** 2020-09616- 4 **Sampled:** 10/20/2020 **Condition:** acceptable

Analyzed By MCJ 10/26/2020 **An?** OK **Apparent Smp Type** Miscellaneous Rubbery

Homogeneous No **# Layers** 2 **Asbestos Detected?** No

Non-Fibrous Components (in approx. decreasing order): polymer, filler,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	base cove	90	tan	1	n.d.	-	-	-	-	-
2	mastic	10	off-white	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers

		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note

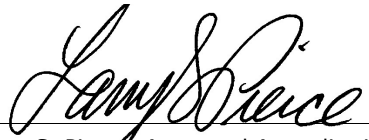
Procedure: tweased apart using forceps. Procedure: dissolution of polymer matrix using solvent. Minor adhering wall paint and/or texture, etc. not analyzed.

Fr=Friability: 1=very non-friable; 2= non-friable; 3=friable; 4=highly friable
Colors: B=black;BL=blue;BR=brown;CL=clear;G=Green;GY=gray;OR=orange;OW=off-white;PN=pink;PU=purple;R=red;TN=tan;W=white;Y=yellow;V=various
Fiber Morphology: A=fine fibers/bundles, white, sinewy, flexible; B=fine fibers/bundles, w-br, straight, broomed ends; C=fine fibers/bundles, blue, straight, broomed ends; D=fine to coarse fibers, CL-B, brittle; E=coarse fibers,CL or dyed, striated; F=coarse fibers or splinters, W-BR, ribbon-like; G=lath-like or shards, low aspect ratio, may taper
Iso=isotropism - may be yes or no; Pleo=pleochroism - may be yes or no; Bi=birefringence - may be None, Low, Medium or High
Elg=sign of elongation - may be +, - or B (both); Ext=extinction - may be Parallel, Oblique, None or Undulating; Oil=medium used to for dispersion staining
Col Par=dispersion staining colors parallel to the fiber (fiber/halo): b/w=black/white; dg/py=dark gray/pale yellow; vg/y=violet gray/yellow; db/ly=dark blue/lemon yellow; vb/g= vivid blue/gold; sb/o=sky blue/orange; pb/r=pale blue/red; gb/dr=gray blue/dark red; w/b=white/black. Col Perp=same only perpendicular to fiber.
RI Par=refractive index parallel to fiber; RI Perp=refractive index perpendicular to fiber

Analyst: MARK C. JEFFERSON

Printed: 26-Oct-20

Original Print Date: 26-Oct-20



Larry S. Pierce, Approved Accreditation Signatory

FIBERQUANT ANALYTICAL SERVICES

Fiberquant Analytical Services 5025 S. 33rd St.; Phoenix, AZ 85040; Phone: 602-276-6139; FAX: 602-276-4558; info@fiberquant.com

Analysis Request/Chain-of-Custody Form

Submitted by (Company)	Facility Services Management
Address	Clarkson RD Building 30033
City, State, Zip Code	Fort Huachuca, AZ 85613
Phone 520-533-5906	FAX N/A
Email	william.j.barnes88.ctr@mail.mil

Invoice to (Company)	Department of Public Works
Address	3040 Butler Road Building 22422
City, State, Zip Code	Fort Huachuca, AZ 85613
Phone 520-533-2837	FAX 520-533-2227

Contact (print)	Billy Barnes
Sampled by (signature)	
Job Number or Project Name	1-96625624
PO Number	68048

Analysis Method Requested ONLY ONE METHOD per COC			Turn-around-time (circle one) Rush		Norm.	Ext.
Asbestos by **PLM**	Improved ☐ Interim ☐ Analyze: ☐ All or ☐ ATPF If ATPF then by: Layer ☐ or Sample ☐ Single Layer Protocol: Yes ☐ No ☐		Urg. Rush <3 hrs ☐	<6 hrs ☐	1-3 days ☒	15-30 days ☐
Fibers by **PCM**	7400(Area) ☐ ORM (Personal) ☐		<4 hr ☐		24hr ☐	-
Asbestos by **TEM**	AIR: AHERA ☐ Mod. AHERA ☐		<6hr ☐		24 hr ☐	3-5d ☐
	Water*: Water ☐ Sludge ☐		1-2d ☐		3-5d ☐	N/A
	Annex2 : Chatfield ☐ Full ☐					
	Vacuum Dust (ASTM)		3-5d ☐		5-10d ☐	N/A
Pb by **FLAA**	Analyte:	Pb Other	<6 hrs ☐		2-3 days ☐	N/A
	Matrix:	Filter: MCE ☐				
		Paint: by Area ☐ by Weight ☐				
		Soil ☐				
		Wipe ☐				
	Initial here certifying wipes used are ASTM E1792 compliant ☐					
Fungi	Air Sample:	Zef ☐ Aller ☐ Oth ☐	<6 hrs ☐		1-2 days ☐	N/A
	Bulk:	Sample ☐ Swab ☐				
	Tape:	Qualitative (%) ☐ or Quantitative (cm2) ☐				
Soot	ASTM D6602-03B	Optical	<6r ☐		1-2 days ☐	N/A
		Optical & TEM	1-2 days ☐		3-5days ☐	N/A
Other			Call		Call	

