

DOCUMENT 00 01 15

LIST OF DRAWINGS
02/24

PART 1 GENERAL

1.1 SUMMARY

This section lists the drawings for the project pursuant to contract clause "DFARS 252.236-7001, Contract Drawings and Specifications."

1.2 CONTRACT DRAWINGS

Contract drawings are as follows:

DWG NO.	NAVFAC DWG NO.	TITLE
G-001	17361624	COVER SHEET
G-002	17361625	SHEET INDEX
G-003	17361626	SHEET INDEX
GI001	17361627	LOCATION MAP AND HAUL ROUTE
GI002	17361628	TYPICAL SYMBOLS AND ABBREVIATIONS
GI003	17361629	ABBREVIATIONS CONTINUED
GI108	17361630	PHASING PLAN
GI109	17361631	AIRFIELD PHASING PLAN
V-101	17361632	OVERALL EXISTING CONDITIONS
V-102	17361633	EXISTING CONDITIONS - AREA 1
V-103	17361634	EXISTING CONDITIONS - AREA 2
V-104	17361635	EXISTING CONDITIONS - AREA 3
V-105	17361636	EXISTING CONDITIONS - AREA 4
V-106	17361637	EXISTING CONDITIONS - AREA 5
V-107	17361638	EXISTING CONDITIONS - AREA 6
V-108	17361639	EXISTING CONDITIONS - AREA 7
V-109	17361640	EXISTING CONDITIONS - AREA 8
V-110	17361641	EXISTING CONDITIONS - AREA 9
V-111	17361642	EXISTING CONDITIONS - AREA 10
V-112	17361643	EXISTING CONDITIONS - AREA 11
V-113	17361644	EXISTING CONDITIONS - AREA 12
V-114	17361645	EXISTING CONDITIONS - AREA 13
V-115	17361646	EXISTING CONDITIONS - AREA 14
V-116	17361647	EXISTING CONDITIONS - AREA 15
V-117	17361648	EXISTING CONDITIONS - AREA 16
V-118	17361649	EXISTING CONDITIONS - AREA 17
V-119	17361650	EXISTING CONDITIONS - AREA 18
V-120	17361651	EXISTING CONDITIONS - AREA 19
V-121	17361652	EXISTING CONDITIONS - AREA 20
V-122	17361653	EXISTING CONDITIONS - AREA 21
V-123	17361654	EXISTING CONDITIONS - AREA 22
V-124	17361655	EXISTING CONDITIONS - AREA 23
V-125	17361656	EXISTING CONDITIONS - AREA 24
V-126	17361657	EXISTING CONDITIONS - AREA 25
V-127	17361658	EXISTING CONDITIONS - AREA 26

V-128	17361659	SURVEY CONTROL PLAN
BB101	17361660	LIMITED GEOTECHNICAL FIELD WORK PLAN
BB102	17361661	PHASE 2 GEOTECHNICAL FIELD WORK
BB103	17361662	BORING LOGS
BB104	17361663	BORING LOGS
BB105	17361664	BORING LOGS
BB106	17361665	BORING LOGS
BB107	17361666	BORING LOGS
BB108	17361667	BORING LOGS
BB109	17361668	BORING LOGS
BB110	17361669	BORING LOGS
BB111	17361670	BORING LOGS
BB112	17361671	BORING LOGS
BB113	17361672	BORING LOGS
BB114	17361673	BORING LOGS
BB115	17361674	BORING LOGS
BB116	17361675	BORING LOGS
BB117	17361676	BORING LOGS
BB118	17361677	BORING LOGS
BB119	17361678	BORING LOGS
BB120	17361679	BORING LOGS
BB121	17362005	EXISTING ERT SURVEY INFORMATION
BB122	17362006	EXISTING ERT SURVEY INFORMATION
BB123	17362007	EXISTING ERT SURVEY INFORMATION
BB124	17362008	EXISTING ERT SURVEY INFORMATION
BB125	17362009	EXISTING ERT SURVEY INFORMATION
BB126	17362010	APPROXIMATE LOCATIONS OF POTENTIAL KARST FEATURES
C-001	17361680	GENERAL NOTES
CD101	17361681	OVERALL DEMOLITION PLAN
CD102	17361682	DEMOLITION PLAN - AREA 1
CD103	17361683	DEMOLITION PLAN - AREA 2
CD104	17361684	DEMOLITION PLAN - AREA 3
CD105	17361685	DEMOLITION PLAN - AREA 4
CD106	17361686	DEMOLITION PLAN - AREA 5
CD107	17361687	DEMOLITION PLAN - AREA 6
CD108	17361688	DEMOLITION PLAN - AREA 7
CD109	17361689	DEMOLITION PLAN - AREA 8
CD110	17361690	DEMOLITION PLAN - AREA 9
CD112	17361691	DEMOLITION PLAN - AREA 11
CD113	17361692	DEMOLITION PLAN - AREA 12
CD114	17361693	DEMOLITION PLAN - AREA 13
CD115	17361694	DEMOLITION PLAN - AREA 14
CD116	17361695	DEMOLITION PLAN - AREA 15
CD117	17361696	DEMOLITION PLAN - AREA 16
CD118	17361697	DEMOLITION PLAN - AREA 17
CD119	17361698	DEMOLITION PLAN - AREA 18
CD120	17361699	DEMOLITION PLAN - AREA 19
CD121	17361700	DEMOLITION PLAN - AREA 20
CD122	17361701	DEMOLITION PLAN - AREA 21
CD123	17361702	DEMOLITION PLAN - AREA 22
CD124	17361703	DEMOLITION PLAN - AREA 23
CD125	17361704	DEMOLITION PLAN - AREA 24
CD126	17361705	DEMOLITION PLAN - AREA 25
CD127	17361706	DEMOLITION PLAN - AREA 26

CD130	17361707	NOT USED
CD131	17361708	NOT USED
CD132	17361709	NOT USED
CD134	17361710	NOT USED
CD135	17361711	NOT USED
CD136	17361712	NOT USED
CD137	17361713	NOT USED
CD138	17361714	NOT USED
CD139	17361715	NOT USED
CS101	17361716	OVERALL SITE & PAVING PLAN
CS102	17361717	SITE & PAVING PLAN - AREA 1
CS103	17361718	SITE & PAVING PLAN - AREA 2
CS104	17361719	SITE & PAVING PLAN - AREA 3
CS105	17361720	SITE & PAVING PLAN - AREA 4
CS106	17361721	SITE & PAVING PLAN - AREA 5
CS107	17361722	SITE & PAVING PLAN - AREA 6
CS108	17361723	SITE & PAVING PLAN - AREA 7
CS109	17361724	SITE & PAVING PLAN - AREA 8
CS110	17361725	SITE & PAVING PLAN - AREA 9
CS111	17361726	SITE & PAVING PLAN - AREA 10
CS112	17361727	SITE & PAVING PLAN - AREA 11
CS113	17361728	SITE & PAVING PLAN - AREA 12
CS114	17361729	SITE & PAVING PLAN - AREA 13
CS115	17361730	SITE & PAVING PLAN - AREA 14
CS120	17361731	SITE & PAVING PLAN - AREA 20
CS121	17361732	SITE & PAVING PLAN - AREA 21
CS122	17361733	SITE & PAVING PLAN - AREA 22
CS123	17361734	SITE & PAVING PLAN - AREA 23
CS124	17361735	SITE & PAVING PLAN - AREA 24
CS125	17361736	SITE & PAVING PLAN - AREA 25
CS126	17361737	SITE & PAVING PLAN - AREA 26
CS130	17361738	OVERALL PAVEMENT MARKING PLAN
CS131	17361739	PAVEMENT MARKING PLAN - AREA 1
CS132	17361740	PAVEMENT MARKING PLAN - AREA 2
CS133	17361741	PAVEMENT MARKING PLAN - AREA 3
CS134	17361742	PAVEMENT MARKING PLAN - AREA 5
CS135	17361743	PAVEMENT MARKING PLAN - AREA 6
CS136	17361744	PAVEMENT MARKING PLAN - AREA 7
CS137	17361745	PAVEMENT MARKING PLAN - AREA 11
CS138	17361746	PAVEMENT MARKING PLAN - AREA 12
CS139	17361747	PAVEMENT MARKING PLAN - AREA 13
CS140	17361748	PAVEMENT MARKING PLAN - AREA 20
CS141	17361749	PAVEMENT MARKING PLAN - AREA 21
CS142	17361750	PAVEMENT MARKING PLAN - AREA 22
CS143	17361751	PAVEMENT MARKING PLAN - AREA 23
CS144	17361752	PAVEMENT MARKING PLAN - AREA 24
CS145	17361753	PAVEMENT MARKING PLAN - AREA 25
CS146	17361754	PAVEMENT MARKING PLAN - AREA 26
CS201	17361755	ROADWAY PLAN & PROFILE RW01 STA 0+00-6+25 - AREA 22
CS202	17361756	ROADWAY PLAN & PROFILE RW01 STA 6+25-12+50 - AREA 22 & 23
CS203	17361757	ROADWAY PLAN & PROFILE RW01 STA 12+50-18+75 - AREA 23 & 24
CS204	17361758	ROADWAY PLAN & PROFILE RW01 STA 18+75-25+00 - AREA 24 & 25
CS205	17361759	ROADWAY PLAN & PROFILE RW01 STA 25+00-31+25 - AREA 25 & 26
CS206	17361760	ROADWAY PLAN & PROFILE RW01 STA 31+25-37+50 - AREA 21 & 26

CS207	17361761	ROADWAY PLAN & PROFILE RW01 STA 37+50-44+00 - AREA 21
CS212	17361762	TAXILANE PLAN & PROFILE L2 STA 00+00-06+50
CS213	17361763	TAXILANE PLAN & PROFILE L2 STA 06+50-13+00
CS215	17361764	TAXILANE PLAN & PROFILE L3 STA 00+00-06+50
CS216	17361765	TAXILANE PLAN & PROFILE L3 STA 06+50-13+00
CS301	17361766	ROADWAY SECTIONS - SAMPLE LINE PLAN
CS302	17361767	ROADWAY SECTIONS - RW01
CS303	17361768	ROADWAY SECTIONS - RW01
CS304	17361769	ROADWAY SECTIONS - RW01
CS305	17361770	ROADWAY SECTIONS - RW01
CS306	17361771	ROADWAY SECTIONS - RW01
CS307	17361772	ROADWAY SECTIONS - RW01
CS308	17361773	ROADWAY SECTIONS - RW01
CS309	17361774	ROADWAY SECTIONS - RW01
CS310	17361775	APRON SECTIONS - A01
CS311	17361776	APRON SECTIONS - A02
CS312	17361777	APRON SECTIONS - A03
CS501	17361778	SITE DETAILS
CS502	17361779	SITE DETAILS
CS503	17361780	SITE DETAILS
CS504	17361781	SITE DETAILS
CS505	17361782	SITE DETAILS
CS506	17361783	SITE DETAILS
CS507	17361784	SITE DETAILS
CT101	17361785	OVERALL JOINTING PLAN
CT102	17361786	JOINTING PLAN - AREA 1
CT103	17361787	JOINT ELEVATION PLAN - AREA 1
CT104	17361788	JOINTING PLAN - AREA 2
CT105	17361789	JOINT ELEVATION PLAN - AREA 2
CT106	17361790	JOINTING PLAN - AREA 3
CT107	17361791	JOINT ELEVATION PLAN - AREA 3
CT108	17361792	JOINTING PLAN - AREA 6
CT109	17361793	JOINT ELEVATION PLAN - AREA 6
CT110	17361794	JOINTING PLAN - AREA 7
CT111	17361795	JOINT ELEVATION PLAN - AREA 7
CT112	17361796	JOINTING PLAN - AREA 12
CT113	17361797	JOINT ELEVATION PLAN - AREA 12
CT114	17361798	JOINTING PLAN - AREA 13
CT115	17361799	JOINT ELEVATION PLAN - AREA 13
CG101	17361800	OVERALL GRADING AND DRAINAGE PLAN
CG102	17361801	GRADING AND DRAINAGE PLAN - AREA 1
CG103	17361802	GRADING AND DRAINAGE PLAN - AREA 2
CG104	17361803	GRADING AND DRAINAGE PLAN - AREA 3
CG105	17361804	GRADING AND DRAINAGE PLAN - AREA 4
CG106	17361805	GRADING AND DRAINAGE PLAN - AREA 5
CG107	17361806	GRADING AND DRAINAGE PLAN - AREA 6
CG108	17361807	GRADING AND DRAINAGE PLAN - AREA 7
CG109	17361808	GRADING AND DRAINAGE PLAN - AREA 8
CG110	17361809	GRADING AND DRAINAGE PLAN - AREA 9
CG112	17361810	GRADING AND DRAINAGE PLAN - AREA 11
CG113	17361811	GRADING AND DRAINAGE PLAN - AREA 12
CG114	17361812	GRADING AND DRAINAGE PLAN - AREA 13
CG115	17361813	GRADING AND DRAINAGE PLAN - AREA 14
CG116	17361814	GRADING AND DRAINAGE PLAN - AREA15

CG117	17361815	GRADING AND DRAINAGE PLAN - AREA 16
CG118	17361816	GRADING AND DRAINAGE PLAN - AREA 17
CG119	17361817	GRADING AND DRAINAGE PLAN - AREA 18
CG120	17361818	GRADING AND DRAINAGE PLAN - AREA 19
CG121	17361819	GRADING AND DRAINAGE PLAN - AREA 20
CG122	17361820	GRADING AND DRAINAGE PLAN - AREA 21
CG123	17361821	GRADING AND DRAINAGE PLAN - AREA 22
CG124	17361822	GRADING AND DRAINAGE PLAN - AREA 23
CG125	17361823	GRADING AND DRAINAGE PLAN - AREA 24
CG126	17361824	GRADING AND DRAINAGE PLAN - AREA 25
CG127	17361825	GRADING AND DRAINAGE PLAN - AREA 26
CG130	17361826	NOT USED
CG131	17361827	NOT USED
CG132	17361828	NOT USED
CG134	17361829	NOT USED
CG135	17361830	NOT USED
CG136	17361831	NOT USED
CG137	17361832	NOT USED
CG138	17361833	NOT USED
CG139	17361834	NOT USED
CG140	17361835	LIMITS OF GEOSYNTHETIC CLAY LINER
CG141	17361836	LIMITS OF GEOSYNTHETIC CLAY LINER
CG142	17361837	LAWN RESTORATION PLAN
CG143	17361838	NOT USED
CG144	17361839	KARST FEATURES PLAN
CG145	17361840	NOT USED
CG146	17361841	KARST FEATURES DETAIL
CG147	17361842	TURF REINFORCEMENT PLAN
CG148	17361843	NOT USED
CG201	17361844	DRAINAGE PROFILES
CG202	17361845	DRAINAGE PROFILES
CG203	17361846	DRAINAGE PROFILES
CG204	17361847	DRAINAGE PROFILES
CG205	17361848	DRAINAGE PROFILES
CG206	17361849	DRAINAGE PROFILES
CG207	17361850	DRAINAGE PROFILES
CG208	17361851	DRAINAGE PROFILES
CG209	17361852	DRAINAGE PROFILES
CG210	17361853	DRAINAGE PROFILES
CG211	17361854	DRAINAGE PROFILES
CG212	17361855	DRAINAGE PROFILES
CG501	17361856	DRAINAGE DETAILS
CG502	17361857	DRAINAGE DETAILS
CG503	17361858	DRAINAGE DETAILS
CG504	17361859	DRAINAGE DETAILS
CG505	17361860	DRAINAGE DETAILS
CG506	17361861	DRAINAGE DETAILS
CG507	17361862	SAND FILTER DETAILS
CU101	17361863	OVERALL UTILITY PLAN
CU102	17361864	UTILITY PLAN - AREA 1
CU103	17361865	UTILITY PLAN - AREA 6
CU104	17361866	UTILITY PLAN - AREA 7
CU105	17361867	UTILITY PLAN - AREA 8
CU106	17361868	UTILITY PLAN - AREA 23

CU107	17361869	UTILITY PLAN - AREA 24
CU108	17361870	UTILITY PLAN - AREA 25
CU109	17361871	UTILITY PLAN - AREA 26
CU201	17361872	UTILITY PROFILES
CU202	17361873	UTILITY PROFILES
CU203	17361874	UTILITY PROFILES
CU501	17361875	UTILITY DETAILS
CU502	17361876	UTILITY DETAILS
S-001	17361877	STRUCTURAL GENERAL NOTES
S-002	17361878	STRUCTURAL GENERAL NOTES
S-101	17361879	FOUNDATION PLANS
S-501	17361880	TYPICAL CONCRETE DETAILS
S-502	17361881	TYPICAL CONCRETE DETAILS
S-503	17361882	CONCRETE SECTIONS AND DETAILS
A-001	17361883	GENERAL NOTES, SYMBOLS, AND EXTERIOR PERSPECTIVE VIEWS
A-406	17361884	DETACHED EQUIPMENT YARD
E-001	17361885	ELECTRICAL LEGEND 1 OF 2
E-002	17361886	ELECTRICAL LEGEND 2 OF 2
ED101	17361887	ELECTRICAL DEMOLITION PLAN 1
ED102	17361888	ELECTRICAL DEMOLITION PLAN 2
ED601	17361889	EXISTING DISTRIBUTION ONE LINE DIAGRAM - DEMOLITION PLAN
ES101	17361890	ELECTRICAL SITE PLAN 1
ES102	17361891	ELECTRICAL SITE PLAN 2
ES103	17361892	ELECTRICAL SITE PLAN 3
ES104	17361893	ELECTRICAL SITE PLAN 4
ES105	17361894	ENLARGED ELECTRICAL SITE PLAN
ES201	17361895	EXISTING SWITCHING STATION - 13.8KV SWITCHGEAR ARRANGEMENT
ES501	17361896	ELECTRICAL SITE DETAILS
ES502	17361897	ELECTRICAL SITE DETAILS
ES503	17361898	ELECTRICAL SITE DETAILS
ES504	17361899	ELECTRICAL SITE DETAILS
ES505	17361900	ELECTRICAL SITE DETAILS
ES506	17361901	ELECTRICAL SITE DETAILS
ES701	17361902	HIGH MAST LIGHT POLE LOCATIONS
EP601	17361903	EXISTING DISTRIBUTION ONE LINE DIAGRAM - NEW WORK
EP602	17361904	ONE-LINE DIAGRAMS
EP701	17361905	PANELBOARD SCHEDULES
EA101	17361906	AIRFIELD ELECTRICAL PLAN 1
EA102	17361907	AIRFIELD ELECTRICAL PLAN 2
EA501	17361908	AIRFIELD LIGHTING DETAILS
EA502	17361909	AIRFIELD LIGHTING DETAILS
EA503	17361910	AIRFIELD LIGHTING DETAILS
EA504	17361911	AIRFIELD LIGHTING DETAILS
EA701	17361912	AIRFIELD LIGHTING POINTS SCHEDULE
EA702	17361913	AIRFIELD LIGHTING ONE-LINE DIAGRAMS
TS001	17361914	TELECOMMUNICATIONS SITE LEGEND
TD101	17361915	TELECOMMUNICATIONS SITE DEMOLITION PLAN 1
TD102	17361916	TELECOMMUNICATIONS SITE DEMOLITION PLAN 2
TS101	17361917	TELECOMMUNICATIONS SITE PLAN 1
TS102	17361918	TELECOMMUNICATIONS SITE PLAN 2
TS103	17361919	TELECOMMUNICATIONS SITE PLAN 3
TS104	17361920	TELECOMMUNICATIONS SITE PLAN 4
TS105	17361921	TELECOMMUNICATIONS SITE PLAN 5
TS106	17362001	TELECOMMUNICATIONS SITE PLAN 6

TS107	17362002	TELECOMMUNICATIONS SITE PLAN 7
TS108	17362003	TELECOMMUNICATIONS SITE PLAN 8
TS109	17362004	TELECOMMUNICATIONS SITE PLAN 9
TS501	17361922	TELECOMMUNICATIONS SITE DETAILS
TS502	17361923	TELECOMMUNICATIONS SITE DETAILS
TS701	17361924	TELECOMMUNICATIONS INTERBUILDING BACKBONE RISER
TS702	17362011	TELECOMMUNICATIONS INTERBUILDING BACKBONE RISER
CF101	17361925	OVERALL FUELING PLAN
CF102	17361926	OVERALL COMM PLAN
CF201	17361927	FUEL PLAN AND PROFILE - AREA 1
CF202	17361928	FUEL PLAN AND PROFILE - AREA 2
CF203	17361929	FUEL PLAN AND PROFILE - AREA 3
CF204	17361930	FUEL PLAN AND PROFILE - AREA 4
CF205	17361931	FUEL PLAN AND PROFILE - AREA 5
CF206	17361932	FUEL PLAN AND PROFILE - AREA 6
CF207	17361933	FUEL PLAN AND PROFILE - AREA 7
CF208	17361934	FUEL PLAN AND PROFILE - AREA 8
CF209	17361935	FUEL PLAN AND PROFILE - AREA 9
CF210	17361936	FUEL PLAN AND PROFILE - AREA 10
CF211	17361937	FUEL PLAN AND PROFILE - AREA 11
CF212	17361938	FUEL PLAN AND PROFILE - AREA 12
CF221	17361939	COMM PLAN - AREA 1
CF222	17361940	COMM PLAN - AREA 2
CF223	17361941	COMM PLAN - AREA 3
CF224	17361942	COMM PLAN - AREA 4
CF225	17361943	COMM PLAN - AREA 5
CF226	17361944	COMM PLAN - AREA 6
CF227	17361945	COMM PLAN - AREA 7
CF228	17361946	COMM PLAN - AREA 8
CF229	17361947	COMM PLAN - AREA 9
CF230	17361948	COMM PLAN - AREA 10
CF231	17361949	COMM PLAN - AREA 11
CF232	17361950	COMM PLAN - AREA 12
CF233	17361951	COMM PLAN - AREA 13
CF234	17361952	COMM PLAN - AREA 14
CF501	17361953	FUELING DETAILS
CF502	17361954	FUELING DETAILS
SF001	17361955	STRUCTURAL GENERAL NOTES - SHEET 1
SF002	17361956	STRUCTURAL GENERAL NOTES - SHEET 2
SF003	17361957	LEGENDS AND ABBREVIATIONS
SF101	17361958	OVERALL STRUCTURAL LAYOUT
SF111	17361959	ISOLATION VALVE VAULT 1 - PLANS
SF112	17361960	ISOLATION VALVE VAULT 2 - PLANS - SHEET 1
SF113	17361961	ISOLATION VALVE VAULT 2 - PLAN - SHEET 2
SF114	17361962	HYDRANT PIT - PLANS AND SECTIONS
SF115	17361963	HPV PITS - PLANS AND SECTIONS
SF501	17361964	STANDARD STRUCTURAL DETAILS - SHEET 1
SF502	17361965	STANDARD STRUCTURAL DETAILS - SHEET 2
SF511	17361966	ISOLATION VALVE VAULT - SECTIONS - SHEET 1
SF512	17361967	ISOLATION VALVE VAULT - SECTIONS - SHEET 2
SF513	17361968	ISOLATION VALVE VAULT - SECTIONS AND DETAILS
SF521	17361969	ROLLING COVER - SHEET 1
SF522	17361970	ROLLING COVER - SHEET 2
SF523	17361971	ROLLING COVER - SHEET 3

SF524	17361972	ROLLING COVER - SHEET 4
SF525	17361973	ROLLING COVER - SHEET 5
SF551	17361974	PIPE SUPPORT DETAILS
MF001	17361975	FUELING MECHANICAL LEGEND
MF002	17361976	FUELING MECHANICAL GENERAL NOTES
MF011	17361977	FUELING MECHANICAL FLOW DIAGRAM - OVERALL
MF101	17361978	FUELING MECHANICAL OVERALL SITE PLAN
MF501	17361979	FUELING MECHANICAL DETAILS - ISOLATION VALVE VAULT (IVV-1)
MF502	17361980	FUELING MECHANICAL DETAILS - ISOLATION VALVE VAULT (IVV-2)
MF503	17361981	FUELING MECHANICAL DETAILS
MF504	17361982	FUELING MECHANICAL DETAILS
MF505	17361983	FUELING MECHANICAL DETAILS
MF506	17361984	FUELING MECHANICAL DETAILS
MF601	17361985	FUELING MECHANICAL P&ID
EF001	17361986	ELECTRICAL FUELING LEGEND - 1
EF002	17361987	ELECTRICAL FUELING LEGEND - 2
EF011	17361988	OVERALL FUELING HAZARDOUS AREA PLAN
EF101	17361989	OVERALL FUELING ELECTRICAL SITE PLAN
EF401	17361990	ENLARGED PLAN - PUMPHOUSE
EF501	17361991	ELECTRICAL DETAILS - EPDS
EF502	17361992	ELECTRICAL DETAILS - GROUNDING
EF503	17361993	ELECTRICAL SITE DETAILS - HANDHOLES
EF504	17361994	ELECTRICAL SITE DETAILS - DUCT BANKS
EF511	17361995	ELEVATION - PUMP CONTROL PANEL
EF611	17361996	PCP - CONTROL DIAGRAM
EF621	17361997	NORTH APRON EPDS - FRONT LAYOUT
EF622	17361998	NORTH ARON EPDS WIRING - 1
EK501	17361999	CATHODIC PROTECTION DETAILS
EK501	17362000	CATHODIC PROTECTION DETAILS

1.3 REFERENCE DRAWINGS

The following reference drawings are intended only to show the original construction. Drawing are the property of the Government and must not be used for any purpose other than that intended by the contract.

NAVFAC DWG NO.	TITLE
3201807	REPAIR/REPLACE OIL/WATER SEPARATORS BUILDING NO. 2550 JET ENGINE TEST FACILITY
7320181	REPAIR/REPLACE OIL/WATER SEPARATORS BLDG NO. 2550 JET ENGINE TEST FACILITY
AND-W-122	CONSTRUCT OIL SEPARATOR WET ENGINE TEST STAND (BLG 2550)
AND B-230	CONSTRUCT JET TEST STAND READY ROOM
AND-R-60	AIR CONDITIONING SHAW ESTES JET ENGINE TEST CELL CONTROL RM. BLDG. 2551

1.3.1 As-Builts for Design EFSO Repairs at Various Fuels Facilities - Design EFSO Repairs to HS-3 (Hydrant System #3)

<u>SHEET</u>	<u>SHEET TITLE</u>
<u>03G-001</u>	<u>GENERAL SHEET INDEX, SITE, AND LOCATION MAP</u>
<u>03C-001</u>	<u>CIVIL OVERALL SITE PLAN - PUMP HOUSE 3</u>
<u>03C-002</u>	<u>CIVIL FRANGIBLE EFSO REQUIREMENT PLAN</u>
<u>03C-101</u>	<u>CIVIL SITE PLAN AND PROFILE SHEET 1</u>
<u>03C-102</u>	<u>CIVIL SITE PLAN AND PROFILE SHEET 2</u>
<u>03C-103</u>	<u>CIVIL SITE PLAN AND PROFILE SHEET 3</u>
<u>03C-104</u>	<u>CIVIL SITE PLAN AND PROFILE SHEET 4</u>
<u>03C-105</u>	<u>CIVIL SITE PLAN AND PROFILE SHEET 5</u>
<u>03C-106</u>	<u>CIVIL SITE PLAN AND PROFILE SHEET 6</u>
<u>03C-107</u>	<u>CIVIL SITE PLAN AND PROFILE SHEET 7</u>
<u>03C-108</u>	<u>CIVIL SITE PLAN AND PROFILE SHEET 8</u>
<u>03C-109</u>	<u>CIVIL SITE PLAN AND PROFILE SHEET 9</u>
<u>03C-110</u>	<u>CIVIL SITE PLAN AND PROFILE SHEET 10</u>
<u>03C-111</u>	<u>CIVIL SITE PLAN AND PROFILE SHEET 11</u>
<u>03C-112</u>	<u>CIVIL SITE PLAN AND PROFILE SHEET 12</u>
<u>03C-113</u>	<u>CIVIL SITE PLAN AND PROFILE SHEET 13</u>
<u>01C-031</u>	<u>12" TRENCHLESS CROSSING 3-1 PLAN AND PROFILE</u>
<u>01C-032</u>	<u>12" TRENCHLESS CROSSING 3-2 PLAN AND PROFILE</u>
<u>01C-033</u>	<u>12" TRENCHLESS CROSSING 3-3 PLAN AND PROFILE</u>
<u>01C-034</u>	<u>12" TRENCHLESS CROSSING 3-4 PLAN AND PROFILE</u>
<u>01C-035</u>	<u>12" TRENCHLESS CROSSING 3-5 PLAN AND PROFILE</u>
<u>01C-036</u>	<u>12" TRENCHLESS CROSSING 3-6 PLAN AND PROFILE</u>
<u>01C-037</u>	<u>12" TRENCHLESS CROSSING 3-7 PLAN AND PROFILE</u>
<u>FA101</u>	<u>PUMPHOUSE 3 FIRE ALARM PLAN</u>
<u>03S-101</u>	<u>STRUCTURAL NOTES, & ABBREVIATIONS</u>
<u>03S-102</u>	<u>STRUCTURAL EFSO POST DETAILS</u>
<u>03Y-101</u>	<u>EFSO CONTROL PANEL LAYOUT & BILL OF MATERIAL</u>
<u>03Y-102</u>	<u>EFSO FIBER NETWORK OVERVIEW</u>
<u>03Y-103</u>	<u>EFSO AND PUMP HOUSE WIRING LAYOUT</u>
<u>03Y-104</u>	<u>PUMP HOUSE I&C PLAN AND DETAILS</u>
<u>3.00E-01</u>	<u>LEGENDS SYMBOLS AND ABBREVIATIONS</u>
<u>03ED-201</u>	<u>I&C AND ELECTRICAL SITE PLAN AREA 3 - DEMOLITION</u>
<u>3.00E-101</u>	<u>OVERALL I&C AND ELECTRICAL SITE PLAN</u>
<u>3.00E-201</u>	<u>I&C AND ELECTRICAL SITE PLAN AREA 3</u>
<u>03E-501</u>	<u>ELECTRICAL DETAILS</u>

1.3.2 As-Built for Design EFSO Repairs at Various Fuels Facilities -
Design EFSO Repairs to HS-4 (Hydrant System #4)

<u>SHEET</u>	<u>SHEET TITLE</u>
04G-001	GENERAL SHEET INDEX, SITE, AND LOCATION MAP
04C-101	CIVIL SITE PLAN AND PROFILE SHEET 1
04C-102	CIVIL SITE PLAN AND PROFILE SHEET 2
04C-103	CIVIL SITE PLAN AND PROFILE SHEET 3
04C-104	CIVIL SITE PLAN AND PROFILE SHEET 4
04C-105	CIVIL SITE PLAN AND PROFILE SHEET 5
04C-106	CIVIL SITE PLAN AND PROFILE SHEET 6
04C-107	CIVIL SITE PLAN AND PROFILE SHEET 7
04C-108	CIVIL SITE PLAN AND PROFILE SHEET 8
04C-109	CIVIL SITE PLAN AND PROFILE SHEET 9
04C-110	CIVIL SITE PLAN AND PROFILE SHEET 10
04C-111	CIVIL SITE PLAN AND PROFILE SHEET 11
04C-112	CIVIL SITE PLAN AND PROFILE SHEET 12
04C-113	CIVIL SITE PLAN AND PROFILE SHEET 13
04C-114	CIVIL SITE PLAN AND PROFILE SHEET 14
04C-115	CIVIL SITE PLAN AND PROFILE SHEET 15
01C-041	12" TRENCHLESS CROSSING 4-1 PLAN AND PROFILE
01C-042	12" TRENCHLESS CROSSING 4-2 PLAN AND PROFILE
01C-043	12" TRENCHLESS CROSSING 4-3 PLAN AND PROFILE
01C-044	12" TRENCHLESS CROSSING 4-4 PLAN AND PROFILE
01C-045	12" TRENCHLESS CROSSING 4-5 PLAN AND PROFILE
01C-046	12" TRENCHLESS CROSSING 4-6 PLAN AND PROFILE
FA101	PUMPHOUSE 4 FIRE ALARM PLAN
Y-101	EFSo CONTROL PANEL LAYOUT & BILL OF MATERIAL
Y-102	EFSo FIBER NETWORK OVERVIEW
Y-103	EFSo AND PUMP HOUSE WIRING LAYOUT
Y-104	PUMP HOUSE I&C PLAN AND DETAILS
E-001	LEGENDS SYMBOLS AND ABBREVIATIONS
E-101	OVERALL I&C AND ELECTRICAL SITE PLAN
E-201	I&C AND ELECTRICAL SITE PLAN AREA 4
E-501	LEGENDS SYMBOLS AND ABBREVIATIONS

-- End of Document --

SECTION 01 14 00

WORK RESTRICTIONS
11/22, CHG 5: 05/25

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.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2024) Safety and Occupational Health
(SOH) Requirements

1.2 DEFINITIONS

"State" when used in reference to states of the United States also include the Territory of Guam.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

List of Contact Personnel

Personnel List

Free-Zone Request; G

Vehicle List; G

Statement Of Acknowledgement; G

1.4 SPECIAL SCHEDULING REQUIREMENTS

- a. Have materials, equipment, and personnel required to perform the work at the site prior to the commencement of the work.
- b. The B2616, B2619, the Giant Voice, the airfield, and Marianas Boulevard will remain in operation during the entire construction period. Conduct operations so as to cause the least possible interference with normal operations of the activity.
- c. Permission to interrupt any Activity roads, railroads, or utility service must be requested in writing a minimum of 15 calendar days prior to the desired date of interruption.
- d. Andersen Air Force Base will remove existing 20 foot and 40 foot containers that are located in the IRP Building compound within 60

calendar days after contract award.

1.5 CONTRACTOR ACCESS AND USE OF PREMISES

1.5.1 Activity Regulations

Ensure that Contractor personnel employed on the Activity become familiar with and obey Activity regulations including safety, fire, traffic and security regulations. Keep within the limits of the work and avenues of ingress and egress. Wear appropriate personal protective equipment (PPE) in designated areas. Do not enter any restricted areas unless required to do so and until cleared for such entry. Ensure all Contractor equipment, including delivery vehicles, are clearly identified with their company name.

1.5.1.1 Subcontractors and Personnel Contacts

Provide a [list of contact personnel](#) of the Contractor and subcontractors including addresses and telephone numbers for use in the event of an emergency. As changes occur and additional information becomes available, correct and change the information contained in previous lists.

1.5.1.2 Contractor Requirements for Access to Andersen Air Force Base

- a. All Contractors shall have a sponsor to the installation on Andersen Air Force Base (AFB). Coordinate access to Andersen Air Force Base with the Contracting Officer.
- b. A Contractor Affidavit is required for each person requesting access to Andersen AFB. Complete the "USAF Contractor/Sub-Contractor Access Affidavit" form, <https://www.andersen.af.mil/Contact-Us/Visitor-Center/>.
- c. Contractors are required to submit a paper pass/Base Pass Request with approval from their sponsor/Contracting Officer to the Visitors control Center. Submit [free-zone request](#).
- d. Contractor must submit affidavits within 45 days of contract award and plan for 30 days of Government review.

1.5.1.3 Installation Access

Obtain access to Air Force installations through participation in the Defense Biometrics Identification System (DBIDS). Requirements for Contractor employee registration, and transition for employees currently under Navy Commercial Access Control System (NCACS), are available at <https://www.cnmc.navy.mil/Operations-and-Management/Base-Support/DBIDS/>. No fees are associated with obtaining a DBIDS credential.

Participation in the DBIDS is not mandatory, and Contractor personnel may apply for One-Day Passes at the Base Visitor Control Office to access an installation.

1.5.1.3.1 Registration for DBIDS

Registration for DBIDS is available at <https://www.cnmc.navy.mil/Operations-and-Management/Base-Support/DBIDS/>. Procedure includes:

- a. Present a letter or official award document from the Contracting

Officer, that provides the purpose for access, to the base Visitor Control Center representative.

- b. Present valid identification, such as a passport or Real ID Act-compliant state driver's license.
- c. Provide completed SECNAV FORM 5512/1 to the base Visitor Control Center representative to obtain a background check. This form is available for download at <https://www.cnic.navy.mil/Operations-and-Management/Base-Support/DBIDS/>.
- d. Upon successful completion of the background check, the Government will complete the DBIDS enrollment process, which includes Contractor employee photo, fingerprints, base restriction and several other assessments.
- e. Upon successful completion of the enrollment process, the Contractor employee will be issued a DBIDS credential, and will be allowed to proceed to worksite.

1.5.1.3.2 DBIDS Eligibility Requirements

Throughout the year, the Contractor employee must continue to meet background screen standards. Periodic background screenings are conducted to verify continued DBIDS participation and installation access privileges. DBIDS access privileges will be immediately suspended or revoked if at any time a Contractor employee becomes ineligible.

An adjudication process may be initiated when a background screen failure results in disqualification from participation in the DBIDS, and Contractor employee does not agree with the reason for disqualification. The Government is the final authority.

1.5.1.3.3 DBIDS Notification Requirements

- a. Immediately report instances of lost or stolen badges to the Contracting Officer.
- b. Immediately collect DBIDS credentials and notify the Contracting Officer in writing under the following circumstances:
 - (1) An employee has departed the company without having properly returned or surrendered their DBIDS credentials.
 - (2) There is a reasonable basis to conclude that an employee, or former employee, might pose a risk, compromise, or threat to the safety or security of the Installation or anyone therein.

1.5.1.3.4 One-Day Passes

Personnel applying for One-Day passes at the Base Visitor Control Office are subject to daily mandatory vehicle inspection, and will have limited access to the installation. The Government is not responsible for any cost or lost time associated with obtaining daily passes or added vehicle inspections incurred by non-participants in the DBIDS.

1.5.1.4 No Smoking Policy

Smoking is prohibited within and outside of all buildings on

installation, except in designated smoking areas. This applies to existing buildings, buildings under construction and buildings under renovation. Discarding tobacco materials other than into designated tobacco receptacles is considered littering and is subject to fines. The Contracting Officer will identify designated smoking areas.

1.5.2 Working Hours

Regular working hours will consist of an 8 hour period , between 6:00 a.m. and 6:00 p.m., Monday through Friday, excluding Government holidays.

1.5.3 Work Outside Regular Hours

Work outside regular working hours requires Contracting Officer approval. Make application 30 calendar days prior to such work to allow arrangements to be made by the Government for inspecting the work in progress, giving the specific dates, hours, location, type of work to be performed, contract number and project title. Based on the justification provided, the Contracting Officer may approve work outside regular hours. During periods of darkness, the different parts of the work must be lighted in accordance with requirements of EM 385-1-1. Make utility cutovers after normal working hours or on Saturdays, Sundays, and Government holidays unless directed otherwise.

1.5.4 Exclusionary Period

Work inside the existing airfield fence line along Taxiway D loop could be affected by exercises occurring between February and July every year and require removal and re-establishment of the free zone fence. Taxiway tie-in work must not occur during the February-July exercises without prior approval of the Contracting Officer. Notify the Contracting Officer 60 days prior if work inside the free zone along Taxiway D loop is anticipated during the exercise period.

1.5.5 Occupied Buildings

Work will be around existing buildings which are occupied. Do not enter the buildings without prior approval of the Contracting Officer.

1.5.6 Utility Cutovers and Interruptions

- a. Approval from the 36th CES is required in advance of any temporary or permanent work that impacts a utility system. Examples of work that requires advance approval from the 36th CES are a temporary or permanent connection to a utility, a request to energize a new facility, or work to repair, install, enlarge, demolish or modernize existing utility infrastructure. Depending on the work one or more of the following approvals is required prior to any work being conducted. These forms and instructions are available at the Requirements Section Building 18001 or send an email to CSU Org Box: 36ces.service@us.af.mil.
(1) Project Coordination and Approval Checklist

Andersen Air Base Utility Connection Permit

Record Meter Change

Andersen Air Base Utility Outage Request

- b. Fees: Electrical distribution services are provided by a private contractor, DZSP, hired by Andersen Air Force Base. DZSP charges for some services. Applicants should contact DZSP Customer Service in advance to determine what fees may be required.
- c. Time Lines: Applicants are strongly encourage to contact 36th CES early in the process to discuss the required approvals and estimated timeline for approval. Each of the approvals listed above has established review timelines (noted in the form instructions). However, the length of time to receive all approvals varies from case to case. Some applications are delayed because applicants do not follow instructions carefully. Sometimes additional supporting studies or tests require further review and approval by 36th CES, all of which takes additional time after the application has been submitted. Point of Contact is the Requirements and Optimization Chief who can be reached by sending an email to CSU Org Box: 36ces.service@us.af.mil.
- d. Make utility cutovers and interruptions after normal working hours or on Saturdays, Sundays, and Government holidays. Conform to procedures required in paragraph WORK OUTSIDE REGULAR HOURS.
- e. Ensure that new utility lines are complete, except for the connection, before interrupting existing service.
- f. Interruption to water, sanitary sewer, storm sewer, telephone service, electric service, air conditioning, heating, fire alarm, compressed air, and are considered utility cutovers pursuant to the paragraph WORK OUTSIDE REGULAR HOURS. Such interruptions are further limited to four hours. This time limit includes time for deactivation and reactivation.
- g. Operation of Station Utilities: Do not operate nor disturb the setting of control devices in the station utilities system, including water, sewer, electrical, and steam services. The Government will operate the control devices as required for normal conduct of the work. Notify the Contracting Officer giving reasonable advance notice when such operation is required.

1.5.7 Restrictions on Use of Yellow, Orange-Yellow, Red, and Magenta Materials

The use of yellow, yellow-orange, red and magenta materials for the following purposes is prohibited: sheeting, tarpaulins, polyethylene bottles or other containers, tapes, bags, banding of identification marks on tools, and boundary markers such as ribbons. Obtain Contracting Officer's prior approval for use of such colored materials for other purposes, such as buried vapor barrier membranes.

1.6 SECURITY REQUIREMENTS

1.6.1 Personnel List

Submit for approval, at least 15 days prior to the desired date of entry, an original alphabetical list of personnel who require entry into Government property to perform work on the project. Furnish for each person:

- a. Name

- b. Date and place of birth
- c. Citizenship
- d. Home address
- e. Social Security number
- f. Current pass expiration date
- g. Naturalization or Alien Registration number
- h. Passport number, place of issue, and expiration date
- i. Guam Police clearance report for last six months

The request for personnel passes must be accompanied with the following certification:

"I hereby certify that all personnel on this list are either born U.S. citizens, naturalized U.S. citizens with the naturalization number shown, or legal aliens with the alien registration number indicated."

Signature/Firm Name

1.6.1.1 Citizenship Requirements

Aliens will not be admitted to the work site without approval. Clearance for aliens may require approximately 20 workdays for approval.

1.6.2 Vehicle List

Submit an original list of vehicles to be utilized at the work site with the following information for each vehicle:

- a. Make
- b. Year
- c. Model
- d. License number
- e. Registered owner

1.6.3 Passes

Submit request for personnel and vehicle passes together. Include the Certificate of Insurance for Contractor and Subcontractor(s) and the [Statement of Acknowledgement](#) with the submittal. Passes will normally be issued within 21 calendar days.

1.6.3.1 Control

Maintain strict accountability over passes. Immediately report to the source of issue, passes missing or lost and the circumstances. If the Contractor has another active contract or one commencing immediately, employees' names may be transferred from one contract to the other. Final payment will not be effected until employees are transferred to another

contract or the records are cleared. Furnish a signed letter, countersigned by the source of issue, stating that passes have been turned in.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

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SECTION 01 45 00

QUALITY CONTROL
08/23, CHG 3: 08/25

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.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2024) Safety and Occupational Health
(SOH) Requirements

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 24 (2025) Standard for the Installation of
Private Fire Service Mains and Their
Appurtenances

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program. Include all associated costs in the applicable Bid Schedule item.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

SD-01 Preconstruction Submittals

Contractor Quality Control (CQC) Plan; G

SD-06 Test Reports

Verification Statement

1.4 GENERAL REQUIREMENTS

Establish and maintain an effective quality control (QC) system that complies with FAR 52.246-12 Inspection of Construction. QC is comprised of plans, procedures, and organization necessary to produce an end product that complies with the Contract requirements. The QC system covers all construction operations, both onsite and offsite, and must be keyed to the proposed construction sequence. The Quality Control Manager, Superintendent, Site Safety and Health Officer (SSHO), and all on-site supervisors are responsible for the quality of work and are subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the Contract. The Quality Control Manager must maintain a physical presence at the work site at all times and is the

primary individual responsible for all quality control.

1.5 QUALITY CONTROL (QC) PROGRAM REQUIREMENTS

Establish and maintain a QC program as described in this section. The QC program consists of a QC Organization, QC Plan, QC Plan Meeting(s), a Coordination and Mutual Understanding Meeting, QC meetings, three phases of control, submittal review and approval, testing, completion inspections, QC certifications, [independent Special Inspections in accordance with Section 01 45 35 SPECIAL INSPECTIONS](#), and documentation necessary to provide materials, equipment, workmanship, fabrication, construction and operations that comply with the requirements of this Contract. The QC program must cover on-site and off-site work and be keyed to the work sequence. No construction work or testing may be performed unless the QC Manager is on the work site. The QC Manager must report to an officer of the firm and not be subordinate to the Project Superintendent or the Project Manager. The QC Manager, Project Superintendent and Project Manager must work together effectively. Although the QC Manager is the primary individual responsible for quality control, all individuals will be held responsible for the quality of work on the job.

1.5.1 Meetings

1.5.1.1 Quality Control Plan Meeting

Prior to submission of the QC Plan, the Contractor may request a meeting with the Contracting Officer to discuss the QC Plan requirements of this Contract.

The purpose of this meeting is to develop a mutual understanding of the QC Plan requirements prior to plan development and submission and to agree on the Contractor's list of Definable Feature of Work (DFOW).

1.5.1.2 Coordination and Mutual Understanding Meeting

After the [Preconstruction Conference](#), before start of construction, and prior to acceptance by the Government of the CQC Plan, meet with the Contracting Officer and discuss the Contractor's quality control system. During the meeting, a mutual understanding of the system details must be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting will be prepared by the QC Manager and signed by the Contractor and the Government. Provide a copy of the signed minutes to all attendees and incorporate into the relevant QC Plan. At a minimum the Coordination and Mutual Understanding Meeting must be repeated when a new QC Manager is appointed. There can be other occasions when subsequent conferences will be called by either party to reconfirm mutual understandings or address deficiencies in the CQC system or procedures which can require corrective action by the Contractor.

1.5.1.2.1 Purpose

The purpose of this meeting is to develop a mutual understanding of the QC details, including documentation, administration for on-site and off-site work, design intent, environmental requirements and procedures, coordination of activities to be performed, [Special Inspections](#), and the

coordination of the Contractor's management, production, and QC personnel. At the meeting, the Contractor must explain in detail how three phases of control will be implemented for each DFO, as well as how each DFO will be affected by each management plan or requirement as listed below:

- a. Waste Management Plan.
- b. Procedures for noise and acoustics management.
- c. Environmental Protection Plan.
- d. Environmental regulatory requirements.
- e. Special Inspections.
- f. Indoor Air Quality (IAQ) Management Plan.

1.5.1.2.2 Coordination of Activities

Coordinate activities included in various sections to assure efficient and orderly installation of each component. Coordinate operations included under different sections that are dependent on each other for proper installation and operation. [Schedule construction operations with consideration for indoor air quality as specified in the IAQ Management Plan.](#) [Coordinate Special Inspections.](#)

1.5.1.2.3 Attendees

As a minimum, the Contractor's personnel required to attend include an officer of the firm, the Project Manager, Project Superintendent, QC Manager, Alternate QC Manager, [Special Inspector](#), Environmental Manager, and subcontractor representatives. Each subcontractor who will be assigned QC responsibilities must have a principal of the firm at the meeting.

1.5.1.3 Quality Control (QC) Meetings

After the start of construction, conduct weekly QC meetings led by the QC Manager at the work site with the Project Superintendent, [the Special Inspector](#), and the other personnel as necessary. The QC Manager is to prepare the minutes of the meeting and provide a copy to the Contracting Officer within 2 working days after the meeting. The Contracting Officer may attend these meetings. As a minimum, accomplish the following at each meeting:

- a. Review the minutes of the previous meeting.
- b. Review the schedule and the status of work and deficiencies/rework. Review the most current approved schedule (in accordance with schedule specification) and the status of work and deficiencies/rework.
- c. Review the status of submittals and Request For Information (RFIs).
- d. Review the work to be accomplished in the next 3 weeks as defined by the schedule section paragraph [WEEKLY LOOK AHEAD in Section 01 32 17.00 20 COST-LOADED NETWORK ANALYSIS SCHEDULES \(NAS\)](#) and all quality control documentation required for that work.

- e. Review Testing Plan and Log including status of tests performed since last QC Meeting.
- f. Resolve QC and production problems. Discuss status of pending change orders.
- g. Address items that may require revising the QC Plan.
- h. Review Accident Prevention Plan (APP) and effectiveness of the safety program.
- i. Review environmental requirements and procedures.
- j. Review Environmental Management Plan.
- k. Review Waste Management Plan.
- l. Review the status of training completion.
- m. Review IAQ Management Plan.

1.5.2 Contractor Quality Control (CQC) Plan

Submit no later than 30 days after Contract Award, the CQC Plan proposed to implement the requirements FAR 52.246-12 Inspection of Construction. Construction will be permitted to begin only after acceptance of the CQC Plan and other Contract requirements

1.5.2.1 Content of Contractor Quality Control (CQC) Plan

Provide a CQC Plan, prior to start of construction that includes a table of contents, with major sections identified, pages numbered sequentially, and that documents the proposed methods and responsibilities for accomplishing quality control during the construction of the project. The CQC Plan must at a minimum include the following sections:

- a. A description of the quality control organization and acknowledgment that the CQC staff will implement the three phase control system for all aspects of the work specified.
- b. An organizational chart showing the quality control organization with individual names and job titles and lines of authority up to an executive of the company at the home office.
- c. NAMES AND QUALIFICATIONS: Names and qualifications, in resume format, (including position titles and durations for qualifying experiences) for each person in the QC organization. Include the Construction Quality Management (CQM) for Contractors course certifications for the QC personnel as required by the paragraph CONSTRUCTION QUALITY MANAGEMENT TRAINING.
- d. DUTIES, RESPONSIBILITY AND AUTHORITY OF QC PERSONNEL: Duties, responsibilities, and authorities of each person in the QC organization.
- e. OUTSIDE ORGANIZATIONS: A listing of outside organizations, such as architectural and consulting engineering firms, that will be employed by the Contractor and a description of the services these firms will provide.

- f. **APPOINTMENT LETTERS:** Letters signed by an officer of the firm appointing the QC Manager and Alternate QC Manager, and stating that they are responsible for implementing and managing the QC program as described in this Contract. Include in this letter the responsibility of the QC Manager and Alternate QC Manager to implement and manage the three phases of control, and their authority to stop work that is not in compliance with the Contract. Letters of direction are to be issued by the QC Manager to the Assistant QC Manager and all other QC Specialists or quality control representatives outlining their duties, authorities, and responsibilities. Include copies of the letters in the QC Plan.
- g. **SUBMITTAL PROCEDURES AND INITIAL SUBMITTAL REGISTER:** Procedures for reviewing, approving, scheduling, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. Provide the name(s) of the person(s) in the QC organization authorized to review and certify submittals prior to approval. Provide the initial submittal of the Submittal Register as specified in Section 01 33 00 SUBMITTAL PROCEDURES.
- h. **TESTING LABORATORY INFORMATION:** Testing laboratory information required by the paragraph ACCREDITATION REQUIREMENTS, as applicable.
- i. **TESTING PLAN AND LOG:** A Testing Plan and Log that includes the tests required, associated feature of work required, referenced by the specification paragraph number requiring the test, the frequency, and the person responsible for each test.
- j. Procedures to complete construction deficiencies from identification through acceptable corrective action. Establish verification procedures that identified deficiencies have been corrected. This phase is performed prior to beginning work on each definable feature of work, after all required plans, documents, materials are approved, and after copies are at the work site.
- k. Reporting procedures, including proposed reporting formats.
- l. Procedures for submitting and reviewing design changes/variations prior to submission to the Contracting Officer.
- m. **LIST OF DEFINABLE FEATURES:** A Definable Feature of Work (DFOW) is a task that is separate and distinct from other tasks and has control requirements and work crews unique to that task. A DFOW is identified by different trades or disciplines, or it is work by the same trade in a different environment. A DFOW is by definition any item or activity on the construction schedule, and the schedule specification provides direction regarding how the DFOWs are to be structured. Include in the list of DFOWs for all activities on the Construction Schedule. Although each section of the specifications can generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. Identify the specification section number and schedule activity ID for each DFOW listed. The DFOW list will be reviewed in coordination with the construction schedule and agreed upon during the Coordination and Mutual Understanding Meeting.
- n. **PROCEDURES FOR PERFORMING AND TRACKING THE THREE PHASES OF CONTROL:** Identify procedures used to ensure the three phases of control to

manage the quality on this project. For each Definable Feature of Work (DFOW), a Preparatory and Initial phase checklist will be filled out during the Preparatory and Initial phase meetings. Conduct the Preparatory and Initial Phases and meetings with a view towards obtaining quality construction by planning ahead and identifying potential problems for each DFOW.