Sample Number	Description/Location (include asar type/maker/exp. Date)	Sample Date	Sample Time	Vol/Area
1) 68048-01	CONCRETE SLAB, FOUNDATION		20-OCT-2020	
2) -02	INSULATION COVER/INT. WALL INSULATION			
3) -03	DRYWALL+MUD+TEXT./INT. OFFICE WALL			
4) -04	COVE BASE+MASTIC/INT. OFFICE			
5)				
6)				
7)				
8)				
9)				
10)				
11)				
12)				
13)				
14)				
15)				
16)				
17)				
18)				
19)				
20)				

1)Relinquished by:	Date: 20-OCT-2020	Time: 1100	3)Relinquished by:	Date:	Time:
2)Received by	Date: 10-21-20	Time: 1015	4)Received by:	Date:	Time:
* TEM Water Sampler's name Required by State of Arizona	Print Name	EX Standard 2 of 2			

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Review of Analysis Request (Initials) ET

Note: Data completed by client (including number and identity of samples) is assumed to be correct until it is verified at time of sample preparation.

AMENDMENT 4 APPENDIX 1 HAZMAT TESTING
ASBESTOS SAMPLE PLAN

DATE: 20-Oct-2020 SO #: 1-9625624 BLDG #: 68048

Work Description: Demo building, WO #FEE18079-8J

Sample #	Description	Location
68048-01	Concrete	Slab, foundation
68048-02	Insulation cover	Interior wall insulation
68048-03	Drywall + mud + texture	Interior office wall
68048-04	Cove base + mastic	Interior office

LEAD SAMPLE PLAN

DATE: 20-Oct-2020 SO #: 1-9625624 BLDG #: 68048

Work Description: Demo building, WO #FEE18079-8J

Sample #	Description	Location	Result
-1	White, metal	Roll up door frame, west side	Neg
-2	Red, steel	Beam structure	Neg
-3	White, wood	Interior plywood wall panel	Neg
-4	White, metal	Door frame, west side	Neg
-5	White, metal	Door, west side	Neg
-6	Tan, metal	Exterior sheet metal wall siding	Neg
-7	White, metal	Door frame, interior office	Neg
-8	White, drywall	Interior office wall	Neg
-9	Gray, metal	Roll up door, east side	Neg
-10	White, metal	Hand rail, exterior stairs, NE corner	Neg

Appendix 3-PCC Pavement Details

Pavement Thickness Report
U.S. Army Corps of Engineers
PCASE Version 2.09.06
Date : 10/27/2020

Design Name :	COMPOUND PCC
Design Type :	Roads
Pavement Type :	Rigid
Road Type :	Road
Terrain Type :	Flat
Analysis Type :	K
Depth of Frost (in) :	0
Wander Width (in) :	33.35
% Load Transfer :	0
Effective K (pci) :	262
Reduced Sub Effective K (pci) :	0
Joint Spacing :	10 to 15 ft
Dowel Spacing :	12.00 in
Dowel Length :	16.00 in
Dowel Diameter:	.75 in

Use 7.5" PCC on 6" ABC on 6" Subbase on Compacted Subgrade

NOTE: the M1070 Tractor with M1000 Trailer carrying an M1A1 Abrams tank governs the design

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NOTE: car & pickup traffic are irrelevant to the result, therefore were not listed.

NOTE: Design subgrade K=150 is conservative, and based on limited CBR testing; PCASE model run with historical value of k=200 results in 7.14" PCC

Layer Information

Layer Type	Material Type	Frost Code	Moisture Content	Dry Unit Weight (lb/ft^3)	Flexural Strength (lb/ft^3)	CbCr (psi)	% Steel	Analysis	Non frost Design Thickness (in)	K Strength (pci)
PCC	NA	NFS	0	145	650	0	0	Compute	7.38	0
BASE	BASCA	NFS	5	135	0	0	0	Manual	12	0
SUBG	COHCUT	F3/F4	18	100	0	0	0	Manual	0	150

Traffic Information

Pattern Name	**FIO'S FGR**		
Vehicles	**Weight (lb)**	**Passes per Life Span"**	**Equivalent Passes**
M1070 HET TRACTOR W/M1000	229750	403000	403000
M1074 LOAD SYSTEM W/CRANE	140859	403000	19494
M1A1, MAIN TANK TRACKED	126000	403000	42631
M2A3, BRADLEY VEHICLE TRA	58200	403000	1322
P-23 CRASH TRUCK (FIRE TR	77880	300	142
STRYKER, RECON VEHICLE	43352	403000	310
M1070 HET TRACTOR W/M1000 TRL W/M1A1 TANK	229750		466899