- o. Coordinate scheduled work with Special Inspections required by Section 01 45 35 SPECIAL INSPECTIONS, the Statement of Special Inspections and the Special Inspections Project Manual. Where the applicable code issued by the International Code Council (ICC) calls for inspections by the Building Official, the Contractor must include the inspections in the Quality Control Plan and must perform the inspections required by the applicable ICC. The Contractor must perform these inspections using independent qualified inspectors. Include the Special Inspections Project Manual requirements in the QC Plan.
- p. PROCEDURES FOR COMPLETION INSPECTION: Procedures for identifying and documenting the completion inspection process. Include in these procedures the responsible party for punch out inspection, pre-final inspection, and final acceptance inspection.
- q. TRAINING PROCEDURES AND TRAINING LOG: Procedures for coordinating and documenting the training of personnel required by the Contract.
- r. ORGANIZATION AND PERSONNEL CERTIFICATIONS LOG: Procedures for coordinating, tracking and documenting all certifications required for entities such as subcontractors, testing laboratories, suppliers, and personnel. The QC Manager will ensure that certifications are current, appropriate for the work being performed, and will not lapse during any period of the Contract that the work is being performed.

1.5.3 Acceptance of the Quality Control (QC) Plan

The Contracting Officer's acceptance of the Contractor QC Plan is required prior to the start of construction. The Contracting Officer reserves the right to require changes in the QC Plan and operations as necessary, including removal or addition of personnel, to ensure the specified quality of work. The Contracting Officer reserves the right to interview any member of the QC organization at any time to verify the submitted qualifications. All QC organization personnel are subject to acceptance by the Contracting Officer. The Contracting Officer may require the removal of any individual for non-compliance with quality requirements specified in the Contract.

1.5.4 Preliminary Construction Work Authorized Prior to Acceptance

The only construction work that is authorized to proceed prior to the acceptance of the QC Plan is mobilization of storage and office trailers, temporary utilities, and surveying with specific prior approval of the Contracting Officer.

1.5.5 Notification of Changes

Notify the Contracting Officer, in writing, of any proposed changes in the QC Plan or changes to the QC organization personnel. Proposed changes are subject to acceptance by the Contracting Officer.

1.5.6 Special Inspections

Perform all required Special Inspections per Section 01 45 35 SPECIAL INSPECTIONS, the statement of Special Inspections and the Schedule of Special Inspections.

1.6 QUALITY CONTROL (QC) ORGANIZATION

1.6.1 Quality Control (QC) Manager

1.6.1.1 Duties

Provide a QC Manager at the work site to implement and manage the QC program. The only duties and responsibilities of the QC Manager are to manage and implement the QC program on this Contract. The QC Manager must attend the partnering meetings, QC Plan Meetings, Coordination and Mutual Understanding Meeting, conduct the QC meetings, perform the three phases of control except for those phases of control designated to be performed by QC Specialists, perform submittal review and approval, ensure testing is performed and provide QC certifications and documentation required in this Contract this contract, including the Fire Protection and Life Safety Duties described in paragraph Fire Protection and Life Safety Duties. The QC Manager is responsible for managing and coordinating the three phases of control and documentation performed by the QC Specialists, testing laboratory personnel and any other inspection and testing personnel required by this Contract. The QC Manager is the manager of all QC activities. The QC manager is responsible for notifying the Special Inspector of activities which require their review. The QC manager is responsible for coordinating the Special Inspection activities, see paragraph CONTRACTOR'S QUALITY CONTROL (QC) MANAGER, in Section 01 45 35 SPECIAL INSPECTIONS. The QC manager is responsible for the quality control for Controlled Area perimeter construction.

1.6.1.1.1 Fire Protection and Life Safety Duties

a. Hydrants

- (1) Perform visual inspections to verify the proper installation of underground service mains/laterals, thrust blocks and connection to aboveground piping for fire hydrants.
- (2) Verify proper orientation of fire hydrants.
- (3) Observe hydrostatic/leak test and system flushing of the underground lines per NFPA 24.
- (4) Verify proper operation of fire hydrant and all control/isolation valves.
- (5) Document all inspections and observations in field report to be submitted to the Government.
- (6) Completed NFPA 24 Contractor's Material and Test Certificate for Underground Piping to be submitted to the Government.

1.6.1.2 Qualifications

The QC Manager must possess at least a Bachelor's degree in engineering, architecture, or construction management, with a current professional

engineer registration and a minimum of 10 years construction experience as a Project Superintendent, QC Manager, Project Manager, Project Engineer or Construction Manager on similar size and type construction Contracts which included the major trades that are part of this Contract. The individual must have at least 4 years experience as a QC Manager. The individual must be familiar with the requirements of EM 385-1-1 and have experience in the areas of hazard identification, safety compliance, and sustainability.

The QC Manager and all members of the QC organization must be capable of reading, writing, and conversing fluently in the English language.

1.6.1.3 Construction Quality Management Training

In addition to the above experience and education requirements, the QC Manager Alternate QC Manager, Superintendent, QC Specialist, and DQCM must have completed the CQM for Contractors course. If the QC Manager does not have a current certification, obtain the CQM for Contractors course certification within 90 days of award. This course is periodically offered by the Naval Facilities Engineering Systems Command and the Army Corps of Engineers. Contact the Contracting Officer for information on the next scheduled class.

The Construction Quality Management Training certificate expires after 5 years. If the QC Manager's certificate has expired, retake the course to remain current.

1.6.2 Organizational Changes

Maintain the QC staff with personnel as required by the specification section at all times. When it is necessary to make changes to the QC staff, revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

1.6.3 Alternate Quality Control (QC) Manager Duties and Qualifications

Designate an alternate for the QC Manager at the work site to serve in the event of the designated QC Manager's absence. The period of absence may not exceed 2 weeks at one time, and not more than 30 workdays during a calendar year. The qualification requirements for the Alternate QC Manager must be the same as for the QC Manager.

1.6.4 Assistant Quality Control (QC) Manager Duties and Qualifications

Provide a full-time assistant to the QC Manager at the work site to perform the three phases of control, perform submittal review, ensure testing is performed, and prepare QC certifications and documentation required by this Contract. The Assistant QC Manager must be on the work site during supplemental work shifts beyond the regular shift and perform the duties of the QC Manager during such supplemental shift work. The qualification requirements for the Assistant QC Manager must be meet the requirements of the QC Manager but with 2 years of minimum experience. The individual must be familiar with the requirements of EM 385-1-1 and have experience in the areas of hazard identification and safety compliance.

The Assistant QC Manager must be capable of reading, writing, and conversing fluently in the English language.

1.6.5 [Enter Appropriate Subpart Title Here][Enter Appropriate Subpart Title Here][Enter Appropriate Subpart Title Here]Quality Control (QC) Specialists

Provide a separate QC Specialist at the work site for each of the areas as listed in the Matrix listed below, who must assist and report to the QC Manager and who may perform production related duties but must be allowed sufficient time to perform their assigned quality control duties. These individuals or specialized technical companies are directly employed by the Prime Contractor and cannot be employed by a supplier or subcontractor on this project. QC Specialists must be physically present at the work site with frequency as indicated in the Experience Matrix below, to participate in the QC Meetings, perform the three phases of control, including participation in Preparatory and Initial Phase meetings, and to perform and document Follow-up inspections as an extension of the QC Manager for each definable feature of work in their area of responsibility. QC Specialist must assist and be present for training events, and Critical System Acceptance inspections by the Government. Qualification, experience, Area of Responsibility, and frequency of QC surveillance are provided in Matrix listed herein.

Experience Matrix		
1. Area	2-1. Qualification 2-2. Experience	3-1. Area of Responsibility 3-2. Frequency
QC Manager	See Section 01 45 00, Paragraph 1.6.1.	3-1. Entire site 3-2. Frequency of QC will be daily during installation and including final inspection.
Alternate QC Manager	See Section 01 45 00, paragraph 1.6.3	3-1. Entire site 3-2. Frequency of QC will be daily during installation and including final inspection.
Assistant QC Manager	See Section 01 45 00, paragraph 1.6.4	3-1. Entire site 3-2. Frequency of QC will be daily during installation and including final inspection.
Electrical	2-1. Graduate Electrical Engineer with a professional engineer registration 2-2. Person 5 years of experience supervising electrical features of work in the field with a construction company	3-1. Inspection of items in Division 26 Electrical 3-2. As specified in technical sections of specifications Division 26 Electrical. Periodic inspections when specified equipment is being installed.
Environmental	2-1. Graduate Environmental Engineer with a professional engineer registration 2-2. 3 years experience	3-1. Entire site 3-2. Daily during site prep and clearing

Experience Matrix		
1. Area	2-1. Qualification 2-2. Experience	3-1. Area of Responsibility 3-2. Frequency
Submittals	2-1. Submittal Clerk 2-2. 1 year experience	3-1. Entire site 3-2. Frequency of QC will be daily during installation and including final inspection.
Electrical Inspector, International Conference of Building Officials (ICBO)	2-1. Building electrical systems and all there electrical systems not listed above for Licensed Electrical Engineer (PE) 2-2. 5 years experience minimum	3-1. Entire Site 3-2. Minimum one time a week during installation and full time during testing.
Concrete Construction	2-1. Certified by ACI as Concrete Construction Special Inspector	3-1. Entire Site 3-2. Inspection of Cast-in-place concrete operations. See section 03 30 00. Continues frequency

Experience Matrix		
1. Area	2-1. Qualification 2-2. Experience	3-1. Area of Responsibility 3-2. Frequency
Geotechnical Engineer/CQC Geotechnical Specialist	2-1. Civil engineer practicing in geotechnical engineering or geotechnical engineer, registered in the United States, the U.S. District of Columbia, or Guam.	3-1. Specifications Section 31 00 00; Section 32 11 23; Section 32 12 15.13; Section 32 13 14.13 3-2. The on site frequency of QC Geotechnical Engineer/CQC Geotechnical Specialist must be at the start of each related earthwork activity and periodically (minimum once every two weeks. during both earthwork and probing/grouting operations.
Geotechnical Engineer/CQC Geotechnical Specialist (cont.)	2-2. At least 10 years of registered experience, of which at least 8 years must be in responsible charge involving excavating, shoring, dewatering, foundation and pavement excavation and backfilling, flexible and concrete pavement curing and placement, proof rolling, tank water surcharge testing, and survey settlement monitoring in residual, volcanic, and alluvial deposits.	Either the QC Geotechnical Engineer or the Geotechnical Field Representative must be full-time on site during all Earthwork and Probing/Grouting Operations.
Geotechnical Engineer/CQC Geotechnical Specialist (cont.)	Responsible charge is defined as being in direct control or personal supervision of geotechnical earthwork and placement of flexible and concrete pavements. See Section 01 45 00, paragraph 1.6.6.1	
Geotechnical Field Representative (GFR)	2-1 & 2.2. Must be certified by ACI per responsibilities defined in 03 30 00, paragraph 1.6.7 and a current NICET Level II Certification in Construction Materials Testing Soils, see Section 31 00 00, paragraph 1.6.2, with a minimum of five years experience in site development, mass grading and foundation construction with similar subsurface materials for this Contract.	3-1. Specifications Section 31 00 00; Section 32 11 23; Section 32 12 15.13; Section 32 13 14.13 3-2. The GFR is required to be full-time on site during all Earthwork and Probing/Grouting Operations when the GE is not present.

Experience Matrix		
1. Area	2-1. Qualification 2-2. Experience	3-1. Area of Responsibility 3-2. Frequency
Quality Control Hydrogeologist Specialist	~~QCHS must be present during all karst mitigation work. Quality Control Hydrogeologist Specialist must be a degreed geologist with 10 years experience working as a hydrogeologist with experience with groundwater aquifers and GEPA "Protection of Sinkholes" requirements.~~ <u>2-1. Must have Guam EPA approved qualifications including the following: Graduate of a recognized University with a Masters degree in hydrogeology, or Masters degree in geology with an emphasis in hydrogeology. Possession of an active certification as a Registered Geologist in a state with national recognition.</u> <u>2-2. Must have Guam EPA approved experience including the following: 10 years of progressively responsible professional experience in hydrogeology, including 2 years in karst situations with an emphasis on experience in a territory that includes Guam. Must have experience with groundwater aquifers and knowledge of GEPA "Protection of Sinkholes" requirements.</u>	3-1. Specification Section 31 00 00, CG133, CG132 <u>3-2. The QCHS must provide continuous full-time on-site presence for the period of time from the start of site clearing to when 90 percent of clearing has been completed. After this period of time, and during the remainder of clearing and grading operations, the QCHS must make site visits for a minimum of 3 consecutive full working days on-site per month, must be available as-needed for additional site visits (e.g. field investigations, karst mitigation, GEPA site visits, etc.), and must be available remotely for meetings and to perform their specified roles/responsibilities.</u>
Telecommunications	2-1. Certified Registered Communications Distribution Designer (RCDD), and 2-2. Person 5 years of experience supervising telecommunications features of work in the field with construction company	3-1. Inspection of items in Division 27 and 33 82 00 3-2. Frequency as specified in technical sections of specification Outside Plant (OSP). Periodic inspections when specified equipment and infrastructure is being installed.
Fuels System-Specialist		~~See paragraph QUALITY CONTROL-FUELS SYSTEMS ENGINEER (QCFSE)~~
~~Quality Control-Fuels Systems-Engineer (QCFSE)~~	~~See Section 01 45 00, paragraph 1.5.8.1 Qualifications~~	~~See paragraph ROLES AND-RESPONSIBILITIES~~

Experience Matrix		
1. Area	2-1. Qualification 2-2. Experience	3-1. Area of Responsibility 3-2. Frequency
Project Geophysicist	See Section 31 00 00	3-1. Specification Section 31 00 00 ~~3-2. At beginning of ERT work and periodically as requested by CO. Daily remote review of work.~~ 3-2. On site when ERT is performed at the first three karst features. Must be available as-needed for additional site visits at the direction of the QCHS, and must be available remotely for meetings and to perform their specified roles/responsibilities.
QC Geophysicist	See Section 31 00 00	3-1. 3-1. Specification Section 31 00 00 3-2. On site when ERT is performed
Geophysical Survey Team Leader	See Section 31 00 00	3-1. Specification Section 31 00 00 3-2. On site when ERT is performed
Hydrogeologist	~~2-1. Guam EPA approved credentials~~ ~~2-2. Minimum 5 years experience~~ <u>2-1. Graduate of a recognized University with a Bachelors degree in geology. Possession of an active certification as a Registered Geologist-In-Training with national recognition.</u> <u>2-2. Minimum 2 years of professional experience in hydrogeology.</u>	3-1. Entire Site 3-2. Daily

1.6.6 Special Inspector and Special Inspector of Record

The Special Inspector (SI) and Special Inspector of Record (SIOR) must be an independent third party hired directly by the Prime Contractor. The SI and SIOR must not be a company employee of the Contractor or any subcontractor performing the work to be inspected. The qualifications of the SI and SIOR are defined in Section 01 45 35 SPECIAL INSPECTION.

1.6.7 Submittal Reviewers Duties and Qualifications

Provide Submittal Reviewers, other than the QC Manager, qualified in the disciplines being reviewed, to review and certify that the submittals meet the requirements of this Contract prior to certification or approval by

the QC Manager.

1.7 SUBMITTAL AND DELIVERABLES REVIEW AND APPROVAL

Procedures for submission, review and approval of submittals are described in Section 01 33 00 SUBMITTAL PROCEDURES. Procedures must include field verification of relevant dimensions and component characteristics by the QC organization prior to submittal being sent to the Contracting Officer. The CQC organization is responsible for certifying that all submittals and deliverables are in compliance with the Contract.

1.8 THREE PHASES OF CONTROL

CQC enables the Contractor to ensure that the construction, including that of subcontractors and suppliers, complies with the requirements of the Contract. At least three phases of control must be conducted by the QC Manager to adequately cover both on-site and off-site work for each definable feature of the construction work as follows:

1.8.1 Preparatory Phase

Document the results of the preparatory phase actions by separate minutes prepared by the QC Manager and attach to the daily CQC report. Instruct applicable workers as to the acceptable level of workmanship required to meet Contract specifications.

Notify the Contracting Officer at least 2 business days in advance of each preparatory phase meeting. The meeting will be conducted by the QC Manager and attended by the QC Specialists, the Project Superintendent, the Special Inspector, the Special Inspector of Record, and the foreman responsible for the DFO. When the DFO will be accomplished by a subcontractor, that subcontractor's foreman must attend the preparatory phase meeting. This phase is performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. Perform the following prior to beginning work on each DFO:

- a. Review each paragraph of the applicable specification sections, reference codes, and standards. Make available during the preparatory inspection a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field. Maintain and make available in the field for use by Government personnel until final acceptance of the work.
- b. Review the Contract drawings.
- c. Verify that field measurements are as indicated on construction or shop drawings or both before confirming product orders, to minimize waste due to excessive materials.
- d. Verify that appropriate shop drawings and submittals for materials and equipment have been submitted and approved. Verify receipt of approved factory test results, when required.
- e. Review the testing plan and ensure that provisions have been made to provide the required QC testing.
- f. Examine the work area to ensure that the required preliminary work has been completed and complies with the Contract and ensure any

deficiencies/rework items in the preliminary work have been corrected and confirmed by the Contracting Officer.

- g. Review coordination of product/material delivery to designated prepared areas to execute the work.
- h. Examine the required materials, equipment and sample work to ensure that they are on hand and conform to the approved shop drawings and submitted data and are properly stored.
- i. Check to assure that all materials and equipment have been tested, submitted, and approved.
- j. Discuss specific controls to be used, construction methods, construction tolerances, workmanship standards, and the approach that will be used to provide quality construction by planning ahead and identifying potential problems for each DFW. Ensure any portion of the plan requiring separate Contracting Officer acceptance has been approved.
- k. Review the APP and appropriate Activity Hazard Analysis (AHA) to ensure that applicable safety requirements are met, and that required Safety Data Sheets (SDS) are submitted.
- l. Review Special Inspections required by Section 01 45 35 SPECIAL INSPECTION, the Statement of Special Inspections and the Schedule of Special Inspections.

1.8.2 Initial Phase

Notify the Contracting Officer at least 2 business days in advance of each initial phase. When construction crews are ready to start work on a DFW, conduct the initial phase with the QC Specialists, the Project Superintendent, the Special Inspector, the Special Inspector of Record, and the foreman responsible for that DFW. Observe the initial segment of the DFW to ensure that the work complies with Contract requirements. Document the results of the initial phase in the daily CQC Report and in the Initial Phase Checklist. Repeat the initial phase for each new crew to work on-site when acceptable levels of specified quality are not being met. Indicate the exact location of initial phase for definable feature of work for future reference and comparison with follow-up phases. Perform the following for each DFW:

- a. Check work to ensure that it is in full compliance with Contract requirements. Review minutes of the preparatory meeting.
- b. Verify adequacy of controls to ensure full Contract compliance. Verify required control inspection and testing comply with the Contract.
- c. Establish level of workmanship and verify that it meets the minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
- d. Resolve any workmanship issues.
- e. Ensure that testing is performed by the approved laboratory.

- f. Check work procedures for compliance with the APP and the appropriate AHA to ensure that applicable safety requirements are met.
- g. Review project specific work plans (i.e., HAZMAT Abatement, Stormwater Management) to ensure all preparatory work items have been completed and documented.
- h. Coordinate scheduled work with Special Inspections required by Section 01 45 35 SPECIAL INSPECTIONS, the Statement of Special Inspections and the Schedule of Special Inspections.

1.8.3 Follow-Up Phase

Perform the following for on-going DFOW daily, or more frequently as necessary, until the completion of each DFOW. The Final Follow-Up for any DFOW will clearly note in the daily report the DFOW is completed, and all deficiencies/rework items have been completed in accordance with the paragraph DEFICIENCY/REWORK ITEMS LIST. Each DFOW that has completed the Initial Phase and has not completed the Final Follow-up must be included on each daily report. If no work was performed on that DFOW for the period of that daily report, it must be so noted. Document all Follow-Up activities for DFOWs in the daily CQC Report:

- a. Ensure the work including control testing complies with Contract requirements until completion of that particular work feature. Record checks in the CQC documentation.
- b. Maintain the quality of workmanship required.
- c. Ensure that testing is performed by the approved laboratory.
- d. Ensure that deficiencies/rework items are being corrected. Conduct final follow-up checks and correct all deficiencies prior to the start of additional features of work which may be affected by the deficient work.
- e. Do not build upon nor conceal non-conforming work.
- f. Assure manufacturers' representatives have performed necessary inspections if required and perform safety inspections.
- g. Coordinate scheduled work with Special Inspections required by Section 01 45 35 SPECIAL INSPECTIONS, the Statement of Special Inspections and the Schedule of Special Inspections.

1.8.4 Additional Preparatory and Initial Phases

Conduct additional preparatory and initial phases on the same DFOW if the quality of on-going work is unacceptable, if there are changes in the applicable QC organization, if there are changes in the on-site production supervision or work crew, if work on a DFOW has not started within 45 days of the initial preparatory meeting or has resumed after 45 days of inactivity, or if other problems develop.

1.8.5 Notification of Three Phases of Control for Off-Site Work

Notify the Contracting Officer at least 2 weeks prior to the start of the preparatory and initial phases.

1.8.6 Deficiency/Rework Items List

The QC Manager must maintain a list of work that does not comply with the Contract, identifying what items need to be corrected, the activity ID number associated with the item, the date the item was originally discovered, the date the item will be corrected by, and the date the item was corrected.

The QC Manager reviews the list at each weekly QC Meeting:

- a. There is no requirement to report a deficiency/rework item that is corrected the same day it is discovered.
- b. No successor task may be advanced beyond the preparatory phase meeting until all deficiencies/rework items have been cleared by the QC Manager and concurred with by the Contracting Officer. This must be confirmed as part of the Preparatory Phase activities.
- c. Attach a copy of the "Deficiency/Rework Items List" to the last daily CQC Report of each month.
- d. The Contractor is responsible for including those items identified by the Contracting Officer.
- e. All deficiencies/rework items must be confirmed as corrected by the QC Manager, and concurred by the Contracting Officer, prior to commencement of any completion inspections per paragraph COMPLETION INSPECTIONS unless specifically exempted by the Contracting Officer.
- f. Non-Compliance with these requirements is grounds for removal in accordance with paragraph ACCEPTANCE OF THE QUALITY CONTROL (QC) PLAN.
- g. All delays, concurrent or related to failure to manage, monitor, control, and correct deficiencies/rework items are entirely the responsibility of the Contractor and can not be made the subject, or any component of any request for additional time or compensation.

1.9 TESTING

Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to Contract requirements. Upon request, furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and acceptance tests when specified. Procure the services of an U.S. Army Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site or on Guam. Perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with Contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all test documentation requirements, have been prepared.

- e. Record results of all tests taken, both passing and failing on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test. If approved by the Contracting Officer, actual test reports are submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer. Failure to submit timely test reports as stated results in nonpayment for related work performed and disapproval of the test facility for this Contract.

1.9.1 Accreditation Requirements

Construction materials testing laboratories must be accredited by a laboratory accreditation authority and must submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (ASTM E329, ASTM C1077, ASTM D3666, ASTM D3740, ASTM E543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing must meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the Corporate Office.

1.9.2 Laboratory Accreditation Authorities

Laboratory Accreditation Authorities include the National Voluntary Laboratory Accreditation Program (NVLAP) administered by the National Institute of Standards and Technology at <https://www.nist.gov/nvlap>, the American Association of State Highway and Transportation Officials (AASHTO) Accreditation Program at <http://www.aashtoresource.org/aap/overview>, International Accreditation Services, Inc. (IAS) at <https://www.iasonline.org/>, U.S. Army Corps of Engineers Materials Testing Center (MTC) at <https://www.erdc.usace.army.mil/Media/Fact-Sheets/Fact-Sheet-Article-View/Article/476661/materials-testing-center/>, the American Association for Laboratory Accreditation (A2LA) program at <https://a2la.org/>, the Washington Association of Building Officials (WABO) at <https://www.wabo.org/> (Approval authority for WABO is limited to projects within Washington State), and the Washington Area Council of Engineering Laboratories (WACEL) at <https://www.wacel.org/lab-accreditation-and-inspection-agency-audit-programs/laboratory-accreditation-program/> (Approval authority by WACEL is limited to projects within Facilities Engineering Command (FEC) Washington geographical area).

1.9.3 Capability Check

The Contracting Officer retains the right to check laboratory equipment in the proposed laboratory and the laboratory technician's testing procedures, techniques, and other items pertinent to testing, for compliance with the standards set forth in this Contract. Laboratories utilized for testing soils, concrete, asphalt, and steel must meet criteria detailed in ASTM D3740 and ASTM E329.

1.9.4 Test Results

Cite applicable Contract requirements, tests or analytical procedures used. Provide actual results and include a statement that the item tested or analyzed conforms or fails to conform to specified requirements. If the item fails to conform, notify the Contracting Officer immediately.

Conspicuously stamp the cover sheet for each report in large red letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements, whichever is applicable. Test results must be signed by a testing laboratory representative authorized to sign certified test reports. Furnish the signed reports, certifications, and other documentation to the Contracting Officer via the QC Manager. **Furnish a summary report of field tests at the end of each month, in accordance with paragraph DOCUMENTATION AND INFORMATION FOR THE CONTRACTING OFFICER.**

1.9.5 Test Reports and Monthly Summary Report of Tests

Furnish the signed reports, certifications, and a summary report of field tests at the end of each month to the Contracting Officer. Attach a copy of the summary report to the last daily CQC Report of each month.

1.10 COMPLETION INSPECTIONS

1.10.1 Punch-Out Inspection

Near the completion of all work or any increment thereof, established by a completion time stated in the Contract Clause entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the QC Manager must conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved drawings, specifications, and Contract. Include in the punch list any remaining items on the "Deficiency/Rework Items List", that were not corrected prior to the Punch-Out Inspection as approved by the Contracting Officer in accordance with the paragraph DEFICIENCY/REWORK ITEMS LIST. Include within the punch list the estimated date by which the deficiencies will be corrected. Provide a copy of the punch list to the Contracting Officer.

The QC Manager, or staff, must make follow-on inspections to ascertain that all deficiencies have been corrected. All punch list items must be confirmed as corrected by the QC Manager and concurred by the Contracting Officer. Once this is accomplished, notify the Government that the facility is ready for the Government "Pre-Final Inspection".

1.10.2 Pre-Final Inspection

The Government and QC Manager will perform this inspection to verify that the facility is complete and ready to be occupied. A Government "Pre-Final Punch List" will be documented by the QC Manager as a result of this inspection. The QC Manager will ensure that all items on this list are corrected and concurred by the Contracting Officer prior to notifying the Government that a "Final" inspection with the Client can be scheduled. All items noted on the "Pre-Final" inspection must be corrected and concurred by the Contracting Officer in a timely manner and be accomplished before the Contract completion date for the work, or any increment thereof, if the project is divided into increments by separate completion dates unless exceptions are directed by the Contracting Officer.

1.10.3 Final Acceptance Inspection

Notify the Contracting Officer at least 14 calendar days prior to the date a final acceptance inspection can be held. State within the notice that all items previously identified on the pre-final punch list will be corrected and acceptable, along with any other unfinished Contract work, by the date of the final acceptance inspection. The Contractor must be

represented by the QC Manager, the Project Superintendent, and others deemed necessary. Attendees for the Government will include the Contracting Officer, other Government QA personnel, and personnel representing the Client. Failure of the Contractor to have all Contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the Contract Clause entitled "Inspection of Construction."

1.11 QUALITY CONTROL (QC) CERTIFICATIONS

1.11.1 Contractor Quality Control (CQC) Report Certification

Contain the following statement within the CQC Report: "On behalf of the Contractor, I certify that this report is complete and correct and equipment and material used, and work performed during this reporting period is in compliance with the Contract drawings and specifications to the best of my knowledge, except as noted in this report."

1.11.2 Completion Certification

Upon completion of work under this Contract, the QC Manager must furnish a certificate to the Contracting Officer attesting that "the work has been completed, inspected, tested and is in compliance with the Contract." Provide a copy of this final QC Certification for completion to the preparer of the Operation & Maintenance (O&M) documentation.

1.11.3 Invoice Certification

Furnish a certificate to the Contracting Officer with each payment request, signed by the QC Manager, attesting that as-built drawings are current, coordinated and attesting that the work for which payment is requested, including stored material, complies with Contract requirements.

1.12 DOCUMENTATION AND INFORMATION FOR THE CONTRACTING OFFICER

1.12.1 Construction Documentation

Prepare a Construction Production Report and a Contractor Quality Control Report for each day that work is performed. Attach the Construction Production Report to the Contractor Quality Control Report prepared for the same day. Maintain current and complete records of on-site and off-site QC program operations and activities.

Account for each calendar day throughout the life of the Contract.

The Project Superintendent and the QC Manager must prepare and sign the Contractor Production and CQC Reports, respectively. Every space on the forms must be filled in. Use N/A if nothing can be reported in one of the spaces. The reporting of work must be identified by terminology consistent with the construction schedule. In the "Remarks" sections of the reports, enter pertinent information including directions received, problems encountered during construction, work progress and delays, conflicts or errors in the drawings or specifications, field changes, safety hazards encountered, instructions given and corrective actions taken, delays encountered, a record of visitors to the work site, quality control problem areas, deviations from the QC Plan, construction deficiencies encountered, and meetings held. For each entry in the report(s), identify the Schedule Activity No. that is associated with the

entered remark.

1.12.2 Quality Control Activities

CQC and Contractor Production reports will be prepared daily to maintain current records providing factual evidence that required quality control activities and tests have been performed. Include in these records the work of subcontractors and suppliers on an acceptable form that includes, as a minimum, the following information:

- a. The name and area of responsibility of the Contractors and any subcontractors.
- b. Operating plant/equipment with hours worked, idle, or down for repair.
- c. Work performed each day, giving location, description, and by whom. When a Network Analysis Schedule (NAS) is used, identify each item of work performed each day by NAS activity number.
- d. Control phase activities performed. Preparatory, and Initial phase Checklists associated with the DFWO referenced to the construction schedule. Follow-up phase activities identified to the DFWO. If testing or specific QC Specialist activities are associated with the Follow-up phase activities for a specific DFWO note this and include those reports.
- e. Test and control activities performed with results and references to specifications and drawings requirements. Identify the control phase (Preparatory, Initial, Follow-up). List of deficiencies noted, along with corrective action in accordance with the paragraph DEFICIENCY/REWORK ITEMS LIST.
- f. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications and drawings requirements.
- g. Submittals and deliverables reviewed, with Contract reference, by whom, and action taken.
- h. Offsite surveillance activities, including actions taken.
- i. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
- j. Instructions given/received and conflicts in plans and specifications.

1.12.3 Verification Statement

Indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. Cover both conforming and deficient features and include a statement that equipment and materials incorporated in the work and workmanship comply with the Contract.

Furnish the original and one copy of these records in report form to the Government by 10:00 AM the next working day after the date covered by the report. As a minimum, prepare and submit one report for every 7 days of no work and on the last day of a no work period. All calendar days need to be accounted for throughout the life of the Contract. The first report

following a day of no work will be for that day only. Reports need to be signed and dated by the QC Manager. Include copies of test reports and copies of reports prepared by all subordinate quality control personnel within the QC Manager Report.

1.12.4 Reports from the Quality Control (QC) Specialist(s)

Document inspection results on a QC specialist report prepared each day work is performed in their area of responsibility. The report must include a description of the visual inspection or observation performed, a written summary of findings, a conclusion on compliance with the Contract documents, and signature of the QC Specialist. In person inspections must be documented with Video/photographs. Video/photographic documentation of deficiencies must include before and after conditions and physical measurements, as necessary. Forward the QC daily report to the QC Manager who must include the report with the submission of their daily QC Report to the Government each day. Every site visit by the QC Specialist must be documented on a QC Specialist daily report.

1.12.5 Quality Control Validation

Establish and maintain the following in an electronic folder. Divide folder into a series of tabbed sections as shown below. Ensure folder is updated at each required progress meeting.

- a. CQC Meeting minutes in accordance with paragraph QUALITY CONTROL (QC) MEETINGS.
- b. All completed Preparatory and Initial Phase Checklists, arranged by specification section, further sorted by DFOV referenced to the construction schedule. Submit each individual Phase Checklist the day the phase event occurs as part of the CQC daily report.
- c. All milestone inspections, arranged by Activity Number referenced to the construction schedule.
- d. An up-to-date copy of the Testing Plan and Log with supporting field test reports, arranged by specification section referenced to the DFOV to which individual reports results are associated. Individual field test reports will be submitted within 2 working days after the test is performed in accordance with the paragraph QUALITY CONTROL ACTIVITIES.
Monthly Summary Report of Tests: Submit the report as an electronic attachment to the CQC Report at the end of each month.
- e. Copies of all Contract modifications, arranged in numerical order. Also include documentation that modified work was accomplished.
- f. An up-to-date copy of the paragraph DEFICIENCY/REWORK ITEMS LIST.
- g. Special Inspection reports.
- h. Upon commencement of Completion Inspections of the entire project or any defined portion, maintain up-to-date copies of all punch lists issued by the QC staff to the Contractor and subcontractors and all punch lists issued by the Government in accordance with the paragraph COMPLETION INSPECTIONS.

1.12.6 Testing Plan and Log

As tests are performed, the QC Manager will record on the "Testing Plan and Log" the date the test was performed and the date the test results were forwarded to the Contracting Officer. Attach a copy of the updated "Testing Plan and Log" to the last daily CQC Report of each month. Provide a copy of the final "Testing Plan and Log" to the preparer of the Operation & Maintenance (O&M) documentation.

1.12.7 As-Built Drawings

The QC Manager must ensure the as-built drawings, required by Section 01 78 00 CLOSEOUT SUBMITTALS are kept current on a daily basis and marked to show deviations which have been made from the Contract drawings. The as-built drawings document commences with the QC Manager ensuring all amendments, or changes to the Contract prior to Contract award are accurately noted in the initial document set creating the accurate baseline of the Contract prior to any work starting. Ensure each deviation has been identified with the appropriate modifying documentation (e.g., PC No., Modification No., Request for Information No.). The QC Manager must initial each revision. Upon completion of work, the QC Manager will furnish a certificate attesting to the accuracy of the as-built drawings prior to submission to the Contracting Officer.

1.13 NOTIFICATION ON NON-COMPLIANCE

The Contracting Officer will notify the Contractor of any detected non-compliance with the Contract. Take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, is deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders will be made the subject of a claim for extension of time for excess costs or damages by the Contractor.

1.14 DELIVERY, STORAGE, AND HANDLING

Designate receiving/storage areas for incoming material to be delivered according to installation schedule and to be placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. Store and handle materials in a manner as to prevent loss from weather and other damage. Keep materials, products, and accessories covered and off the ground, and store in a dry, secure area. Prevent contact with material that may cause corrosion, discoloration, or staining. Protect all materials and installations from damage by the activities of other trades.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

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SECTION 01 57 19

TEMPORARY ENVIRONMENTAL CONTROLS

08/22, CHG 2: 08/25

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.

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA SW-846 (Third Edition; Update VII) Test Methods
for Evaluating Solid Waste:
Physical/Chemical Methods

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.1053	Respirable Crystalline Silica
29 CFR 1910.1200	Hazard Communication
29 CFR 1926.1153	Respirable Crystalline Silica
40 CFR 50	National Primary and Secondary Ambient Air Quality Standards
40 CFR 60	Standards of Performance for New Stationary Sources
40 CFR 63	National Emission Standards for Hazardous Air Pollutants for Source Categories
40 CFR 64	Compliance Assurance Monitoring
40 CFR 82	Protection of Stratospheric Ozone
40 CFR 112	Oil Pollution Prevention
40 CFR 122.26	Storm Water Discharges (Applicable to State NPDES Programs, see section 123.25)
40 CFR 241	Guidelines for Disposal of Solid Waste
40 CFR 243	Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste
40 CFR 258	Subtitle D Landfill Requirements
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste

40 CFR 261.7	Residues of Hazardous Waste in Empty Containers
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 262.11	Hazardous Waste Determination and Recordkeeping
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 273	Standards for Universal Waste Management
40 CFR 279	Standards for the Management of Used Oil
40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
40 CFR 300.125	National Oil and Hazardous Substances Pollution Contingency Plan - Notification and Communications
40 CFR 355	Emergency Planning and Notification
40 CFR 372	Toxic Chemical Release Reporting
40 CFR 403	General Pretreatment Regulations for Existing and New Sources of Pollution
40 CFR 745	Lead-Based Paint Poisoning Prevention in Certain Residential Structures
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
49 CFR 171	General Information, Regulations, and Definitions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

49 CFR 172.101	Hazardous Material Regulation-Purpose and Use of Hazardous Material Table
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
49 CFR 178	Specifications for Packagings

GUAM CODE ANNOTATED (GCA)

10 GCA CH47	Water Pollution Control
10 GCA CH49	Air Pollution Control Act
10 GCA CH50	Guam Pesticides Act
10 GCA CH51	Solid Waste Management and Litter Control
10 GCA CH76	Storage of Hazardous Materials
22 GCA CH32	Professional Engineers, Architects, and Land Surveyors Law

GUAM ADMINISTRATIVE RULES AND REGULATIONS (GAR)

22 GAR DIV1 CH1	Guam Air Pollution Control Act
22 GAR DIV2 CH5	Guam Water Quality Standards
22 GAR DIV2 CH10	Guam Soil Erosion and Sediment Control Regulations
22 GAR DIV3 CH15	Pesticides
22 GAR DIV4 CH20	Solid Waste Disposal Regulations
22 GAR DIV2 CH30	Hazardous Waste Management
22 GAR DIV9 CH45	Soil Erosion and Sedimentation Control
22 GAR DIV10 CH50	Underground Storage Tanks

Department of the Air Force

Final EIS	(2025) Final Environmental Impact Statement for F-15 Beddown and Infrastructure Upgrade at Andersen Air Force Base, Guam
ICRMP	(2015) Andersen Air Force Base Integrated Cultural Resources Management Plan
Data Recovery Plan	(2025) Data Recovery Plan for Sites 66-07-2113, 66-07-2117, 66-07-2118, and 66-08-2981 (Fafalog), Andersen Air Force Base, Guam
<u>Final ROD</u>	<u>Final Record of Decision Site 78 Site-Wide Operable Unit Andersen Air Force Base, Guam</u>

U.S. Fish and Wildlife Service

2025 BO

Biological Opinion for Expansions of
Aircraft Operations Area at Northwest
Field, and Munitions Storage Area (MSA-1),
Andersen Air Force Base, Guam, 25 February
2025

HACCP Manual

(2019) HACCP Hazard Analysis and Critical
Control Point Planning to Prevent the
Spread of Invasive Species

1.2 DEFINITIONS

1.2.1 State

"State" when used in reference to states of the United States, also includes the Territory of Guam.

1.2.2 Class I and II Ozone Depleting Substance (ODS)

Class I ODS is defined in Section 602(a) of The Clean Air Act. A list of Class I ODS can be found on the EPA website at the following weblink.
<https://www.epa.gov/ozone-layer-protection/ozone-depleting-substances>.

Class II ODS is defined in Section 602(s) of The Clean Air Act. A list of Class II ODS can be found on the EPA website at the following weblink.
<https://www.epa.gov/ozone-layer-protection/ozone-depleting-substances>.

1.2.3 Contractor Generated Hazardous Waste

Contractor generated hazardous waste is materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e., methyl ethyl ketone, toluene), waste thinners, excess paints, excess solvents, waste solvents, excess pesticides, and contaminated pesticide equipment rinse water.

1.2.4 Electronics Waste

Electronics waste is discarded electronic devices intended for salvage, recycling, or disposal.

1.2.5 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally or historically.

1.2.6 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes

management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2.7 Hazardous Debris

As defined in paragraph SOLID WASTE, debris that contains listed hazardous waste (either on the debris surface, or in its interstices, such as pore structure) in accordance with 40 CFR 261. Hazardous debris also includes debris that exhibits a characteristic of hazardous waste in accordance with 40 CFR 261.

1.2.8 Hazardous Materials

Hazardous material is any material that: Is defined in 49 CFR 171, listed in 49 CFR 172, regulated as a hazardous material in accordance with 49 CFR 173; or requires a Safety Data Sheet (SDS) in accordance with 29 CFR 1910.1200; or during end use, treatment, handling, packaging, storage, transportation, or disposal meets or has components that meet or have potential to meet the definition of a hazardous waste as defined by 40 CFR 261 Subparts A, B, C, or D. Designation of a material by this definition, when separately regulated or controlled by other sections or directives, does not eliminate the need for adherence to that hazard-specific guidance which takes precedence over this section for "control" purposes. Such material includes ammunition, weapons, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical and pharmaceutical supplies, medical waste and infectious materials, bulk fuels, radioactive materials, and other materials such as asbestos, mercury, and polychlorinated biphenyls (PCBs).

1.2.9 Hazardous Waste

Hazardous Waste is any material that meets the definition of a solid waste and exhibits a hazardous characteristic (ignitability, corrosivity, reactivity, or toxicity) as specified in 40 CFR 261, Subpart C, or contains a listed hazardous waste as identified in 40 CFR 261, Subpart D, or meets a state, local, or host nation definition of a hazardous waste.

1.2.10 Land Application

Land Application means spreading or spraying discharge water at a rate that allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" must occur. Comply with federal, state, and local laws and regulations.

1.2.11 Municipal Separate Storm Sewer System (MS4) Permit

MS4 permits are those held by municipalities or installations to obtain NPDES permit coverage for their stormwater discharges.

1.2.12 National Pollutant Discharge Elimination System (NPDES)

The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

1.2.13 Oily Waste

Oily waste are those materials that are, or were, mixed with Petroleum,

Oils, and Lubricants (POLs) and have become separated from that POLs. Oily wastes also means materials, including wastewaters, centrifuge solids, filter residues or sludges, bottom sediments, tank bottoms, and sorbents which have come into contact with and have been contaminated by, POLs and may be appropriately tested and discarded in a manner which is in compliance with other state and local requirements.

This definition includes materials such as oily rags, "kitty litter" sorbent clay and organic sorbent material. These materials may be land filled provided that: It is not prohibited in other state regulations or local ordinances; the amount generated is "de minimus" (a small amount); it is the result of minor leaks or spills resulting from normal process operations; and free-flowing oil has been removed to the practicable extent possible. Large quantities of this material, generated as a result of a major spill or in lieu of proper maintenance of the processing equipment, are a solid waste. As a solid waste, perform a hazardous waste determination prior to disposal. As this can be an expensive process, it is recommended that this type of waste be minimized through good housekeeping practices and employee education.

1.2.14 Regulated Waste

Regulated waste are solid wastes that have specific additional federal, state, or local controls for handling, storage, or disposal.

1.2.15 Sediment

Sediment is soil and other debris that have eroded and have been transported by runoff water or wind.

1.2.16 Solid Waste

Solid waste is a solid, liquid, semi-solid or contained gaseous waste. A solid waste can be a hazardous waste, non-hazardous waste, or non-Resource Conservation and Recovery Act (RCRA) regulated waste. Types of solid waste typically generated at construction sites may include:

1.2.16.1 Debris

Debris is non-hazardous solid material generated during the construction, demolition, or renovation of a structure that exceeds 2.5-inch particle size that is: a manufactured object; plant or animal matter; or natural geologic material (for example, cobbles and boulders), broken or removed concrete, masonry, and rock asphalt paving; ceramics; roofing paper and shingles. Inert materials may be reinforced with or contain ferrous wire, rods, accessories and weldments. A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if the mixture is comprised primarily of debris by volume, based on visual inspection.

1.2.16.2 Green Waste

Green waste is the vegetative matter from landscaping, land clearing and grubbing, including, but not limited to, grass, bushes, scrubs, small trees and saplings, tree stumps and plant roots. Marketable trees, grasses and plants that are indicated to remain, be re-located, or be re-used are not included.

1.2.16.3 Material Not Regulated As Solid Waste

Material not regulated as solid waste is nuclear source or byproduct materials regulated under the Federal Atomic Energy Act of 1954 as amended; suspended or dissolved materials in domestic sewage effluent or irrigation return flows, or other regulated point source discharges; regulated air emissions; and fluids or wastes associated with natural gas or crude oil exploration or production.

1.2.16.4 Non-Hazardous Waste

Non-hazardous waste is waste that is excluded from, or does not meet, hazardous waste criteria in accordance with 40 CFR 261.

1.2.16.5 Recyclables

Recyclables are materials, equipment and assemblies such as doors, windows, door and window frames, plumbing fixtures, glazing and mirrors that are recovered and sold as recyclable, wiring, insulated/non-insulated copper wire cable, wire rope, and structural components. It also includes commercial-grade refrigeration equipment with Freon removed, household appliances where the basic material content is metal, clean polyethylene terephthalate bottles, cooking oil, used fuel oil, textiles, high-grade paper products and corrugated cardboard, stackable pallets in good condition, clean crating material, and clean rubber/vehicle tires. Metal meeting the definition of "lead contaminated" or "lead based paint contaminated" may be included as recyclable only if the metal is handled and transported in accordance with regulations, and the facility receiving the material is permitted and authorized to accept and process lead contaminated materials. Paint cans that meet the definition of empty containers in accordance with 40 CFR 261.7 may be included as recyclable if sold to a scrap metal company.

1.2.16.6 Surplus Soil

Surplus soil is existing soil that is in excess of what is required for this work, including aggregates intended, but not used, for on-site mixing of concrete, mortars, and paving. Contaminated soil meeting the definition of hazardous material or hazardous waste is not included and must be managed in accordance with paragraph HAZARDOUS MATERIAL MANAGEMENT.

1.2.16.7 Scrap Metal

This includes scrap and excess ferrous and non-ferrous metals such as reinforcing steel, structural shapes, pipe, and wire that are recovered or collected and disposed of as scrap. Scrap metal meeting the definition of hazardous material or hazardous waste is not included.

1.2.16.8 Wood

Wood is dimension and non-dimension lumber, plywood, chipboard, hardboard. Treated or painted wood that meets the definition of lead contaminated or lead based contaminated paint is not included. Treated wood includes, but is not limited to, lumber, utility poles, crossties, and other wood products with chemical treatment.

1.2.17 Surface Discharge

Surface discharge means discharge of water into drainage ditches, storm

sewers, or creeks meeting the definition of "waters of the United States". Surface discharges from construction sites are discrete, identifiable sources and require a permit from the governing agency. Comply with federal, state, and local laws and regulations.

1.2.18 Wastewater

Wastewater is the aqueous liquid waste generated by a project, to include both domestic wastewater (sewage) and industrial wastewater.

1.2.18.1 Stormwater

Stormwater is any precipitation in an urban or suburban area that does not evaporate or soak into the ground, but instead collects and flows into storm drains, rivers, and streams.

1.2.19 Waters of the United States

Waters of the United States means Federally jurisdictional waters, including wetlands, that are subject to regulation under Section 404 of the Clean Water Act or navigable waters, as defined under the Rivers and Harbors Act.

1.2.20 Wetlands

Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

1.2.21 Universal Waste

The universal waste regulations streamline collection requirements for certain hazardous wastes in the following categories: batteries, pesticides, mercury-containing equipment (for example, thermostats), and lamps (for example, fluorescent bulbs). The rule is designed to reduce hazardous waste in the municipal solid waste (MSW) stream by making it easier for universal waste handlers to collect these items and send them for recycling or proper disposal. These regulations can be found at [40 CFR 273](#). The Guam Environmental Protection Agency (Guam EPA or GEPA) has not adopted the Universal Regulation Rule. Comply with the GEPA regulations and requirements.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. [Submittals not having a "G" or "S" classification are for Contractor Quality Control approval.](#) Submit the following in accordance with Section [01 33 00](#) SUBMITTAL PROCEDURES:

[SD-01 Preconstruction Submittals](#)

[Contractor Hazardous Material Inventory Log; G](#)

[Storage Material Inventory](#)

[Preconstruction Survey](#)

[Regulatory Notifications](#)

Environmental Manager Qualifications

Employee Training Records

Environmental Protection Plan; G

Dirt and Dust Control Plan

Solid Waste Management Permit

Stormwater Pollution Prevention Plan (SWPPP); G

Stormwater Notice of Intent (for NPDES coverage under the general permit for construction activities)

Spill Prevention Control and Countermeasure (SPCC) Plan; G

Hazard Analysis and Critical Control Point (HACCP) Plan; G

GEPA Clearing, Grubbing, Grading, and Stockpiling Permit / General Permit Application; G

Final Work Plan for Tarague Forest Enhancement Area; G

Draft Work Plan for Tarague Forest Enhancement Area; G

Draft Natural Resource Work Plan; G

Final Natural Resource Work Plan; G

Natural Resource Field Assessment Report for P-012 Construction Footprint; G

Natural Resource Field Assessment Report for Tarague Forest Enhancement Area; G

Archaeological Monitoring and Discovery Plan; G

SD-02 Shop Drawings

Alignment of Ungulate Fence; G

SD-06 Test Reports

Monthly Solid Waste Disposal Report; G

SWPPP Inspection Reports

Laboratory Analysis

Cultural Resources and Inspection Reports; G

Draft Natural Resources Conservation Report; G

Final Natural Resources Conservation Report; G

Reports and Submittals required by Data Recovery Plan; G

End of Field (EOF) Letter for Archaeological Monitoring - Tarague
FEA; G

Draft Archaeological Monitoring Report-Tarague FEA; G

Final Archaeological Monitoring Report-Tarague FEA; G

SD-07 Certificates

ECATTS Certificate of Completion; G

Employee Training Records; G

Erosion and Sediment Control Inspector Qualifications

Qualification of Qualified Biologist(S); G

Qualification of Archaeologist(s); G

SD-10 Operation and Maintenance Data

Weekly Natural Resources Conservation Status Report; G

Monthly Natural Resources Conservation Progress Report; G

Annual Natural Resources Conservation Progress Report; G

Weekly archaeological monitoring report-Tarague FEA; G

~~Reports and Submittals required by Data Recovery Plan; G~~

~~End of Field (EOF) Letter for Archaeological Monitoring - Tarague
FEA; G~~

SD-11 Closeout Submittals

Contractor Hazardous Material Inventory Log; G

Regulatory Notifications; G

Assembled Employee Training Records; G

Solid Waste Management Permit; G

Stormwater Pollution Prevention Plan Compliance Notebook; G

Stormwater Notice of Termination (for NPDES coverage under the
general permit for construction activities); G

As-Built Topographic Survey

Waste Determination Documentation; G

Project Solid Waste Disposal Documentation Report; G

Sales Documentation; G

Contractor Certification

Hazardous Waste/Debris Management; G

Disposal Documentation for Hazardous and Regulated Waste; G

~~Draft Natural Resources Conservation Report; G~~

~~Final Natural Resources Conservation Report; G~~

~~Weekly archaeological monitoring report-Tarague FEA; G~~

~~Draft Archaeological Monitoring Report-Tarague FEA; G~~

~~Final Archaeological Monitoring Report-Tarague FEA; G~~

1.4 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Protect the environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire duration of this Contract. Comply with federal, state, and local regulations pertaining to the environment, including water, air, solid waste, hazardous waste and substances, oily substances, and noise pollution.

Tests and procedures assessing whether construction operations comply with Applicable Environmental Laws may be required. Analytical work must be performed by qualified laboratories; and where required by law, the laboratories must be certified.

1.4.1 Training in Environmental Compliance Assessment Training and Tracking System (ECATTS)

1.4.1.1 Personnel Requirements

The Environmental Manager is responsible for environmental compliance on projects. The Environmental Manager and other environmental staff, must complete applicable ECATTS training modules (installation specific or general) prior to starting respective portions of on-site work under this Contract. If personnel changes occur for any of these positions after starting work, replacement personnel must complete applicable ECATTS training within 14 days of assignment to the project.

1.4.1.2 Certification

Submit an ECATTS certificate of completion for personnel who have completed the required ECATTS training. This training is web-based and can be accessed from any computer with Internet access using the following instructions.

Register for NAVFAC Environmental Compliance Assessment, Training, and Tracking System, by logging on to <https://environmentaltraining.ecatts.com/>. Obtain the password for registration from the Contracting Officer.

1.4.1.3 Refresher Training

This training has been structured to allow contractor personnel to receive credit under this contract and to carry forward credit to future contracts. Ensure the Environmental Manager review their training plans for new modules or updated training requirements prior to beginning work. Some training modules are tailored for specific state regulatory requirements; therefore, Contractors working in multiple states will be required to retake modules tailored to the state where the contract work is being performed.

1.4.2 Conformance with the Environmental Management System

Perform work under this contract consistent with the policy and objectives identified in the installation's Environmental Management System (EMS). Perform work in a manner that conforms to objectives and targets of the environmental programs and operational controls identified by the EMS. Support Government personnel when environmental compliance and EMS audits are conducted by escorting auditors at the Project site, answering questions, and providing proof of records being maintained. Provide monitoring and measurement information as necessary to address environmental performance relative to environmental, energy, and transportation management goals. In the event an EMS nonconformance or environmental noncompliance associated with the contracted services, tasks, or actions occurs, take corrective and preventative actions. In addition, employees must be aware of their roles and responsibilities under the installation EMS and of how these EMS roles and responsibilities affect work performed under the contract.

Coordinate with the installation's EMS coordinator to identify training needs associated with environmental aspects and the EMS, and arrange training or take other action to meet these needs. Provide training documentation to the Contracting Officer. The Installation Environmental Office will retain associated environmental compliance records. Make EMS Awareness training completion certificates available to Government auditors during EMS audits and include the certificates in the Employee Training Records. See paragraph EMPLOYEE TRAINING RECORDS.

1.5 SPECIAL ENVIRONMENTAL REQUIREMENTS

Comply with the special environmental requirements listed here and attached at the end of this section.

Attachment B. **Data Recovery Plan** for Sites 66-07-2113, 66-07-2117, 66-07-2118, and 66-08-2981 (Fafalog), Andersen Air Force Base, Guam. Conduct data recovery for the archaeological sites that will be impacted/disturbed by the project.

Attachment B-1. SOP #8 Post-Review Discovery of Archaeological Remains and SOP #9 Post-Review Discovery of Human Remains

Attachment C. P-012 Permits Record of Decision (PROD): Obtain all required environmental or construction permits and approvals listed in the PROD. Obtain any additional permits or approvals needed but not listed in the PROD at no cost to the Government.

Attachment D. Environmental Mitigations presented in the 2025 Final Environmental Impact Statement (**Final EIS**) for F-15 Beddown and Infrastructure Upgrade at Andersen Air Force Base, Guam. Comply

with the environmental mitigation requirements.

Attachment E. Natural Resources Requirements specified in the Biological Opinion (2025 B0) for Expansions of Aircraft Operations Area at Northwest Field, and Munitions Storage Area (MSA-1), Andersen Air Force Base, Guam, 25 February 2025.

Attachment F. Natural Resources Performance Work Statement (PWS)

1.5.1 Abandoned Waste Debris

Refer to the Project Demolition Plan (CD-series). Remove and dispose of stockpiles and waste debris. Refer to the Visual Stockpile Observation Report included in Section 02 61 13 EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL. The site includes abandoned waste debris. Waste debris contains asbestos transite pipes and lead paints. Refer to the Hazardous Material Survey Report for the asbestos transite pipes and lead paints. The report is provided at the end of Section 02 82 00 ASBESTOS REMEDIATION.

1.5.2 PFAS Contamination and G-RAM/LLRW

Refer to Section 02 61 13 EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL; Attachment A, Soil Management Plan; and Attachment B, G-RAM/LLRW Performance Work Statement.

The project site include PFAS-impacted areas and potential General Radioactive Material (G-RAM)/Low-Level Radioactive Waste (LLRW) Area. Implement Section 02 61 13 and Section Attachments A and B.

1.5.3 Sinkhole Protection

Sinkholes are present in the vicinity of project sites. Provide the sinkhole mitigation plan and submittals for Government and GEPA review and approval. Obtain Class V Underground Injection Control (UIC) Permits for three existing sinkholes.

1.5.4 Pacific

Comply with the following state, regional and local requirements.

1.5.4.1 Control and Disposal of Ionization Smoke Detectors or Tritium Exit Signs

1.5.4.1.1 Material Bagging

Remove existing ionization smoke detectors and tritium exit signs, and place like types, together (that is same manufacturer and model number) in a plastic bag. Label the bag with the following data:

Manufacturer:	Activity:
MODEL No.:	Contract No.:
Isotope and Quantity (if known):	

1.5.4.1.2 Material Storage

Store plastic bags in 55 gallon covered drum(s). Do not seal the drum(s). Provide a label with a description of the contents and note on the label "TO BE DISPOSED OF BY RASO". Apply the label to the exterior

surface of the cover and site of the drum(s). Provide a record copy of the label for each drum [storage material inventory](#) to the Contracting Officer, and the RASO.

1.5.4.2 Guam

Comply with all applicable Guam regulations, requirements, and guidance including but are not limited to: HACCP Manual; [10 GCA CH47](#); [10 GCA CH49](#); [10 GCA CH50](#); [10 GCA CH51](#); [10 GCA CH76](#); [22 GCA CH32](#); [22 GCA CH32](#); [22 GAR DIV1 CH1](#); [22 GAR DIV1 CH1](#); [22 GAR DIV2 CH5](#); [22 GAR DIV2 CH10](#); [22 GAR DIV3 CH15](#); [22 GAR DIV4 CH20](#); [22 GAR DIV2 CH30](#); [22 GAR DIV9 CH45](#); [22 GAR DIV10 CH50](#); and the CNMI and Guam Stormwater Management Manual, prepared by Horsley Witten Group Inc, dated (October 2006, as amended).

1.5.4.2.1 Demarcate Project Limits

Under General Provision section of [22 GCA CH32](#), use a Professional Land Surveyor in order to layout/demarcate the project limits. Demarcate the limits of construction and use a licensed professional land surveyor to delineate project limits. The limits of construction are to be clearly marked in the field and must be maintained throughout the duration of construction. Use durable, high-visibility tape/rope (unless a physical feature exists at the limit e.g. fence). The marked limits must be on or within the project boundary presented in the project plan.

1.6 QUALITY ASSURANCE

1.6.1 Preconstruction Survey and Protection of Features

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, perform a [Preconstruction Survey](#) of the project site with the Contracting Officer, and take photographs showing existing environmental conditions in and adjacent to the site. Submit a report for the record. Include in the report a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. The Contractor and the Contracting Officer will sign this survey report upon mutual agreement regarding its accuracy and completeness. Protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference that their preservation may cause to the work under the Contract.

1.6.2 [Regulatory Notifications](#)

Provide regulatory notification requirements in accordance with federal, state and local regulations. In cases where the Government will also provide public notification (such as stormwater permitting), coordinate with the Contracting Officer. Submit copies of regulatory notifications to the Contracting Officer at least 30 days prior to commencement of work activities. Typically, regulatory notifications must be provided for the following (this listing is not all-inclusive): demolition, renovation, NPDES defined site work, construction, removal or use of a permitted air emissions source, and remediation of controlled substances (asbestos, hazardous waste, lead paint).

1.6.3 Environmental Brief

Attend an environmental brief to be included in the preconstruction meeting. Provide the following information: types, quantities, and use of hazardous materials that will be brought onto the installation; and types and quantities of wastes/wastewater that may be generated during the Contract. Discuss the results of the Preconstruction Survey at this time.

Prior to initiating any work on site, meet with the Contracting Officer and installation Environmental Office to discuss the proposed Environmental Protection Plan (EPP) or equipment local requirement. Develop a mutual understanding relative to the details of environmental protection, including measures for protecting natural and cultural resources, required reports, required permits, permit requirements (such as mitigation measures), and other measures to be taken.

1.6.4 Environmental Manager

Appoint in writing an Environmental Manager for the project site. The Environmental Manager is directly responsible for coordinating contractor compliance with federal, state, local, and installation requirements. The Environmental Manager must ensure compliance with Hazardous Waste Program requirements (including hazardous waste handling, storage, manifesting, and disposal); implement the EPP; ensure environmental permits are obtained, maintained, and closed out; ensure compliance with Stormwater Program requirements; ensure compliance with Hazardous Materials (storage, handling, and reporting) requirements; and coordinate any remediation of regulated substances (lead, asbestos, PCB transformers, PFAS-contaminated soil, G-RAM/LLRW). This can be a collateral position; however, the person in this position must be trained to adequately accomplish the following duties: ensure waste segregation and storage compatibility requirements are met; inspect and manage Satellite Accumulation areas; ensure only authorized personnel add wastes to containers; ensure Contractor personnel are trained in 40 CFR requirements in accordance with their position requirements; coordinate removal of waste containers; and maintain the Environmental Records binder and required documentation, including environmental permits compliance and close-out. Submit [Environmental Manager Qualifications](#) to the Contracting Officer.

1.6.5 Employee Training Records

Prepare and maintain [Employee Training Records](#) throughout the term of the contract meeting applicable 40 CFR requirements. Provide Employee Training Records in the Environmental Records Binder. Ensure every employee completes a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures compliance with federal, state and local regulatory requirements for RCRA Large Quantity Generator. Provide a Position Description for each employee, by subcontractor, based on the Davis-Bacon Wage Rate designation or other equivalent method, evaluating the employee's association with hazardous and regulated wastes. This Position Description will include training requirements as defined in [40 CFR 265](#) for a Large Quantity Generator facility. Submit these [Assembled Employee Training Records](#) to the Contracting Officer at the conclusion of the project, unless otherwise directed.

Train personnel to meet EPA and state requirements. Conduct environmental protection/pollution control meetings for personnel prior to commencing construction activities. Conduct additional meetings for new personnel

and when site conditions change. Include in the training and meeting agenda: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, waters of the United States, and endangered species and their habitat that are known to be in the area. Provide copy of the [Erosion and Sediment Control Inspector Qualifications](#) as defined by EPA Certification as required by state.

1.6.6 Non-Compliance Notifications

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with federal, state or local environmental laws or regulations, permits, and other elements of the Contractor's EPP. After receipt of such notice, inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. FAR 52.242-14 Suspension of Work provides that a suspension, delay, or interruption of work due to the fault or negligence of the Contractor allows for no adjustments to the contract for time extensions or equitable adjustments. In addition to a suspension of work, the Contracting Officer may use additional authorities under the contract or law.

1.7 ENVIRONMENTAL PROTECTION PLAN

The purpose of the EPP is to present an overview of known or potential environmental issues that must be considered and addressed during construction. Incorporate construction related objectives and targets from the installation's EMS into the EPP. Include in the EPP measures for protecting natural and cultural resources, required reports, and other measures to be taken. Meet with the Contracting Officer or Contracting Officer Representative to discuss the EPP and develop a mutual understanding relative to the details for environmental protection including measures for protecting natural resources, required reports, and other measures to be taken. Submit the EPP within 15 days after notice to proceed and not less than 10 days before the preconstruction meeting. Submit the EPP not less than 60 calendar days before scheduled final site or building design approval. Revise the EPP throughout the project to include any reporting requirements, changes in site conditions, or contract modifications that change the project scope of work in a way that could have an environmental impact. No requirement in this section will relieve the Contractor of any applicable federal, state, and local environmental protection laws and regulations. During Construction, identify, implement, and submit for approval any additional requirements to be included in the EPP. Maintain the current version onsite.

The EPP includes, but is not limited to, the following elements:

1.7.1 General Overview and Purpose

1.7.1.1 Descriptions

A brief description of each specific plan required by environmental permit or elsewhere in this Contract such as but is not limited to:

- a. stormwater pollution prevention plan,
- b. spill control plan,
- c. solid waste management plan,
- d. wastewater and hydrostatic/hydrotesting water management plan,
- e. air pollution control plan,
- f. contaminant prevention plan,
- g. historical, archaeological, cultural resources including data recovery and archaeological monitoring,
- h. biological, natural resources, and compliance with 2025 BO
- i. sinkhole mitigation plan,
- j. traffic control plan,
- k. Hazardous, Toxic and Radioactive Waste (HTRW) Plan (PFAS-contaminated soil, G-RAM/LLRW),
- l. Non-Hazardous Solid Waste Disposal Plan including abandoned waste debris and green waste management,
- m. borrowing material plan,
- n. surplus soil management plan.

1.7.1.2 Duties

The duties and level of authority assigned to the person(s) on the job site who oversee environmental compliance, such as who is responsible for adherence to the EPP, who is responsible for spill cleanup and training personnel on spill response procedures, who is responsible for manifesting hazardous waste to be removed from the site (if applicable), and who is responsible for training the Contractor's environmental protection personnel.

1.7.1.3 Procedures

A copy of any standard or project-specific operating procedures that will be used to effectively manage and protect the environment on the project site.

1.7.1.4 Communications

Communication and training procedures that will be used to convey environmental management requirements to Contractor employees and subcontractors.

1.7.1.5 Contact Information

Emergency contact information contact information (office phone number, cell phone number, and e-mail address).

1.7.2 General Site Information

1.7.2.1 Drawings

Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, jurisdictional wetlands, material storage areas, structures, sanitary facilities, storm drains and conveyances, and stockpiles of excess soil.

1.7.2.2 Work Area

Work area plan showing the proposed activity in each portion of the area and identify the areas of limited use or nonuse. Include measures for marking the limits of use areas, including methods for protection of features to be preserved within authorized work areas and methods to control runoff and to contain materials on site, and a traffic control plan.

Show where any hazardous materials or waste (e.g., asbestos, G-RAM/LLRW, contaminated soil), fuels, hazardous substances, solvents, or lubricants will be stored. Provide a spill plan to address any releases of those materials.

1.7.2.3 Documentation

A letter signed by an officer of the firm appointing the Environmental Manager and stating that person is responsible for managing and implementing the Environmental Program as described in this contract. Include in this letter the Environmental Manager's authority to direct the removal and replacement of non-conforming work.

1.7.3 Management of Natural Resources

- a. Land resources
- b. Natural resources and tree protection including Endangered Species Act (ESA)-listed Endangered and Threatened (T&E) species
- c. Replacement of damaged landscape features
- d. Temporary construction
- e. Sinkhole protection
- f. Fish and wildlife resources (e.g., Mariana fruit bats)

1.7.4 Protection of Historical and Archaeological Resources

- a. Objectives
- b. Methods

1.7.5 Stormwater Management and Control

- a. Ground cover
- b. Erodible soils
- c. Temporary measures

(1) Structural Practices

(2) Temporary and permanent stabilization

d. Effective selection, implementation and maintenance of Best Management Practices (BMPs).

e. Stormwater Pollution Prevention Plan (SWPPP).

1.7.6 Protection of the Environment from Waste Derived from Contractor Operations

This item consists of the management procedures for hazardous waste to be generated. The elements of those procedures will coincide with the Installation Hazardous Waste Management Plan when within an installation. The Contracting Officer will provide a copy of the Installation Hazardous Waste Management Plan as applicable.

As a minimum, include the following:

- a. List of the types of hazardous wastes expected to be generated
- b. Procedures to ensure a written waste determination is made for appropriate wastes that are to be generated
- c. Sampling/analysis plan, including laboratory method(s) that will be used for waste determinations and copies of relevant laboratory certifications
- d. Methods and proposed locations for hazardous waste accumulation/storage (that is, in tanks or containers)
- e. Management procedures for storage, labeling, transportation, and disposal of waste (treatment of waste is not allowed unless specifically noted)
- f. Management procedures and regulatory documentation ensuring disposal of hazardous waste complies with Land Disposal Restrictions ([40 CFR 268](#))
- g. Management procedures for recyclable hazardous materials such as lead-acid batteries, used oil, and similar
- h. Used oil management procedures in accordance with [40 CFR 279](#); Hazardous waste minimization procedures
- i. Plans for the disposal of hazardous waste by permitted facilities; and Procedures to be employed to ensure required employee training records are maintained.
- j. Plans for off-site reuse or disposal of surplus soil.

1.7.7 Prevention of Releases to the Environment

Procedures to prevent releases to the environment

Notifications in the event of a release to the environment

1.7.8 Regulatory Notification and Permits

List what notifications and permit applications must be made. Some permits require up to 240 days to obtain. Demonstrate that those permits have been obtained or applied for by including copies of applicable environmental permits. The EPP will not be approved until the permits have been obtained.

1.7.9 Clean Air Act Compliance

1.7.9.1 Haul Route

Submit truck and material haul routes along with a [Dirt and Dust Control Plan](#) for controlling dirt, debris, and dust on Installation roadways. As a minimum, identify in the plan the subcontractor and equipment for cleaning along the haul route and measures to reduce dirt, dust, and debris from roadways.

1.7.9.2 Pollution Generating Equipment

Identify air pollution generating equipment or processes that may require federal, state, or local permits under the Clean Air Act. Determine requirements based on any current installation permits and the impacts of the project. Provide a list of all fixed or mobile equipment, machinery or operations that could generate air emissions during the project to the Installation Environmental Office (Air Program Manager). Ensure required permits are obtained prior to installing and operating applicable equipment/processes.

1.7.9.3 Stationary Internal Combustion Engines

Identify portable and stationary internal combustion engines that will be supplied, used or serviced. Comply with [40 CFR 60](#) Subpart IIII, [40 CFR 60](#) Subpart JJJJ, [40 CFR 63](#) Subpart ZZZZ, and local regulations as applicable. At minimum, include the make, model, serial number, manufacture date, size (engine brake horsepower), and EPA emission certification status of each engine. Maintain applicable records and log hours of operation and fuel use. Logs must include reasons for operation and delineate between maintenance/testing, emergency, and non-emergency operation.

1.7.9.4 Refrigerants

Identify management practices to ensure that heating, ventilation, and air conditioning (HVAC) work involving refrigerants complies with [40 CFR 82](#) requirements. Technicians must be certified, maintain copies of certification on site, use certified equipment and log work that requires the addition or removal of refrigerant. Any refrigerant reclaimed is the property of the Government, coordinate with the Installation Environmental Office to determine the appropriate turn in location.

1.7.9.5 Air Pollution-engineering Processes

Identify planned air pollution-generating processes and management control measures (including, but not limited to, concrete batch plants, generators, spray painting, abrasive blasting, demolition, material handling, fugitive dust, and fugitive emissions). Log hours of operations and track quantities of materials used.

1.7.9.6 Compliant Materials

Provide the Government a list of SDSs for all hazardous materials proposed for use on site. Materials must be compliant with all Clean Air Act regulations for emissions including solvent and volatile organic compound contents, and applicable National Emission Standards for Hazardous Air Pollutants requirements. The Government may alter or limit use of specific materials as needed to meet installation permit requirements for emissions.

1.8 LICENSES AND PERMITS

Obtain licenses and permits required for the construction of the project and in accordance with FAR 52.236-7 Permits and Responsibilities. Notify the Government of all equipment that may require permits or special approvals that the Contractor plans to use on site. This paragraph supplements the Contractor's responsibility under FAR 52.236-7 Permits and Responsibilities.

1.9 ENVIRONMENTAL RECORDS BINDER

Maintain on-site a separate three-ring Environmental Records Binder and submit at the completion of the project. Make separate parts within the binder that correspond to each submittal listed under paragraph CLOSEOUT SUBMITTALS in this section.

1.10 SOLID WASTE MANAGEMENT PERMIT

Provide the Contracting Officer with written notification of the quantity of anticipated solid waste or debris that is anticipated or estimated to be generated by construction. Include in the report the locations where various types of waste will be disposed or recycled. Include letters of acceptance from the receiving location or as applicable; submit one copy of the receiving location state and local Solid Waste Management Permit or license showing such agency's approval of the disposal plan before transporting wastes off Government property.

1.10.1 Monthly Solid Waste Disposal Report

Monthly, submit a solid waste disposal report to the Contracting Officer. For each waste, the report will state the classification (using the definitions provided in this section), amount, location, and name of the business receiving the solid waste.

1.11 FACILITY HAZARDOUS WASTE GENERATOR STATUS

AAFB is designated as a Large Quantity Generator. Meet the regulatory requirements of this generator designation for any work conducted within the boundaries of this Installation. Comply with provisions of federal, state, and local regulatory requirements applicable to this generator status regarding training and storage, handling, and disposal of construction derived wastes.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PROTECTION OF NATURAL RESOURCES

Minimize interference with, disturbance to, and damage to fish, wildlife, and plants, including their habitats. Prior to the commencement of activities, consult with the Installation Environmental Office as applicable, regarding rare species or sensitive habitats that need to be protected. The protection of rare, threatened, and endangered animal and plant species identified, including their habitats, is the Contractor's responsibility. The following species are known and could be affected within the construction area:

- a. *Cycas micronesica*
- b. *Tabernaemontana rotensis* (T. rotensis)
- c. *Bulbophyllum guamense*, *Dendrobium guamense*, and *Tuberolabium guamense*
- d. Mariana fruit bats

Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work that is consistent with the requirements of the Installation Environmental Office or as otherwise specified. Confine construction activities to within the limits of the work indicated or specified.

3.1.1 2025 B0 and NR PWS

Comply with and implement the natural resources requirements, including conservation measures and Best Management Practices (BMP), specified in Attachment E, Biological Opinion (2025 B0) and Attachment F, Natural Resources Performance Work Statement (PWS) for the project. Comply with and implement all requirements for the P-012 project site, Tarague Forest Enhancement Area (Tarague FEA), and Habitat Management Unit (HMU). The locations of Tarague FEA and HMU are presented in Attachment F1, Figures for Natural Resources Conservation. The Contractor must review, understand, and execute the 2025 B0. Prepare a [Hazard Analysis and Critical Control Point \(HACCP\) Plan](#) for Government review and approval.

Submit the plans and reports specified in the PWS.

- a. [Qualification of qualified biologist\(s\)](#)
- b. [Draft Natural Resource Work Plan](#)
- c. [Final Natural Resource Work Plan](#)
- d. [Natural Resource Field Assessment Report for P-012 Construction footprint](#)
- e. [Natural Resource Field Assessment Report for Tarague Forest Enhancement Area](#)
- f. [Alignment of Ungulate Fence](#)
- g. [Draft Work Plan for Tarague Forest Enhancement Area](#)
- h. [Final Work Plan for Tarague Forest Enhancement Area](#)
- i. [Weekly Natural Resources Conservation Status Report](#)

- j. Monthly Natural Resources Conservation Progress Report
- k. Annual Natural Resources Conservation Progress Report
- l. Draft Natural Resources Conservation Report
- m. Final Natural Resources Conservation Report

3.1.2 Flow Ways

Do not alter water flows or otherwise significantly disturb the native habitat adjacent to the project and critical to the survival of fish and wildlife, except as specified and permitted.

3.1.3 Vegetation

Except in areas to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without the Contracting Officer's permission. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless authorized by the Contracting Officer. Where such use of attached ropes, cables, or guys is authorized, the Contractor is responsible for any resultant damage.

Protect existing trees and critical root zones (CRZ) that are to remain to ensure they are not injured, bruised, defaced, or otherwise damaged by construction operations. Remove displaced rocks from uncleared areas. Coordinate with the Contracting Officer and Installation Environmental Office to determine appropriate action for trees and other landscape features scarred or damaged by equipment operations.

3.2 STORMWATER

Do not discharge stormwater from construction sites to the sanitary sewer. If the water is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Obtain authorization in advance from the Installation Environmental Office for any release of contaminated water.

3.2.1 Construction General Permit

Provide a Construction General Permit as required by [40 CFR 122.26](#) or EPA General Permit. Under the terms and conditions of the permit, install, inspect, maintain BMPs, prepare stormwater erosion and sediment control inspection reports, and submit SWPPP inspection reports. Maintain construction operations and management in compliance with the terms and conditions of the general permit for stormwater discharges from construction activities.

3.2.1.1 Stormwater Pollution Prevention Plan

Submit a project-specific [Stormwater Pollution Prevention Plan](#) (SWPPP) to the Contracting Officer for approval, within 30 days of notice to proceed and prior to the commencement of work. The SWPPP must meet the requirements of [40 CFR 122.26](#) and the EPA General Permit for stormwater discharges from construction sites.

Include the following:

- a. Comply with terms of the EPA general permit for stormwater discharges from construction activities. Prepare SWPPP in accordance with EPA requirements. Use EPA guide Developing your Stormwater Pollution Prevention Plan located at <https://www.epa.gov/npdes/developing-stormwater-pollution-prevention-plan-swppp> to prepare the SWPPP.
- b. Select applicable BMPs from EPA Fact Sheets located at <https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#constr> or in accordance with applicable state or local requirements.
- c. Include a completed copy of the Notice of Intent, BMP Inspection Report Template, and Stormwater Notice of Termination, except for the effective date.
- d. Comply with local additional requirements including the Commonwealth of the Northern Marianas Islands (CNMI) and the Territory of Guam, Stormwater Management Manuals (2006 or as amended). Apply and obtain a GEPA Clearing, Grubbing, Grading, and Stockpiling Permit / General Permit Application for Earthmoving Work & Full Construction prior to relevant construction activities. The permit requires an Environmental Protection Plan.

3.2.1.2 Stormwater Notice of Intent for Construction Activities

Prepare and submit the Notice of Intent for NPDES coverage under the general permit for construction activities to the Contracting Officer for review and approval.

Submit the approved NOI and appropriate permit fees onto the appropriate federal or state agency for approval. No land disturbing activities may commence without permit coverage. Maintain an approved copy of the SWPPP at the onsite construction office, and continually update as regulations require, reflecting current site conditions.

Comply with additional state and local requirements.

3.2.1.3 SWPPP Inspection Reports

Submit "SWPPP Inspection Reports" to the Contracting Officer in accordance with EPA Construction General Permit.

3.2.1.4 Stormwater Pollution Prevention Plan Compliance Notebook

Create and maintain a three ring binder of documents that demonstrate compliance with the Construction General Permit. Include a copy of the permit Notice of Intent, proof of permit fee payment, SWPPP and SWPPP update amendments, inspection reports and related corrective action records, copies of correspondence with the EPA and GEPA Permitting Agency, and a copy of the permit Notice of Termination in the binder. At project completion, the notebook becomes property of the Government. Provide the compliance notebook to the Contracting Officer.

3.2.1.5 Stormwater Notice of Termination for Construction Activities

Submit a Notice of Termination to the Contracting Officer for approval once construction is complete and final stabilization has been achieved on all portions of the site for which the permittee is responsible. Once

approved, submit the Notice of Termination to the appropriate state or federal agency. Prepare [as-built topographic survey](#) information required by the permitting agency for certification of the stormwater management system, and provide to the Contracting Officer.

3.2.2 Erosion and Sediment Control Measures

Provide erosion and sediment control measures in accordance with state and local laws and regulations. Preserve vegetation to the maximum extent practicable.

Erosion control inspection reports may be compiled as part of a stormwater pollution prevention plan inspection reports.

3.2.2.1 Erosion Control

Prevent erosion by mulching, Compost Blankets, Geotextiles, temporary slope drains. Stabilize slopes by chemical stabilization, sodding, seeding, or such combination of these methods necessary for effective erosion control. Use of hay bales is prohibited. Use of sandbags as stormwater BMPs is not allowed.

3.2.2.2 Sediment Control Practices

Implement sediment control practices to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Implement sediment control practices prior to soil disturbance and prior to creating areas with concentrated flow, during the construction process to minimize erosion and sediment laden runoff. Include the following devices: silt fence, temporary diversion dikes, storm drain inlet protection. Location and details of installation and construction are indicated on the drawings.

3.2.3 Work Area Limits

Mark the areas that need not be disturbed under this Contract prior to commencing construction activities. Mark or fence isolated areas within the general work area that are not to be disturbed. Protect monuments and markers before construction operations commence. Where construction operations are to be conducted during darkness, all markers must be visible in the dark. Personnel must be knowledgeable of the purpose for marking and protecting particular objects.

3.2.4 Contractor Facilities and Work Areas

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designated on the drawings or as directed by the Contracting Officer. Move or relocate the Contractor facilities only when approved by the Government. Provide erosion and sediment controls for onsite borrow and spoil areas to prevent sediment from entering nearby waters. Control temporary excavation and embankments for plant or work areas to protect adjacent areas.

3.2.5 Municipal Separate Storm Sewer System (MS4) Management

Comply with the Installation's MS4 permit requirements. [Comply with local requirements.](#)

3.3 SURFACE AND GROUNDWATER

3.3.1 Cofferdams, Diversions, and Dewatering

Construction operations for dewatering, removal of cofferdams, tailrace excavation, and tunnel closure must be constantly controlled to maintain compliance with existing state water quality standards and designated uses of the surface water body. Comply with the Guam water quality standards and anti-degradation provisions. Do not discharge excavation ground water to the sanitary sewer, storm drains, or to surface waters without prior specific authorization in writing from the Installation Environmental Office or Contracting Officer. Discharge of hazardous substances will not be permitted under any circumstances. Use sediment control BMPs to prevent construction site runoff from directly entering any storm drain or surface waters.

If the construction dewatering is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Obtain authorization for any contaminated groundwater release in advance from the Installation Environmental Officer and the federal or state authority, as applicable. Discharge of hazardous substances will not be permitted under any circumstances.

3.3.2 Waters of the United States

Do not enter, disturb, destroy, or allow discharge of contaminants into waters of the United States.

3.4 PROTECTION OF CULTURAL RESOURCES

3.4.1 Archaeological Resources

Existing archaeological resources within the work area are shown on Attachment B, [Data Recovery Plan](#).

Protect these resources and be responsible for their preservation during the life of the Contract. If, during excavation or other construction activities, any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, activities that may damage or alter such resources will be suspended. Resources covered by this paragraph include, but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, immediately notify the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds must be made. Cease all activities that may result in impact to or the destruction of these resources. Secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources. The Government retains ownership and control over archaeological resources.

3.4.2 Qualified Archaeologists

Provide qualified archaeologists. Archaeologists must have a graduate degree in archaeology, anthropology, or closely related field and meet the Secretary of the Interior's Professional Qualifications for Archaeology.

The qualified archaeologist(s) can be one person or more than one person who meets the qualifications listed above. Submit the [Qualification of Archaeologist\(s\)](#).

3.4.3 P-012 Project Site

3.4.3.1 Archaeological Monitoring: Not Required

Archaeological monitoring is not required. However, in the event that unidentified archaeological resources or human remains are discovered, the archaeologist retained by the Contractor, Contracting Officer, and AAFB Cultural Resources Manager (CRM) must be immediately notified.

The on-site manager must halt all action in the vicinity of the discovery and secure the area per the guidance of the archaeological monitors.

The AAFB CRM and archaeologist will assess the discovery and make the appropriate notifications and follow-up actions. Any archaeological resources discovered during the project and construction must be reported and documented in accordance with the [ICRMP](#) SOP 8 and 9. The area will be released back for construction activities by the Contracting Officer once AAFB CRM has made the notification that the inadvertent discovery has been mitigated.

3.4.3.2 Data Recovery

The qualified archaeologist retained by the Contractor must execute and implement Attachment B, Data Recovery Plan for Sites 66-07-2113, 66-07-2117, and 66-07-2118 for the archaeological sites. Conduct data recovery for the archaeological sites that will be impacted/disturbed by the P-012 project. Provide the [Reports and Submittals required by Data Recovery Plan](#).

3.4.4 Tarague Forest Enhancement Area (FEA)

Tarague FEA is likely to contain significant subsurface deposits. Provide archaeological monitoring for all ground disturbing activities, including vegetation clearance, installation of ungulate fencing, T&E transplanting, and invasive species clearance. The qualified archaeologists must provide monitoring. Submit an [Archaeological Monitoring and Discovery Plan](#) (AMDP) for the Government review and approval. Anticipate review by the Guam State Historic Preservation Office (Guam SHPO). The AMDP must include the treatment plans specified in Part 3.4.5 Cultural Resources Post Review Discovery for P-012 Project Site and Tarague FEA.

If subsurface deposits are encountered during archaeological monitoring, note the observation. Additional testing is not required. Install the ungulate fence and transplant plants nearby areas without subsurface deposits.

Provide an [End of Field \(EOF\) Letter for Archaeological Monitoring - Tarague FEA](#) within 5 working days after completion of ungulate fencing. Submit a [Draft Archaeological Monitoring Report-Tarague FEA](#) within 30 calendar days after completion of ungulate fencing. Submit the [Final Archaeological Monitoring Report-Tarague FEA](#) within 30 calendar days after receipt of Government comments.

Provide a [weekly archaeological monitoring report-Tarague FEA](#).

3.4.5 Cultural Resources Post Review Discovery for P-012 Project Site and Tarague FEA

The project includes the following Sub-Line Item Number (SLIN). All plans and reports must be prepared by the Contractor and reviewed/approved by the Government and Guam SHPO if the respective SLIN is executed. The Contractor must indicate a list of submittals and submittal schedule in the AMDP.

3.4.5.1 One-Day Cultural Resources Feature Investigations (SLIN 0001AD)

Provide required Cultural Resources and Inspection Reports including findings, preliminary significance, photographs, and recommendations.

3.4.5.2 Cultural Resources Post Review Discovery for Small Sites (SLIN 0001AE)

Provide required Cultural Resources and Inspection Reports.

3.4.5.3 Cultural Resources Post Review Discovery for Large Sites (SLIN 0001AF)

Provide required Cultural Resources and Inspection Reports.

3.4.5.4 Cultural Resources Post Review Discovery of Human Skeletal Remains (SLIN 0001AG)

Provide required Cultural Resources and Inspection Reports.

3.5 AIR RESOURCES

Equipment operation, activities, or processes will be in accordance with **40 CFR 64** and state air emission and performance laws and standards. Use ultra-low sulfur diesel fuel.

3.5.1 Preconstruction Air Permits

Notify the Air Program Manager, through the Contracting Officer, at least 6 months prior to bringing equipment, assembled or unassembled, onto the Installation, so that air permits can be secured. Necessary permitting time must be considered in regard to construction activities. Clean Air Act (CAA) permits must be obtained prior to bringing equipment, assembled or unassembled, onto the Installation.

Confirm that these permits have been obtained.

3.5.2 Oil or Dual-fuel Boilers and Furnaces

Provide product data and details for new, replacement, or relocated fuel fired boilers, heaters, or furnaces to the Installation Environmental Office (Air Program Manager) through the Contracting Officer. Data to be reported include: equipment purpose (water heater, building heat, process), manufacturer, model number, serial number, fuel type (oil type, gas type) size (MMBTU heat input). Provide in accordance with paragraph PRECONSTRUCTION AIR PERMITS.

3.5.3 Burning

Burning is prohibited on the Government premises.

3.5.4 Class I and II ODS Prohibition

Class I and II ODS are Government property and must be returned to the Government for appropriate management. Coordinate with the Installation Environmental Office to determine the appropriate location for turn in of all reclaimed refrigerant.

3.5.5 Venting of Refrigerant

Accidental venting of a refrigerant is a release and must be reported immediately to the Contracting Officer. Intentional venting of refrigerants (including most Non-ODS substitute refrigerants) is prohibited per 40 CFR 82.

3.5.6 EPA Certification Requirements

Heating and air conditioning technicians must be certified through an EPA-approved program. Maintain copies of certifications at the employees' places of business; technicians must carry certification wallet cards, as provided by environmental law.

3.5.7 Dust Control

Keep dust down at all times, including during nonworking periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not unnecessarily shake bags of cement, concrete mortar, or plaster. Since these products contain Crystalline Silica, comply with the applicable OSHA standard, 29 CFR 1910.1053 or 29 CFR 1926.1153 for controlling exposure to Crystalline Silica Dust.

3.5.7.1 Particulates

Dust particles, aerosols and gaseous by-products from construction activities, and processing and preparation of materials (such as from asphaltic batch plants) must be controlled at all times, including weekends, holidays, and hours when work is not in progress. Maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates that would exceed 40 CFR 50, state, and local air pollution standards or that would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators, or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp. Provide sufficient, competent equipment available to accomplish these tasks. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with state and local visibility regulations.

3.5.7.2 Abrasive Blasting

Blasting operations cannot be performed without prior approval of the Installation Air Program Manager. The use of silica sand is prohibited in sandblasting.

Provide tarpaulin drop cloths and windscreens to enclose abrasive blasting operations to confine and collect dust, abrasive agent, paint chips, and other debris. Perform work involving removal of hazardous material in accordance with 29 CFR 1910.

3.5.8 Odors

Control odors from construction activities. The odors must be in compliance with state regulations and local ordinances and may not constitute a health hazard.

3.6 WASTE MINIMIZATION

Minimize the use of hazardous materials and the generation of waste. Include procedures for pollution prevention/ hazardous waste minimization in the Hazardous Waste Management Section of the EPP. Obtain a copy of the installation's Pollution Prevention/Hazardous Waste Minimization Plan for reference material when preparing this part of the EPP. If no written plan exists, obtain information by contacting the Contracting Officer. Describe the anticipated types of the hazardous materials to be used in the construction when requesting information.

3.6.1 Salvage, Reuse and Recycle

Identify anticipated materials and waste for salvage, reuse, and recycling. Describe actions to promote material reuse, resale or recycling. To the extent practicable, all scrap metal must be sent for reuse or recycling and will not be disposed of in a landfill.

Include the name, physical address, and telephone number of the hauler, if transported by a franchised solid waste hauler. Include the destination and, unless exempted, provide a copy of the state or local permit (cover) or license for recycling.

3.6.2 Nonhazardous Solid Waste Diversion Report

Maintain an inventory of nonhazardous solid waste diversion and disposal of construction and demolition debris. Submit a report to Installation Environmental Office through the Contracting Officer on the first working day after each fiscal year quarter, starting the first quarter that nonhazardous solid waste has been generated. Include the following in the report:

Construction and Demolition (C&D) Debris Disposed	cubic yards or tons, as appropriate
C&D Debris Recycled	cubic yards or tons, as appropriate
C&D Debris Composted	cubic yards or tons, as appropriate

Construction and Demolition (C&D) Debris Disposed	cubic yards or tons, as appropriate
Total C&D Debris Generated	cubic yards or tons, as appropriate
Waste Sent to Waste-To-Energy Incineration Plant (This amount must not be included in the recycled amount)	cubic yards or tons, as appropriate

3.7 WASTE MANAGEMENT AND DISPOSAL

3.7.1 Waste Determination Documentation

Complete a Waste Determination form (provided at the pre-construction conference) for Contractor-derived wastes to be generated. All potentially hazardous solid waste streams that are not subject to a specific exclusion or exemption from the hazardous waste regulations (e.g., scrap metal, domestic sewage) or subject to special rules, (lead-acid batteries and precious metals) must be characterized in accordance with the requirements of 40 CFR 262.11 or corresponding applicable state or local regulations. Base waste determination on user knowledge of the processes and materials used, and analytical data when necessary. Consult with the Installation environmental staff for guidance on specific requirements. Attach support documentation to the Waste Determination form. As a minimum, provide a Waste Determination form for the following waste (this listing is not exhaustive): oil- and latex-based painting and caulking products, solvents, adhesives, aerosols, petroleum products, and containers of the original materials.

3.7.1.1 Sampling and Analysis of Waste

3.7.1.1.1 Waste Sampling

Sample waste in accordance with EPA SW-846. Clearly mark each sampled drum or container with the Contractor's identification number, and cross reference to the chemical analysis performed.

3.7.1.1.2 Laboratory Analysis

Follow the analytical procedure and methods in accordance with the 40 CFR 261. Provide analytical results and reports performed to the Contracting Officer. Coordinate all activities with Installation Hazardous Waste Manager.

3.7.1.1.3 Analysis Type

Identify hazardous waste by analyzing for the following characteristics: ignitability, corrosivity, reactivity, toxicity based on TCLP results. Laboratory must be certified by the National Environmental Laboratory Accreditation Program (NELAP) or DoD Environmental Laboratory Accreditation Program (ELAP).

3.7.2 Solid Waste Management

3.7.2.1 Project Solid Waste Disposal Documentation Report

Provide copies of the waste handling facilities' weight tickets, receipts, bills of sale, and other [sales documentation](#). In lieu of sales documentation, a statement indicating the disposal location for the solid waste that is signed by an employee authorized to legally obligate or bind the firm may be submitted. The sales documentation [Contractor certification](#) must include the receiver's tax identification number and business, EPA or state registration number, along with the receiver's delivery and business addresses and telephone numbers. For each solid waste retained for the Contractor's own use, submit the information previously described in this paragraph on the solid waste disposal report. Prices paid or received do not have to be reported to the Contracting Officer unless required by other provisions or specifications of this Contract or public law.

3.7.2.2 Control and Management of Solid Wastes

Pick up solid wastes, and place in covered containers that are regularly emptied. Do not prepare or cook food on the project site. Prevent contamination of the site or other areas when handling and disposing of wastes. At project completion, leave the areas clean. Employ segregation measures so that no hazardous or toxic waste will become co-mingled with non-hazardous solid waste. Transport solid waste off Government property and dispose of it in compliance with [40 CFR 260](#), state, and local requirements for solid waste disposal. A Subtitle D RCRA permitted landfill is the minimum acceptable offsite solid waste disposal option. Verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. Segregate and separate treated wood components disposed at a lined landfill approved to accept this waste in accordance with local and state regulations. Solid waste disposal offsite must comply with most stringent local, state, and federal requirements, including [40 CFR 241](#), [40 CFR 243](#), and [40 CFR 258](#).

Manage hazardous material used in construction, including but not limited to, aerosol cans, waste paint, cleaning solvents, contaminated brushes, and used rags, in accordance with [49 CFR 173](#).

3.7.3 Control and Management of Hazardous Waste

Do not dispose of hazardous waste on Government property. Do not discharge any waste to a sanitary sewer, storm drain, or to surface waters or conduct waste treatment or disposal on Government property without written approval of the Contracting Officer and Installation Hazardous Waste Manager.

3.7.3.1 Hazardous Waste/Debris Management

Identify construction activities that will generate hazardous waste or debris. Provide a documented waste determination for resultant waste streams. Identify, label, handle, store, and dispose of hazardous waste or debris in accordance with federal, state, and local regulations, including [40 CFR 261](#), [40 CFR 262](#), [40 CFR 263](#), [40 CFR 264](#), [40 CFR 265](#), [40 CFR 266](#), and [40 CFR 268](#).

Manage hazardous waste in accordance with the approved Hazardous Waste Management Section of the EPP. Store hazardous wastes in approved

containers in accordance with 49 CFR 173 and 49 CFR 178. Hazardous waste generated within the confines of Government facilities is identified as being generated by the Government. Prior to removal of any hazardous waste from Government property, hazardous waste manifests must be signed by personnel from the Installation Environmental Office. Do not bring hazardous waste onto Government property. Provide the Contracting Officer with a copy of waste determination documentation for any solid waste streams that have any potential to be hazardous waste or contain any chemical constituents listed in 40 CFR 372-SUBPART D.

3.7.3.2 Waste Storage/Satellite Accumulation/90 Day Storage Areas

Accumulate hazardous waste at satellite accumulation points and in compliance with 40 CFR 262 and applicable state or local regulations. Individual waste streams will be limited to 55 gallons of accumulation (or one quart for acutely hazardous wastes). If the Contractor expects to generate hazardous waste at a rate and quantity that makes satellite accumulation impractical, the Contractor may request a temporary 90-day or 180-day, as appropriate, accumulation point be established. Submit a request in writing to the Contracting Officer and provide the following information (Attach Site Plan to the Request):

Contract Number	_____
Contractor	_____
Haz/Waste or Regulated Waste POC	_____
Phone Number	_____
Type of Waste	_____
Source of Waste	_____
Emergency POC	_____
Phone Number	_____
Location of the Site	_____

Attach a Waste Determination form for the expected waste streams. Allow 10 working days for processing this request. Additional compliance requirements (e.g., training and contingency planning) that may be required are the responsibility of the Contractor. Barricade the designated area where waste is being stored and post a sign identifying as follows:

"DANGER - UNAUTHORIZED PERSONNEL KEEP OUT"

3.7.3.3 Hazardous Waste Disposal

3.7.3.3.1 Responsibilities for Contractor's Disposal

Provide hazardous waste manifest to the Installations Environmental Office for review, approval, and signature prior to shipping waste off Government property.

3.7.3.3.1.1 Services

Provide service necessary for the final treatment or disposal of the

hazardous material or waste in accordance with 40 CFR 260 - 40 CFR 279, local, and state, laws and regulations, and the terms and conditions of the Contract within 60 days after the materials have been generated. These services include necessary personnel, labor, transportation, packaging, detailed analysis (if required for disposal or transportation, include manifesting or complete waste profile sheets, equipment, and compile documentation).

3.7.3.3.1.2 Samples

Obtain a representative sample of the material generated for each job done to provide waste stream determination.

3.7.3.3.1.3 Analysis

Analyze each sample taken and provide analytical results to the Contracting Officer. See paragraph WASTE DETERMINATION DOCUMENTATION.

3.7.3.3.1.4 Labeling

During waste accumulation label all containers in accordance with 40 CFR 262. Prior to offering a waste for off-site transport, determine the Department of Transportation's (DOT's) proper shipping names for waste in accordance with 49 CFR 172 (each container requiring disposal) and demonstrate to the Contracting Officer how this determination is developed and supported by the sampling and analysis requirements contained herein. Label all containers of hazardous waste with the words "Hazardous Waste" or other words to describe the contents of the container in accordance with 40 CFR 262 and applicable state or local regulations.

3.7.3.3.2 Contractor Disposal Turn-In Requirements

Hazardous waste generated must be disposed of in accordance with the following conditions to meet installation requirements:

- a. Drums must be compatible with waste contents and drums must meet DOT requirements for 49 CFR 173 for transportation of materials.
- b. Band drums to wooden pallets.
- c. No more than three 55 gallon drums or two 85 gallon over packs are to be banded to a pallet.
- d. Band using 1-1/4 inch minimum band on upper third of drum.
- e. Provide label in accordance with 49 CFR 172.101.
- f. Leave 3 to 5 inches of empty space above volume of material.

3.7.3.4 Universal Waste Management

GEPA has not adopted the Universal Regulation Rule. Comply with the Guam EPA regulations and installation specific requirements.

Mercury is prohibited in the construction of this facility, unless specified otherwise, and with the exception of mercury vapor lamps and fluorescent lamps. Dumping of mercury-containing materials and devices such as mercury vapor lamps, fluorescent lamps, and mercury switches, in rubbish containers is prohibited. Remove without breaking, pack to

prevent breakage, and transport out of the activity in an unbroken condition for disposal as directed.

3.7.3.5 Electronics End-of-Life Management

Recycle or dispose of electronics waste, including, but not limited to, used electronic devices such as computers, monitors, hard-copy devices, televisions, mobile devices, in accordance with 40 CFR 260-262, state, and local requirements, and installation instructions.

3.7.3.6 Disposal Documentation for Hazardous and Regulated Waste

Contact the Contracting Officer or designated representative for the facility RCRA identification number that is to be used on each manifest.

Submit a copy of the applicable EPA and or state permit(s), manifest(s), or license(s) for transportation, treatment, storage, and disposal of hazardous and regulated waste by permitted facilities. Hazardous or toxic waste manifests must be reviewed, signed, and approved by the Contracting Officer before the Contractor may ship waste. To obtain specific disposal instructions, coordinate with the Installation Environmental Office. Refer to location special requirements for the Installation Point of Contact information.

3.7.4 Releases/Spills of Oil and Hazardous Substances

3.7.4.1 Response and Notifications

Exercise due diligence to prevent, contain, and respond to spills of hazardous material, hazardous substances, hazardous waste, sewage, regulated gas, petroleum, lubrication oil, and other substances regulated in accordance with 40 CFR 300. Maintain spill cleanup equipment and materials at the work site. In the event of a spill, take prompt, effective action to stop, contain, curtail, or otherwise limit the amount, duration, and severity of the spill/release. In the event of any releases of oil and hazardous substances, chemicals, or gases; immediately (within 15 minutes) notify the Installation Fire Department, the Installation Command Duty Officer, the Installation Environmental Office, the Contracting Officer and the state or local authority.

Submit verbal and written notifications as required by the federal (40 CFR 300.125 and 40 CFR 355), state, local regulations and instructions. Provide copies of the written notification and documentation that a verbal notification was made within 20 days. Spill response must be in accordance with 40 CFR 300 and applicable state and local regulations. Contain and clean up these spills without cost to the Government.

3.7.4.2 Clean Up

Clean up hazardous and non-hazardous waste spills. Reimburse the Government for costs incurred including sample analysis materials, clothing, equipment, and labor if the Government will initiate its own spill cleanup procedures, for Contractor- responsible spills, when: Spill cleanup procedures have not begun within one hour of spill discovery/occurrence; or, in the Government's judgment, spill cleanup is inadequate and the spill remains a threat to human health or the environment.

3.7.5 Mercury Materials

Immediately report to the Environmental Office and the Contracting Officer instances of breakage or mercury spillage. Clean mercury spill area to the satisfaction of the Contracting Officer.

Do not recycle a mercury spill cleanup; manage it as a hazardous waste for disposal.

3.7.6 Wastewater

3.7.6.1 Disposal of Wastewater

Disposal of wastewater must be as specified below.

3.7.6.1.1 Treatment

Do not allow wastewater from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, and forms to enter water ways or to be discharged. Dispose of the construction- related waste water off-Government property in accordance with 40 CFR 403, state, regional, and local laws and Prior to disposal, submit a WIS to the Installation Environmental Office and have the results reviewed and approved by the Contracting Officer prior to being discharged or disposed of off-Government property.

3.7.6.1.2 Surface Discharge

For discharge of ground water, obtain a state or federal permit specific for pumping and discharging ground water prior to surface discharging. Surface discharge in accordance with federal, state, and local laws and regulations. Surface discharge in accordance with the requirements of the NPDES or state STORMWATER DISCHARGES FROM CONSTRUCTION SITES permit.

3.7.6.1.3 Land Application

Water generated from the flushing of lines after disinfection or hydrostatic testing must be land- applied in accordance with federal, state, and local laws and regulations for land application upon receiving approval from the Installation Environmental Office.

3.8 HAZARDOUS MATERIAL MANAGEMENT

Include hazardous material control procedures in the Accident Prevention Plan (APP), in accordance with Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS. Address procedures and proper handling of hazardous materials, including the appropriate transportation requirements. Do not bring hazardous material onto Government property that does not directly relate to requirements for the performance of this contract. Submit an SDS and estimated quantities to be used for each hazardous material to the Contracting Officer prior to bringing the material on the installation. Typical materials requiring SDS and quantity reporting include, but are not limited to, oil and latex based painting and caulking products, solvents, adhesives, aerosol, and petroleum products. Use hazardous materials in a manner that minimizes the amount of hazardous waste generated. Containers of hazardous materials must have National Fire Protection Association labels or their equivalent. Certify that hazardous materials removed from the site are hazardous materials and do not meet

the definition of hazardous waste, in accordance with 40 CFR 261 and state and installation requirements.

3.8.1 Contractor Hazardous Material Inventory Log

Submit the "Contractor Hazardous Material Inventory Log"(found at: <https://www.wbdg.org/dod/ufgs/forms-graphics-tables>), which provides information required by (EPCRA Sections 312 and 313) along with corresponding SDS, to the Contracting Officer at the start and at the end of construction (30 days from final acceptance), and update no later than January 31 of each calendar year during the life of the contract. Keep copies of the SDSs for hazardous materials onsite. At the end of the project, provide the Contracting Officer with copies of the SDSs, and the maximum quantity of each material that was present at the site at any one time, the dates the material was present, the amount of each material that was used during the project, and how the material was used.

The Contracting Officer may request documentation for any spills or releases, environmental reports, or off-site transfers.

3.9 PREVIOUSLY USED EQUIPMENT

Clean previously used construction equipment prior to bringing it onto the project site. Equipment must be free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. Consult with the U.S. Department of Agriculture jurisdictional office for additional cleaning requirements.

3.10 CONTROL AND MANAGEMENT OF ASBESTOS-CONTAINING MATERIAL (ACM)

Manage and dispose of asbestos- containing waste in accordance with all applicable federal, state, and local (or Host Nation) requirements. Refer to Section 02 82 00 ASBESTOS REMEDIATION. Manifest asbestos-containing waste and provide the manifest to the Contracting Officer. Notifications to the regulatory authorities and Installation Air Program Manager are required before starting any asbestos work.

3.11 CONTROL AND MANAGEMENT OF LEAD-BASED PAINT (LBP)

Manage and dispose of lead-contaminated waste in accordance with 40 CFR 745 and Section 02 83 00 LEAD REMEDIATION. Manifest any lead-contaminated waste and provide the manifest to the Contracting Officer.

3.12 CONTROL AND MANAGEMENT OF POLYCHLORINATED BIPHENYLS (PCBs)

Manage and dispose of PCB-contaminated waste in accordance with 40 CFR 761 and Section 02 84 33 REMOVAL AND DISPOSAL OF POLYCHLORINATED BIPHENYLS (PCBs).

3.13 CONTROL AND MANAGEMENT OF LIGHTING BALLAST AND LAMPS CONTAINING PCBs

Manage and dispose of contaminated waste in accordance with 40 CFR 761. Refer to Section 02 84 16 HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBs AND MERCURY.

3.14 MILITARY MUNITIONS

In the event military munitions, as defined in 40 CFR 260, are discovered

or uncovered, immediately stop work in that area and immediately inform the Contracting Officer.

3.15 PETROLEUM, OIL, LUBRICANT (POL) STORAGE AND FUELING

POL products include flammable or combustible liquids, such as gasoline, diesel, lubricating oil, used engine oil, hydraulic oil, mineral oil, and cooking oil. Store POL products and fuel equipment and motor vehicles in a manner that affords the maximum protection against spills into the environment. Manage and store POL products in accordance with EPA [40 CFR 112](#), and other federal, state, regional, and local laws and regulations. Use secondary containments, dikes, curbs, and other barriers, to prevent POL products from spilling and entering the ground, storm or sewer drains, stormwater ditches or canals, or navigable waters of the United States. Describe in the EPP (see paragraph ENVIRONMENTAL PROTECTION PLAN) how POL tanks and containers must be stored, managed, and inspected and what protections must be provided. Storage of fuel on the project site must be in accordance with EPA, state, and local laws and regulations and paragraph OIL STORAGE INCLUDING FUEL TANKS.

3.15.1 Used Oil Management

Manage used oil generated on site in accordance with [40 CFR 279](#). Determine if any used oil generated while onsite exhibits a characteristic of hazardous waste. Used oil containing 1,000 parts per million of solvents is considered a hazardous waste and disposed of at the Contractor's expense. Used oil mixed with a hazardous waste is also considered a hazardous waste. Dispose in accordance with paragraph HAZARDOUS WASTE DISPOSAL.

3.15.2 Oil Storage Including Fuel Tanks

Provide secondary containment and overfill protection for oil storage tanks. A berm used to provide secondary containment must be of sufficient size and strength to contain the contents of the tanks plus [5 inches](#) freeboard for precipitation. Construct the berm to be impervious to oil for 72 hours that no discharge will permeate, drain, infiltrate, or otherwise escape before cleanup occurs. Use drip pans during oil transfer operations; adequate absorbent material must be onsite to clean up any spills and prevent releases to the environment. Cover tanks and drip pans during inclement weather. Provide procedures and equipment to prevent overfilling of tanks. If tanks and containers with an aggregate aboveground capacity greater than [1320 gallons](#) will be used onsite (only containers with a capacity of [55 gallons](#) or greater are counted), provide and implement a [Spill Prevention Control and Countermeasure \(SPCC\) plan](#) meeting the requirements of [40 CFR 112](#). Do not bring underground storage tanks to the installation for Contractor use during a project. Submit the SPCC plan to the Contracting Officer for approval.

Monitor and remove any rainwater that accumulates in open containment dikes or berms. Inspect the accumulated rainwater prior to draining from a containment dike to the environment, to determine there is no oil sheen present.

3.16 INADVERTENT DISCOVERY OF PETROLEUM-CONTAMINATED SOIL OR HAZARDOUS WASTES

If petroleum-contaminated soil, or suspected hazardous waste is found during construction that was not identified in the Contract documents,

immediately notify the Contracting Officer. Do not disturb this material until authorized by the Contracting Officer.

3.17 CHLORDANE

Evaluate excess soils and concrete foundation debris generated during the demolition of housing units or other wooden structures for the presence of chlordane or other pesticides prior to reuse or final disposal.

3.18 SOUND INTRUSION

Make the maximum use of low-noise emission products, as certified by the EPA. Blasting or use of explosives are not permitted without written permission from the Contracting Officer, and then only during the designated times. Confine pile-driving operations to the period between 8 a.m. and 4 p.m., Monday through Friday, exclusive of holidays, unless otherwise specified.

Keep construction activities under surveillance and control to minimize environment damage by noise. Comply with the provisions of the Guam rules.

3.19 POST CONSTRUCTION CLEANUP

Clean up areas used for construction in accordance with Contract Clause: "Cleaning Up". Unless otherwise instructed in writing by the Contracting Officer, remove traces of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. Grade parking area and similar temporarily used areas to conform with surrounding contours.

3.20 ATTACHMENTS

Attachment A. Contractor Hazardous Material Inventory Log

Attachment B. Data Recovery Plan for Sites 66-07-2113, 66-07-2117, 66-07-2118, and 66-08-2981 (Fafalog), Andersen Air Force Base, Guam

Attachment B-1. SOP #8 Post-Review Discovery of Archaeological Remains and SOP #9 Post-Review Discovery of Human Remains

Attachment C. P-012 Permits Record of Decision

Attachment D. 2025 Final Environmental Impact Statement (Final EIS) for F-15 Beddown and Infrastructure Upgrade at Andersen Air Force Base, Guam.

Attachment E. Biological Opinion (2025 BO) for Expansions of Aircraft Operations Area at Northwest Field, and Munitions Storage Area (MSA-1), Andersen Air Force Base, Guam, 25 February 2025.

Attachment F. Natural Resources Performance Work Statement (NR PWS)

Attachment G. Low Impact Development (LID) Data Cards

Attachment H. Final Record of Decision Site 78 Site-Wide Operable Unit
Andersen Air Force Base, Guam

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SECTION 01 57 19
TEMPORARY ENVIRONMENTAL CONTROLS

ATTACHMENT H.
FINAL RECORD OF DECISION SITE 78
SITE-WIDE OPERABLE UNIT AAFB GUAM

AUGUST 2014

Final

Record of Decision

Site 78

Site-Wide Operable Unit

Andersen Air Force Base, Guam

August 2014

Department of the Navy
Naval Facilities Engineering Command, Marianas
PWD Guam
PSC 455, Box 195
FPO AP 96540-2937



Indefinite Delivery/Indefinite Quantity
Contract Number: N40192-11-D-5001, CTO 0005

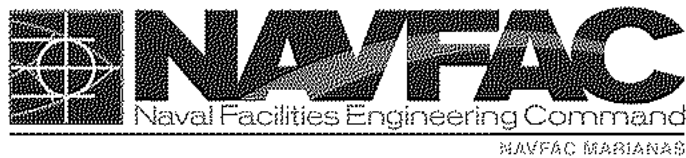
Final

Record of Decision

Site 78 Site-Wide Operable Unit
Andersen Air Force Base, Guam

August 2014

Prepared for:



**Department of the Navy
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PWD GUAM
PSC 455, BOX 195
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Prepared under:

**Indefinite Delivery/Indefinite Quantity Contract
Contract Number N40192-11-D-5001, CTO 0005**

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APPENDICES

Appendix A	Site Photographs
Appendix B	Public Notifications of Document Availability

ACRONYMS and Abbreviations

°F	degrees Fahrenheit
µg	micrograms
AFB	Air Force Base
AOC	Area of concern
AR	Administrative Record
bgs	below ground surface
BTV	Background threshold value
CES/CEVR	Civil Engineering Squadron/Civil Engineer Environmental Flight
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
COC	Contaminant of concern
COPC	Contaminant of potential concern
CRP	Community Relations Plan
CSM	Conceptual Site Model
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
dL	deciliter
DSI	Detailed Site Inventory
EA	EA Engineering, Science and Technology, Inc.
EM	Electromagnetic
EPA	Environmental Protection Agency
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
ESI	Expanded Source Investigation
FFA	Federal Facilities Agreement
FTA	Firefighter Training Area
GEPA	Guam Environmental Protection Agency
HHRA	Human Health Risk Assessment
HI	Hazard index
ICF	ICF Technology, Inc.
ID	Identification
IRP	Installation Restoration Program
IEUBK	Integrated Exposure Uptake Biokinetic Model
kg	kilograms
LTGM	Long-Term Groundwater Monitoring
MARBO	Marianas Bonins
MEC	Munitions and Explosives of Concern
MCL	Maximum contaminant level
mg	milligrams
MMRP	Military Munitions Response Program
MSL	Mean sea level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan of 1990
NEPA	National Environmental Policy Act
ng	nanograms
NGL	Northern Guam Lens

NPL	National Priorities List
OU	Operable Unit
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PCDD	Polychlorinated dibenzo-p-dioxin
PCDF	Polychlorinated dibenzofuran
PCE	Tetrachloroethene
PRG	Preliminary Remediation Goals
RA	Release Assessment
RAB	Restoration Advisory Board
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SLERA	Screening Level Ecological Risk Assessment
SWMU	Solid waste management unit
SVOC	Semivolatile organic compound
TCDD TEQ	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCE	Trichloroethene
TEF	Toxic equivalence factor
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
USN	United States Navy
VOC	Volatile organic compound
VSI	Visual Site Investigation

1.0 DECLARATION

1.1 Site Name and Location

Facility Name: Andersen Air Force Base (AFB), Guam

Site Location: Yigo, Guam

Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification (ID) Number: GU6571999519

Operable Unit/Site: Installation Restoration Program (IRP) Site 78 located in the Site Wide Operable Unit (OU)

1.2 Statement of Basis and Purpose

This decision document presents the Selected Remedy for the United States Navy (USN) IRP Site 78 at Andersen AFB, Guam. The Selected Remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record (AR) for this site, including pertinent IRP documents, correspondence and guidance related to CERCLA investigations and cleanups.

This document is issued by the United States Navy (USN)¹ as the lead agency. The United States Air Force (USAF) was the original lead agency and was responsible for funding and conducting the site assessment, and subsequent remedy selection. However, administrative responsibility for management of real property, including implementation of the selected remedy, transferred to the USN on October 1, 2009. Therefore, the remainder of this document identifies the USN as the lead agency. References to the USAF as the previous lead agency have been maintained where relevant and appropriate. Additionally, the USN has delegated signature authority for the Record of Decision (ROD) to the Andersen AFB Base Commanding Officer.

¹ The Department of Defense is in the process of realigning installation management functions at Andersen AFB. On October 1, 2009, pursuant to the 2005 Defense Base Closure and Realignment Commission Report, administrative custody of all real property on Andersen AFB and responsibility for installation support functions, including Environmental Restoration Program responsibilities, transferred within the Department of Defense from the Department of the Air Force to the Department of the Navy. Title to Andersen AFB real property will remain with the United States and the Air Force will continue to utilize the Base. The Navy will also utilize portions of the Base. In accordance with the April 15, 2008, Department of Defense Environmental Supplemental Guidance for Implementing and Operating a Joint Base, at the time of property transfer, the Navy, as the new property manager at the Base, assumed responsibility "for all existing and future environmental permits, requirements, plans and agreements" at the Base (Ch. 1.1.2) and was required to "honor all existing, previously negotiated Federal Facility Agreements in place" (Ch. 2.17.5 of the Guidance).

In January 2009, the Navy and the Air Force entered into a separate Memorandum of Agreement, which delegated installation support and authority back to the Air Force General who is the Andersen Base Commanding Officer under the authority, control, and direction of the Joint Region Commander, who is a Navy Admiral. This delegation includes the authority to sign Records of Decision. The Andersen Base Commanding Officer and Andersen environmental staff continue to administer the FFA under Navy direction. Both the Air Force and the Navy notified USEPA of the change of administrative responsibility under the FFA.

The USN is managing remediation of contamination at the Site Wide OU in accordance with CERCLA as required by the Defense Environmental Restoration Program (DERP). The USN and the United States Environmental Protection Agency (USEPA) have jointly selected the remedy for the site, and the Guam Environmental Protection Agency (Guam EPA) has concurred with the selected remedy, under the guidelines established in the Federal Facilities Agreement (FFA) signed in February 1993 by representatives of USEPA Region 9, Guam EPA, and the USAF (USEPA et al. 1993).

1.3 Assessment of Site

The USN has determined that no action is necessary to protect public health or welfare or the environment at Site 78.

The USN is committed to implementing, monitoring, maintaining, and enforcing all components of the selected remedy to ensure that it remains protective of human health and the environment.

1.4 Description of Selected Remedy

Based on the results of the previously conducted Remedial Investigation (RI), which included a Human Health Risk Assessment (HHRA) and a Screening Level Ecological Risk Assessment (SLERA), the USN has determined that *no further action* is necessary at Site 78.

1.5 Statutory Determinations

This section describes how the selected remedy satisfies the statutory requirements of CERCLA §121 and the regulatory requirements of the NCP.

The results of the HHRA and the SLERA indicate that there are no unacceptable risks to human or ecological receptors; therefore, the USN has determined that *no further action* is necessary for Site 78.

A Five-Year Review is not required, as there are currently no hazardous substances, pollutants, or contaminants remaining at the sites above levels that would restrict future use or limit access/exposure.

1.6 Data Certification Checklist

The information included in the Decision Summary section (Section 2) of this ROD is summarized in Table 1-1. Additional information can be found in the Administrative Record (AR) file for Andersen AFB, which is available for public review at the two (2) Information Repositories, located at the Robert F. Kennedy Library, on the University of Guam campus, and the Nieves M. Flores Memorial Library in Hagåtña, Guam.

Table 1-1 Data Certification Summary

Decision Summary Sections	Section #	Page #
List of contaminants of concern (COC) and their respective concentrations	Section 2.7.1	2-27
Baseline risk represented by the COCs	Section 2.7.1	2-28
Cleanup levels established for COCs and the basis for these levels	NA	NA
How source materials constituting principal threats will be addressed	NA	NA
Current and reasonably anticipated future land use assumptions and current or potential future beneficial uses of groundwater used in the baseline risk assessment and ROD	Section 2.7.1	2-35
Potential land and groundwater use that will be available at the site as a result of the selected remedies	Section 2.7.6	2-39
Estimated capital, annual operation and maintenance and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected	NA	NA
Key factor(s) that lead to the selected remedy (i.e. describe how the selected remedy provides the best balance of trade-offs with respect to the balancing and modifying criteria, high lightening criteria key to the decision	NA	NA

Notes:

NA= not applicable

1.7 Authorizing Signatures

The following signature sheets document the USN and USEPA Region 9's decision to select *No Further Action* as the remedy for Site 78, Site Wide OU, Andersen AFB, Guam, and the concurrence of Guam EPA in that decision.

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This signature sheet documents the USN co-selection of *No Further Action* as the remedial action for Site 78, Site Wide OU, Andersen AFB, Guam.

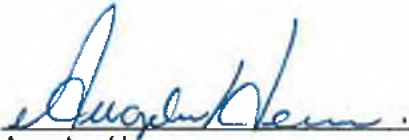


Andrew J. Toth
Brigadier General, USAF
Base Commanding Officer

26 JAN 15
Date

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This signature sheet documents the USEPA Region 9 co-selection of *No Further Action* as the remedial action for Site 78, Site Wide OU, Andersen AFB, Guam.

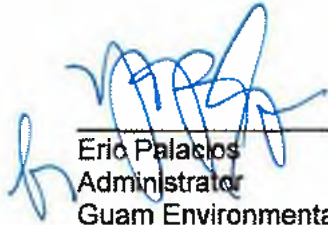


Angeles Herrera
Assistant Director
Federal Facilities and Site Cleanup Branch
U.S. Environmental Protection Agency, Region IX

September 30, 2015

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This signature sheet documents the Guam EPA concurrence in the selection of *No Further Action* as the remedial action for Site 78, Site Wide OU, Andersen AFB, Guam.

A handwritten signature in blue ink, appearing to read "Eric Palacios", is written over a horizontal line.

Eric Palacios
Administrator
Guam Environmental Protection Agency

10-28-15

Date

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2.0 DECISION SUMMARY

The Decision Summary identifies the selected remedy for Site 78; explains how the selected remedy fulfills statutory and regulatory requirements; and provides a substantive summary of the AR file that supports the remedy selection decision.

2.1 Site Name, Location and Description

Full Site Name: Site 78 (former Area of Concern [AOC]-8) - Former Firefighter Training Area-3

CERCLIS ID#: GU571999519

Site Location: Site Wide OU, Andersen AFB, Guam

Site 78 (former AOC-8, the former Firefighter Training Area (FTA)-3, is a vacant and vegetated area located north of North Field and northeast of Facility 2552 on Andersen AFB, Guam (Figure 2-1). The site consists of an open field that covers approximately 10 acres, and contains several areas of empty drums on the eastern boundary of the site, a 2-inch underground drain line traced to approximately 200 feet of the northwest portion of the former fire training burn pit, and berm areas, which appear to be bulldozed soil resulting from grading the site. The site is located on a generally flat area that gradually slopes to the north.

Site photographs taken in 2010 during the Remedial Investigation are presented in Appendix A.

2.2 Site History and Enforcement Activities

This section provides background information and summaries the series of investigations that led to this ROD. It describes the CERCLA response actions undertaken at Site 78, Site Wide OU.

2.2.1 Site History

Site 78 was reportedly used for firefighter training between 1955 and 1973 (ICF 1996a). Although limited documentation describing site activities are available, the area was identified as an FTA on a 1988 Master Plan (ICF 1996a). An aerial photograph (undated, 1970s) of the North Field runways showed active use at the site with a least three aircraft inside the cleared area for training purposes. Aerial photographs dated 1984 and 1994 clearly depicted the burn pit as a circular feature in the center of the clearing.

Site 78 has been investigated since 1994. It was misidentified and investigated as a solid waste management unit (SWMU) under Andersen AFB Compliance program, but eventually was transferred and funded under the Andersen AFB Installation Restoration Program (IRP) for a completion of an RI.

Site 78 has been evaluated in the following four (4) environmental reports:

- *Expanded Source Investigation (ESI) – Visual Site Inspection (VSI) for Andersen AFB, Guam* (ICF, 1996b)
- *Phase I Release Assessment (RA)* (URS/EA 2000)

- *2003 Phase II Release Assessment (RA) for Two (2) Areas of Concern (AOC-5 & AOC-8) and six (6) Solid Waste Management Units (SWMU-15, SWMU-20D, SWMU-20E, SWMU-30C, SWMU-43, & SWMU-57), Andersen AFB, Guam (EA, 2005)*
- *Remedial Investigation for Site 78, Site Wide Operable Unit, Andersen AFB, Guam (EA, 2010)*

The results from these reports are summarized in Section 2.5.6.

2.2.2 Enforcement Activities

Due to its primary mission in national defense, the USAF has long been involved in a wide variety of operations that involve the use, storage, and disposal of hazardous materials. On October 14, 1992, Andersen AFB was formally listed on the National Priorities List by USEPA to investigate abandoned sites that may have been impacted by the use, storage, and disposal of hazardous materials. The USAF (previously the lead agency) entered into a Federal Facilities Agreement (FFA) with USEPA Region 9 and the Guam EPA, on 30 March 1993. The FFA was based on applicable environmental laws including CERCLA, Hazardous and Soil Waste Act of 1982, SARA, and NCP and established a framework for performing detailed environmental investigations at Andersen AFB.

The USN has conducted environmental investigations at IRP Site 78, in accordance with CERCLA under the DERP, which was established by Section 211 of SARA.

As the support agencies, USEPA Region 9 and Guam EPA provide primary oversight of the environmental restoration actions, in accordance with the FFA. Funding is provided by the Defense Environmental Restoration Account; a funding source approved by Congress to clean up contaminated sites on U.S. Department of Defense (DoD) Installations.



Project: ROD Site 78
Sitewide Operable Unit AAFB, Gu

Description: Location Map for Site 78

Figure
2-1

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2.3 Community Participation

NCP Section 300.430(f)(3) establishes a number of public participation activities that the lead agency must conduct following preparation of the Proposed Plan and review by the support agencies (USEPA and Guam EPA). Components of these items and documentation of how each component was satisfied for Site 78, at Andersen AFB, Guam are described in Table 2-1 and Table 2-2.

Andersen AFB has provided copies of reports related to Site 78 to the IR file at the Information Repository in the following locations:

Nieves M. Flores Memorial Library

254 Martyr Street
Hagåtña, Guam 96910
Telephone: (671) 475-4751-4

University of Guam

Learning Resources, Government Documents
UOG Station
Mangilao, Guam 96923
Telephone: (671) 735-2315

A notice of availability of the Proposed Plan for Site 78 was published in the Pacific Daily News, a major local newspaper, on September 18, 2012 (Appendix B). In September 2012, the Proposed Plan for Site 78 was released to the public for review and comment. The public comment period extended from September 19 to October 18, 2012. A public meeting was held at the Guam Marriott Resort and Spa in Tumon on September 26, 2012. At the public meeting, the Proposed Plan was presented and representatives from the USN responded to public comments. Responses to comments received during the public comment period are included in the Responsiveness Summary, presented in Section 3 of this ROD.

Table 2-1 Public Notification of Document Availability

Requirement	Satisfied by:
Notice of availability of the Proposed Plan must be made in a widely-read section of a major local newspaper.	Notice of availability was published in the public announcement section of the Pacific Daily News on September 18, 2012.
Notice of availability should occur at least two weeks prior to the beginning of the public comment period.	Notice of availability was published on September 18, 2012.
Notice of availability must include a brief abstract of the Proposed Plan which describes the alternatives evaluated and identifies the preferred alternative (NCP Section 300.430(f)(3)(i)(A))	Notice of availability included all of these components and is included in Appendix B of this ROD.
Notice of availability should consist of the following information: - Site name and location - Date and location of public meeting - Identification of lead and support agencies - Alternatives evaluated in the detailed analysis - Identification of preferred alternative - Request for public comments - Public participation opportunities including: - o Location of information repositories and Administrative Record file - o Methods by which the public may submit written and oral comments, including a contact person - o Dates of public comment period - o Contact person for the community advisory group (e.g. Restoration Advisory Board) if applicable	Notice of availability included all required and pertinent information (see Appendix B).

Notes:

AR = Administrative Record

NCP = National Oil and Hazardous Substances Pollution Contingency Plan of 1990

ROD = Record of Decision

Table 2-2 Public Comment Period Requirements

Requirement	Satisfied by:
Lead agency (USN) should make document available to public for review on same date as newspaper notification.	Document was available to the public on <i>September 19, 2012</i> . The notification of availability was made on <i>September 18, 2013</i>
Lead agency (USN) must ensure that all information that forms the basis for selecting the response action is included as part of the AR file and made available to the public during the public comment period.	The USAF maintains information repositories for the Andersen AFB Administrative Record file at the Robert F. Kennedy Library at the University of Guam and the Nieves M. Flores Memorial Library in Hagåtña. Data and supporting CERCLA primary documents produced for Andersen AFB are maintained as part of these files and are available to the public.
CERCLA Section 177(a)(2) and NCP Section 300.430(f)(3)(i) requires the lead agency to provide the public with a reasonable opportunity (30 days) to submit written and oral comments on the Proposed Plan.	The Air Force (previously the lead agency) provided a public comment period for the Proposed Plan from <i>September 19 to October 18, 2012</i> .
The lead agency (USN) must extend the public comment period by at least 30 additional days upon timely request.	No request for extension of the public comment period was received by the Air Force.
The lead agency (USN) must provide the opportunity for a public meeting to be held at or near the site during the public comment period. A transcript of this meeting must be made available to the public and be maintained in the AR for the site (pursuant to NCP Section 300.430(f)(3)(i)(E)).	A public meeting was held on <i>September 26, 2012</i> , at <i>Guam Marriott Resort and Spa, Tumon, Guam</i> . A transcript of this meeting will be maintained in the AR file.

Notes:

AFB = Air Force Base

AR = Administrative Record

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

NCP = National Oil and Hazardous Substances Pollution Contingency Plan of 1990

USN = United States Navy

2.4 Scope and Role of Operable Unit or Response Action

The USN with concurrence from USEPA Region 9 and Guam EPA, has organized the environmental restoration work at Andersen AFB into six (6) OUs as described below:

Main Base OU (Sites 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 25, 26, 27, 28, 29, 34, and 35)

Records of Decision addressing the Main Base OU are either completed or are in the process of completion. The sites following were proposed to be addressed in separate RODs:

- Sites 6, 9, and 12 (Group 1)
- Sites 5 and 8 (Group 2)
- Sites 4, 11, 25, 28, and 34 (Group 3)
- Sites 3, 10, 13, and 27 (Group 4)
- Sites 29 and 35
- Sites 2, 4, 15 and 26 (Grouping not yet addressed)

Final RODs for Groups 1, 2, and 3 were completed in 2007. Final RODs for Group 4 and Sites 29 and 35 were completed in 2010 and 2009, respectively. The ROD for Site 2 will be completed after the completion of remediation; for Site 4, completed in 2007; for Site 26, completed in 2009; and for Site 15, completed in 2010.

Northwest Field OU (Sites 7, 16, 17, 21, 30, 31, and 36)

A final ROD addressing Sites 7, 16, 17, 31, and 36 was completed in September 2007. A final ROD for Site 21 was completed in 2010.

Due to the presence of munitions and explosives of concern (MEC), Site 30 was transferred to Andersen Air Force Base's Military Munitions Response Program (MMRP). Under the MMRP, a ROD will be completed for Site 30 following further investigation/feasibility study with respect to the MEC.

Marianas Bonins Command (MARBO) Annex OU (Sites 20, 22, 23, 24, 37 and 38)

A final ROD for the MARBO Annex OU was completed in May 1998. The first Five-Year Review to evaluate remedial action effectiveness at the MARBO Annex was completed in July 2004. The second Five-Year Review for MARBO Annex was completed in 2009.

Harmon Annex OU (Sites 18, 19, and 39)

A final ROD for the Harmon Annex OU was completed in July 2002.

Urunao OU (Site 40)

A final ROD for the Urunao OU was completed in December 2003.

Site Wide OU (Sites 41 through 78)

The Site Wide OU consists of IRP Sites that have been added to the program in recent years, and are therefore distributed geographically across the Main Base, Northwest Field, MARBO Annex, Tumon Tank Farm, and Potts Junction. The sites are proposed to be addressed in separate ROD documents as follows:

- Sites 45, 49, 59, 61, 67, 68, and 69 (Group A)

- Sites 48, 56, 58, 70 and 73 (Group B)
- Sites 47, 50, 51, 53, and 55 (Group C)
- Sites 63, 64, 65, 66, 72, and 77 (Group D)
- Sites 57, 71, 74, 75, and 76 (Group E)
- Sites 44 and 46 (Group F)
- Sites 41, 42, and 43 (Group G)
- Site 54
- Site 78
- Site 79
- Site 80

Records of Decisions addressing these sites were completed for Group A, B, C, and F in 2008; for Group D, E, and G in 2009; and for Site 54 in 2010. The ROD for Site 78 is presented in this document. The ROD for Site 79 is scheduled for 2015.

Due to presence of MEC, three sites (52, 60 and 62) were transferred to the Air Force's MMRP. Under the MMRP, RODs will be completed for these sites after further investigations/feasibility studies are completed with respect to MEC.

2.5 Site Characteristics

This section describes the physical characteristics, including the climate, physiography, topography, geology and hydrogeology, of Site 78 addressed in this ROD.

2.5.1 Climate

Guam experiences a year-round warm and humid climate due to its proximity to the equator. The mean annual temperature is 81 degrees Fahrenheit (°F), with daily temperatures ranging from the lower 70's to the upper 80's °F. There are two distinct seasons on Guam, a wet and a dry season. Approximately 65% of the annual precipitation falls during the wet season between July and November. Annual rainfall in the northern portion of Guam averages 80 to 100 inches. Tropical storms and typhoons typically occur during the wet season. The dry season occurs from December to June and is characterized by dry and warm conditions. Strong trade winds are also common throughout these months.

2.5.2 Physiography and Topography

The island of Guam has two distinctive physiographic divisions - the northern half characterized by an undulating limestone plateau, and the southern half, composed of rugged volcanic highland. Guam is designated as a Seismic Risk Zone 4, because it is located near the Marianas Trench. The Mariana Trench is an active seismic subduction zone, and forms the world's deepest ocean trench at 37,521 feet below msl.

The topography of the northern portion of Guam consists of a marine limestone plateau 295 to 590 feet above sea level that overlies a volcanic inland core. Site 78 is located inside the fence of the Main Base and is relatively flat with small surface mounds and elevations ranging from 476 to 505 feet above mean sea level (Figure 2-2). Due to the highly porous limestone and extremely permeable soils, there is no surface water present on the northern portion of Guam or this property.

2.5.3 Geology

The island of Guam has two distinct physiographic provinces: the Northern Limestone Plateau and the Southern Volcanics, which are separated by the Adelup Fault. South of the fault, the island is composed almost entirely of volcanic rocks, and north of the fault, the island is composed almost entirely of limestone (excluding portions of Mt. Santa Rosa and Mataguac Hill). Andersen AFB is situated on an undulating limestone plateau with surficial karst features.

The geology of the Main Base consists of the Mariana and Barrigada limestones, which are underlain at depth by the volcanic rocks of the Alutom Formation (Tracey et al. 1964).

The Pliocene and Pleistocene-aged (1 to 5 million years) Mariana Limestone consists of the reefal, detrital, molluscan and fore-reef facies. The reefal facies is situated along the cliff line facies and consists predominately of corals in position of growth in a matrix of encrusting calcareous algae. The reefal facies is white, massive, generally compact, and porous to cavernous (Tracey et al., 1964). The detrital facies is lagoonal in origin, varies from friable to well cemented, ranges in grain size from coarse to fine, and is generally porous (Tracey et al. 1964). The molluscan facies consists of fine-grained (mud), and white to tan limestone of lagoonal origin containing abundant casts and molds of mollusks (Tracey et al., 1964). The fore-reef facies consists of a well-bedded, friable to indurated foraminiferal limestone deposited as fore-reef sand and debris.

The Miocene-aged (5 to 24 million years) Barrigada Limestone lies beneath the Mariana Limestone. The Barrigada Limestone is generally a deep-water deposit of medium- to coarse-grained texture and ranges from compact and well lithified to extremely friable. The formation contains abundant foraminifera Operculina, Gypsina, and Cycloclypeus (Tracey et al 1964). It is a principal water-bearing unit, and contains abundant solution openings, voids, and fissures. The Eocene/Oligocene-aged Alutom Formation unconformably underlies the Barrigada Limestone and consists of well-bedded, fine- to coarse-grained volcanic and volcanoclastic rocks.

The soils at Site 78 consist predominately of the following two series of upland limestone soils—Guam and Guam Urban Land Series:

- The Guam cobbly clay loam is derived from sediments overlying porous coralline limestone. It is neutral to mildly alkaline, with moderately rapid permeability and a very low water-holding capacity. The surface layer is usually removed or mixed with underlying material during construction. The soil is composed of dusky red, gravelly, clay loam. The depth to limestone is usually 2 to 10 inches, unless landscaping has taken place
- The Guam-Urban land complex is commonly composed of 55 percent of Guam cobbly clay loam and 45 percent urban land. Most areas have been disturbed by land shaping for urban development and the surface layer has typically been removed and mixed with underlying materials during construction. The subsoil is composed of dusky red, cobbly

clay loam with the depth to limestone usually within 2 to 10 inches. The soil is neutral to mildly alkaline, and well drained with moderately rapid permeability.

These soils are generally very shallow to shallow, well-drained, and range from flat to gently sloping on the interior to extremely steep along the cliff lines (Young 1988).

Surface soils and bedrock are very porous and permeable and, as a result, no rivers or streams are present in the northern portion of the island. Precipitation, except that portion lost to evapotranspiration, contributes to the groundwater lens.

2.5.4 Groundwater and Surface Water Hydrogeology

Site 78 is located on the northern plateau of Guam with flat-lying limestone and limited surface runoff. No wetlands or surface water are located within the vicinity of Site 78. The thin soil and limestone bedrock are both porous and permeable, and rainwater readily infiltrates downward through interconnected pore spaces preventing the formation of surface streams, rivers and lakes.

The groundwater beneath northern Guam, including the Main Base, is part of the Northern Guam Lens (NGL), which is the principal drinking water aquifer for the island and produces approximately 40 million gallons of freshwater per day for public use. This aquifer is contained within the porous limestone deposits of the Barrigada and Mariana Formations and is recharged by precipitation, which infiltrates through hundreds of feet of porous limestone creating a freshwater lens that floats atop an approximately 20 ft thick brackish transition zone underlain by marine water. The groundwater is encountered approximately 300-500 ft below ground surface (bgs). The groundwater surface generally coincides with sea level and the depth of water depends on surface elevation. The thickness of the lens is generally around 90-120 feet and subject to highly conductive groundwater flow.

Regionally, the groundwater flow direction in the NGL is from the limestone/volcanic contacts toward the sea. Groundwater flow can be affected by faults, fractures, brecciated zones, joints, vertical and horizontal solution channels or cavities, and by pumping wells. The rapid infiltrating recharge to the upper portion of the freshwater lens propagates quickly (within weeks to months) to coastal discharge areas via seeps and/or large-scale dissolution features. Contaminant trends have indicated strong lateral flow components in the upper portion of the freshwater lens that is not evident in the basal portion of the lens. Based on extensive data collected over the duration of the IRP Program, it appears that the elevation and thickness of the freshwater lens varies in response to short-term rainfall events, occasional rainfall and monsoonal effects on sea level.

The aquifer beneath Site 78 presented in this ROD occurs in basal conditions, which is highly permeable and porous with estimated hydraulic conductivities ranging from 2 to 20,000 feet per day and porosities ranging from 15 to 20 percent (ICF 1995).

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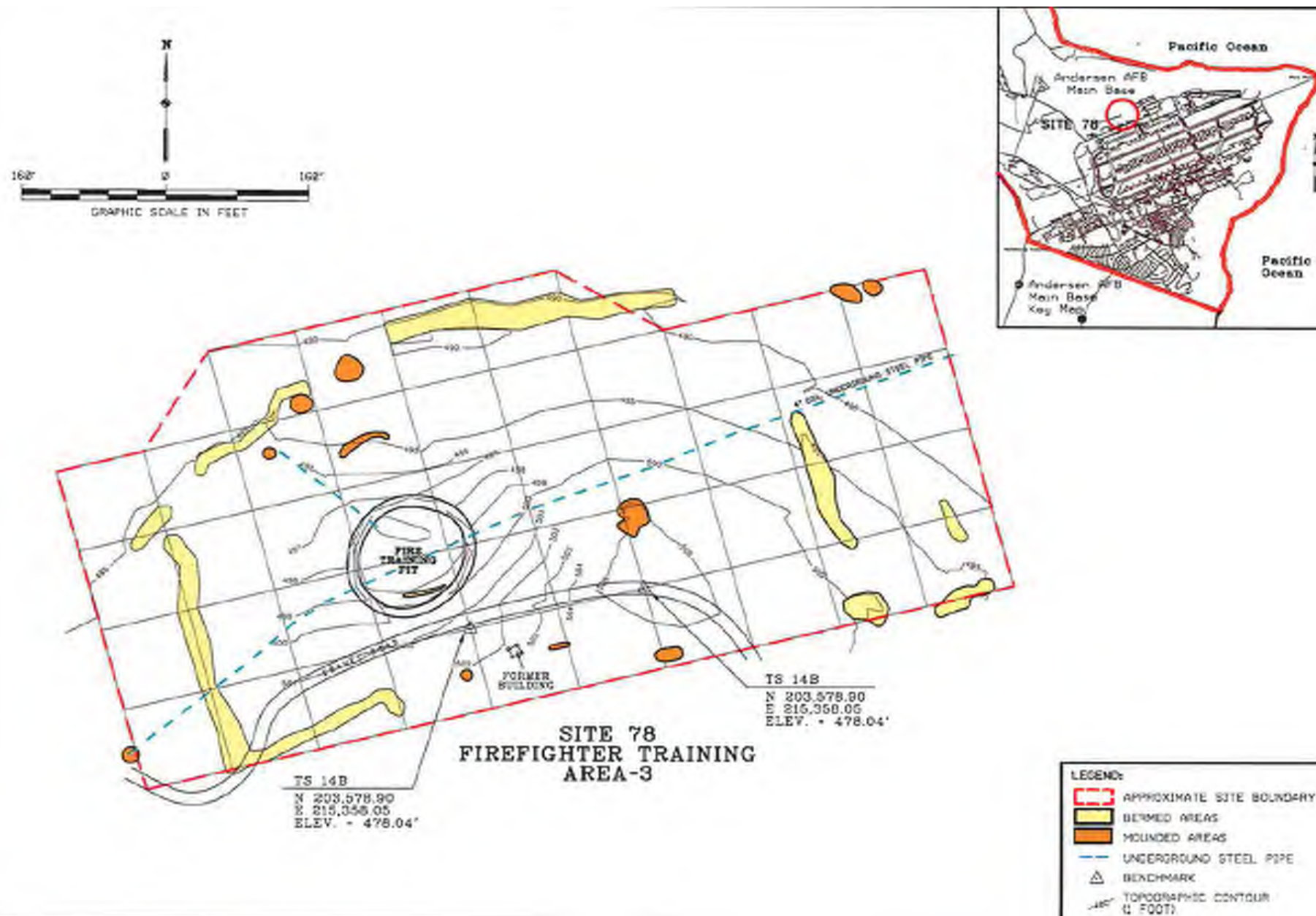


Figure 2-2. Topographic Survey at Site 78, Andersen AFB, Guam

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2.5.5 Ecology

The ecological habitat of the northern limestone plateau, including the Main Base, is primarily secondary growth limestone forest. A major concern for the Territory of Guam is the extinction of native flora and fauna (Pratt et al 1987). Taxa experiencing losses include nearly all of the endemic species of birds and mammals, sea turtles, many lizard species, four species of tree snails and several species of plants.

Andersen AFB supports remnant populations of the fire tree (*Serianthes nelsonii*), Ufa-halotano tree (*Heritiera longipetiolata*), Mariana crow (*Corvus kubaryi*), Micronesian starling (*Aplonis opaca guami*), Mariana fruit bat (*Pteropus mariannus*), and green sea turtle (*Chelonia mydas*), all of which are listed as endangered (Andersen AFB 2003).

The Mariana fruit bat forages for food in limestone forests and often roosts in strand and forest vegetation near cliff lines like those observed along the eastern portion of Northwest Field. The Mariana crow also forages and roosts in limestone forests, while the Micronesian starling prefers the industrial and residential areas of the base to roost. As a result, while no endangered plant or animal species have been observed at Site 78 during the previous environmental investigations, Site 78 is within the range of known populations for use as forage or roosting.

2.5.6 Previous Site Characterization Activities

Results from the previous site characterization activities are summarized below and in Table 2-6 and are presented in greater detail in the Remedial Investigation (RI) for Site 78 Report (EA 2010).

Expanded Source Investigation/Visual Site Inspection (ICF, February 1996b)

The first investigation at Site 78 was performed during the 1994 ESI/VS. This was a site reconnaissance without any sampling. Based on the information obtained during the initial site reconnaissance, additional field investigation was recommended for the site.

Phase I Release Assessment (URS/EA, December 2000)

In 2000, as part of the Phase I Release Assessment (RA), Site 78 was revisited and a number of potential sources of contamination were identified, including a 135-foot diameter burn pit with a 1-foot high soil berm, a cleared area surrounding the burn pit, a metal framed rusting structure, and approximately fifty (50) 55-gallon drums. Five (5) of the 55-gallon drums were still intact and contained fluids, while the remaining drums were in a rusted or deteriorated condition. The drum labels indicated that the drums contained lube oil, hydraulic oil and fuel oil.

Phase II Release Assessment (EA, November 2005a)

A follow-up Phase II Release Assessment (RA) investigation was completed at Site 78 in 2003. The Phase II RA included site reconnaissance/detailed site inventory (DSI), a geophysical survey, a soil gas survey, and surface and subsurface soil sampling (EA 2005).

A DSI was conducted at Site 78 in June 2003 during the Phase II RA. A complete list describing the location and type of materials observed during the inventory is summarized in the RI Report (EA 2010). The detailed information collected was used to help determine appropriate locations for surface and subsurface soil sampling at the site.

An EM geophysical survey was performed during the Phase II RA to define the horizontal extent of suspected buried wastes at the site. The results of the geophysical survey indicated that the locations of most of the anomalies were consistent with the locations of the metallic debris found at the surface or partially buried within mounds.

In 2003, during the Phase II RA, fifteen (15) surface soil samples (including one duplicate sample) were collected from the areas where there were suspected sources of contamination. These soil samples were analyzed for semivolatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides, total metals, and dioxins and furans. None of the surface soil samples contained SVOCs, pesticides, or PCBs at concentrations exceeding the preliminary screening criteria. Six (6) analytes were detected at concentrations exceeding the respective screening levels as presented in Table 2-4.

Table 2-3 Phase II RA Surface Soil Analytical Results Above USEPA Preliminary Remediation Goals, Site 78, Andersen AFB, Guam (EA 2005)

Analyze	Units	Region 9 USEPA PRG		Phase II Result (EA 2005a)	# of soil samples with concentrations exceeding PRG
		Residential	Industrial		
PAH					
Benzo(a)anthracene	µg/kg	620	2,100	1,300	1
Benzo(a)pyrene	µg/kg	62	210	870 & 1,800	2
Benzo(b)fluoranthene	µg/kg	620	2100	740 & 1,500	2
Dibenz(a,h)pyrene	µg/kg	62	210	100 & 160	2
METALS					
Lead	mg/kg	400	800	720-940	4
DIOXINS					
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Toxicity Equivalent (TEQ)	ng/kg	3.6	16	4.40-37.8	8

Notes:

PRG = Preliminary Remediation Goals

µg/kg = micrograms/kilograms

mg/kg = milligrams/kilograms

ng/kg = nanograms/kilograms

In 2003, as part of the Phase II RA, eighteen (18) subsurface soil samples were collected at Site 78 at suspected sources of contamination. These subsurface soil samples were analyzed for volatile organic compounds (VOCs), SVOCs, PAHs, PCBs, pesticides, total metals, and dioxins, and furans. Only one (1) analyte, 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Toxicity Equivalent (TEQ), was detected in one (1) subsurface soil sample at a concentration of 8.66 ng/kg, exceeding the residential PRG of 3.6 ng/kg.

Based on the 2003 analytical results, three (3) surface soil samples were collected in the southeast corner of the site and analyzed for SVOCs, PAHs, PCBs, pesticides, and total metals. Eighteen (18) surface soil samples were collected in the vicinity of the former firefighter training burn pit and analyzed for dioxins and furans. None of the surface soil samples collected contained SVOCs, PAHs, pesticides, or total metals at concentrations exceeding the preliminary

screening criteria. The PCB Aroclor 1260 was detected in one (1) surface soil sample at a concentration of 5,360 µg/kg, exceeding the residential PRG of 220 µg/kg. TCDD TEQ was detected in seventeen (17) soil samples at concentrations ranging from 5.59 to 121 ng/kg, exceeding the residential PRG of 3.9 ng/kg. Nine (9) of these samples also exceeded the industrial PRG of 16 ng/kg.

Remedial Investigation (EA, June 2010)

Field investigations activities conducted during the RI included a site reconnaissance, topographic survey, ecological survey, test pitting/trenching activities, and collection of surface and subsurface soil samples (EA 2010).

Site Reconnaissance

During the RI, several areas of empty drums were identified on the eastern boundary of the site. In addition, a 2-inch underground drain line was discovered and traced to approximately 200 feet of the northwest portion of the former fire training burn pit. The five (5) intact 55-gallon drums observed during the Phase I RA were not observed during the RI Site Reconnaissance. The fate of these drums is unknown.

RI Surface Soil Sampling

Based up the results of the previous investigations, three (3) surface soil samples were collected and analyzed for PCBs and twenty-three (23) surface soil samples (including two [2] field duplicates) were collected and analyzed for dioxins and furans. PCBs were not detected in any of the surface soil samples. TCDD TEQ was detected in seventeen (17) surface soil samples at concentrations ranging from 4.38 to 300 ng/kg, exceeding the residential PRG of 3.9 ng/kg. Twelve (12) of these soil samples also exceeded the industrial PRG of 16 ng/kg.

To further investigate the site, twelve (12) surface soil samples (including one [1] field duplicate) were collected and analyzed for PAHs, PCBs, and/or total metals. An additional nine (9) surface soil samples were collected and analyzed for dioxins and furans.

No PAHs or PCBs were detected at concentrations exceeding the preliminary screening levels. Lead and TCDD TEQ were detected at concentrations exceeding the respective screening levels as presented in Table 2-5.

Table 2-4 RI Surface Soil Analytical Results Above USEPA Preliminary Remediation Goals, Site 78, Andersen AFB, Guam (EA 2010)

Analyze	Units	Region 9 USEPA PRG		RI Result (EA 2010)	# of soil samples with concentrations exceeding PRG
		Residential	Industrial		
METALS					
Lead	mg/kg	400	800	424 – 1,350	3
DIOXINS					
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Toxicity Equivalent (TEQ)	ng/kg	3.6	16	9.8 - 108	5

Notes:

PRG = Preliminary Remediation Goals

µg/kg = micrograms/kilograms

mg/kg = milligrams/kilograms

ng/kg = nanograms/kilograms

RI Subsurface Soil Sample Results

To further investigate the site, five (5) subsurface soil samples were collected and analyzed for VOCs, PAHs, PCBs, and total metals. None of the soil samples collected contained VOCs, PAHs, or PCBs at concentrations exceeding the preliminary screening criteria. Three (3) metal analytes were detected at concentrations exceeding the respective screening levels as presented in Table 2-6.

Table 2-5 RI Subsurface Soil Analytical Results Above Screening Levels, Site 78, Andersen AFB, Guam (EA 2010)

Analyze	Units	Region 9 USEPA PRG		Phase II Result (EA 2010)	# of soil samples with concentrations exceeding PRG
		Residential	Industrial		
METALS					
Aluminum	mg/kg	76,000	100,000	190,000 & 289,000	2
Copper	mg/kg	3,100	41,000	4,810	1
Lead	mg/kg	400	800	550	1

Notes:

PRG = Preliminary Remediation Goals

µg/kg = micrograms/kilograms

mg/kg = milligrams/kilograms

ng/kg = nanograms/kilograms

Table 2-6 Summary of Previous Investigations at Site 78

Date	Previous Investigations*	Investigation Activities	Results and Recommendations
1996	Expanded Source Investigation (ESI)/ Visual Site Inspection (VSI)	Site Reconnaissance without any sampling	Additional field investigations were recommended for the site.
2000	Phase I Release Assessment (RA)	Site Reconnaissance	Identified a few potential sources of contamination, including a burn pit, berms, a cleared area surrounding the burn pit, a metal framed rusting structure and approximately 50 55-gallon drums.
2003	Phase II Release Assessment (RA)	Site Reconnaissance/ Detailed Site Inventory (DSI), geophysical survey, soil gas survey, and surface and subsurface soil sampling	PAH, lead, dioxins, and furans detected at concentrations exceeding respected USEPA Region IX residential PRGs and/or background threshold values. Additional investigation including soil sampling recommended.
2010	Remedial Investigation (RI)	Site reconnaissance, topographic survey, ecological survey, test pitting/trenching activities, and collection of surface and subsurface soil samples. Used results of investigation to conduct HHRA and SLERA.	Aluminum detected in two (2) subsurface soil samples,, copper detected in one (1) subsurface sample, and lead detected in one (1) subsurface soil sample at concentrations exceeding the preliminary screening criteria. Results of HHRA indicated no unacceptable non-cancer or carcinogenic risks found in the surface or subsurface soil for identified receptors. SLERA results indicated potential risks to terrestrial plants and/or soil invertebrates minimal and do not require further action to address.

* The documents listed are available in the Administrative Record and provide detailed information used to support remedy selection at Site 78.

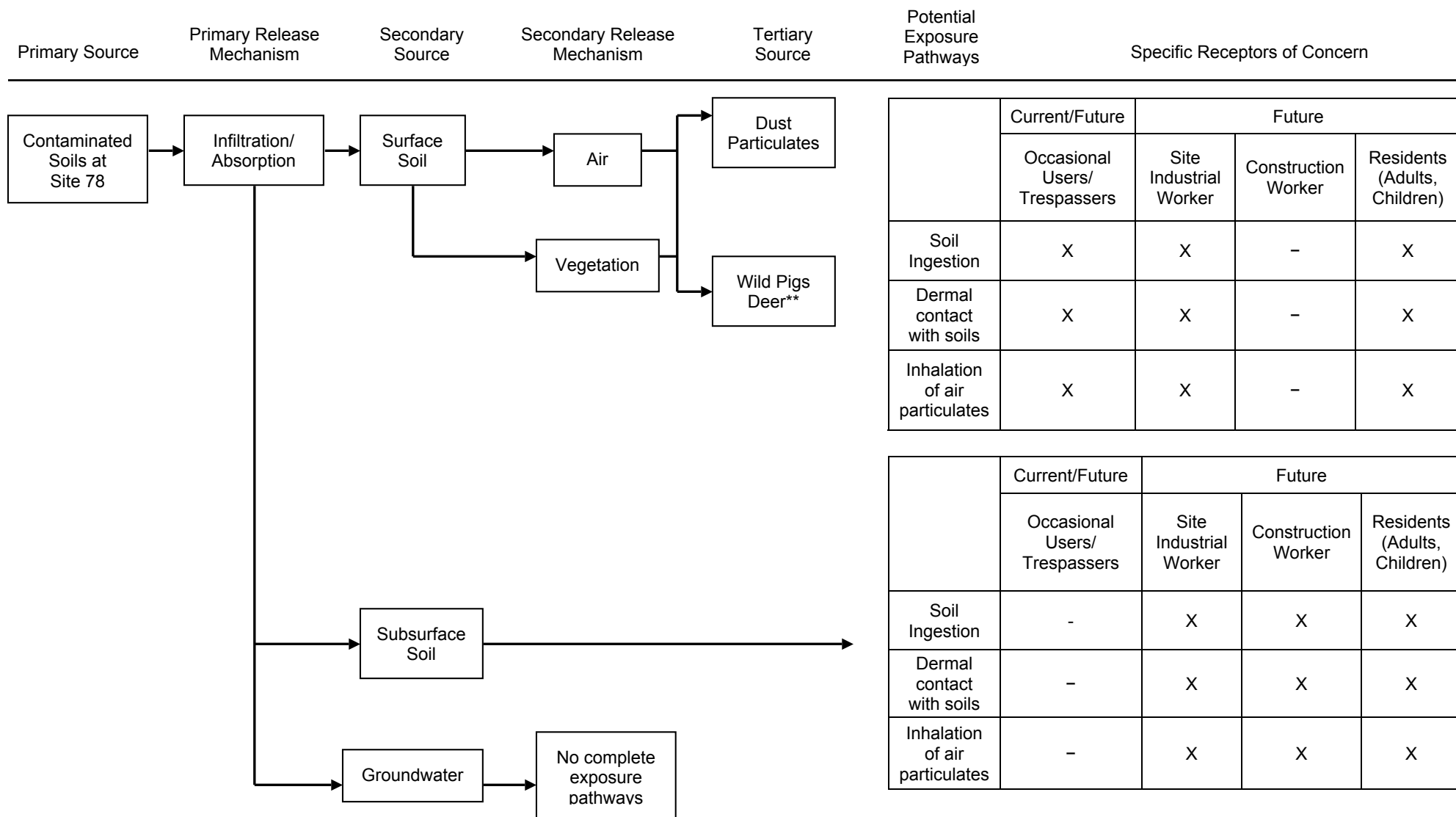
2.5.7 Nature and Extent of Contamination

Analytical results indicated that lead and TCDD TEQ exceeded screening levels in a few surface soil samples. Aluminum, copper and lead exceeded screening levels in a few subsurface soil samples. The risk assessment, as described in Section 2.7, indicated that contaminants of potential concern (COPC) present at Site 78, do not present unacceptable risks to human or ecological receptors, allowing for unlimited use of and unrestricted exposure to the land.

2.5.8 Conceptual Site Model

A conceptual site model (CSM) was developed for Site 78 to depict the potential relationship or exposure pathway between chemical sources and receptors. An exposure pathway describes the means by which a receptor can be exposed to contaminants in environmental media. These pathways are presented in Figure 2-3 (Human Health Risk) and Figure 2-4 (Ecological Risk), based upon current and reasonably likely future land uses at Site 78.

Figure 2-3 Human Health Conceptual Site Model for Site 78, Andersen AFB, Guam



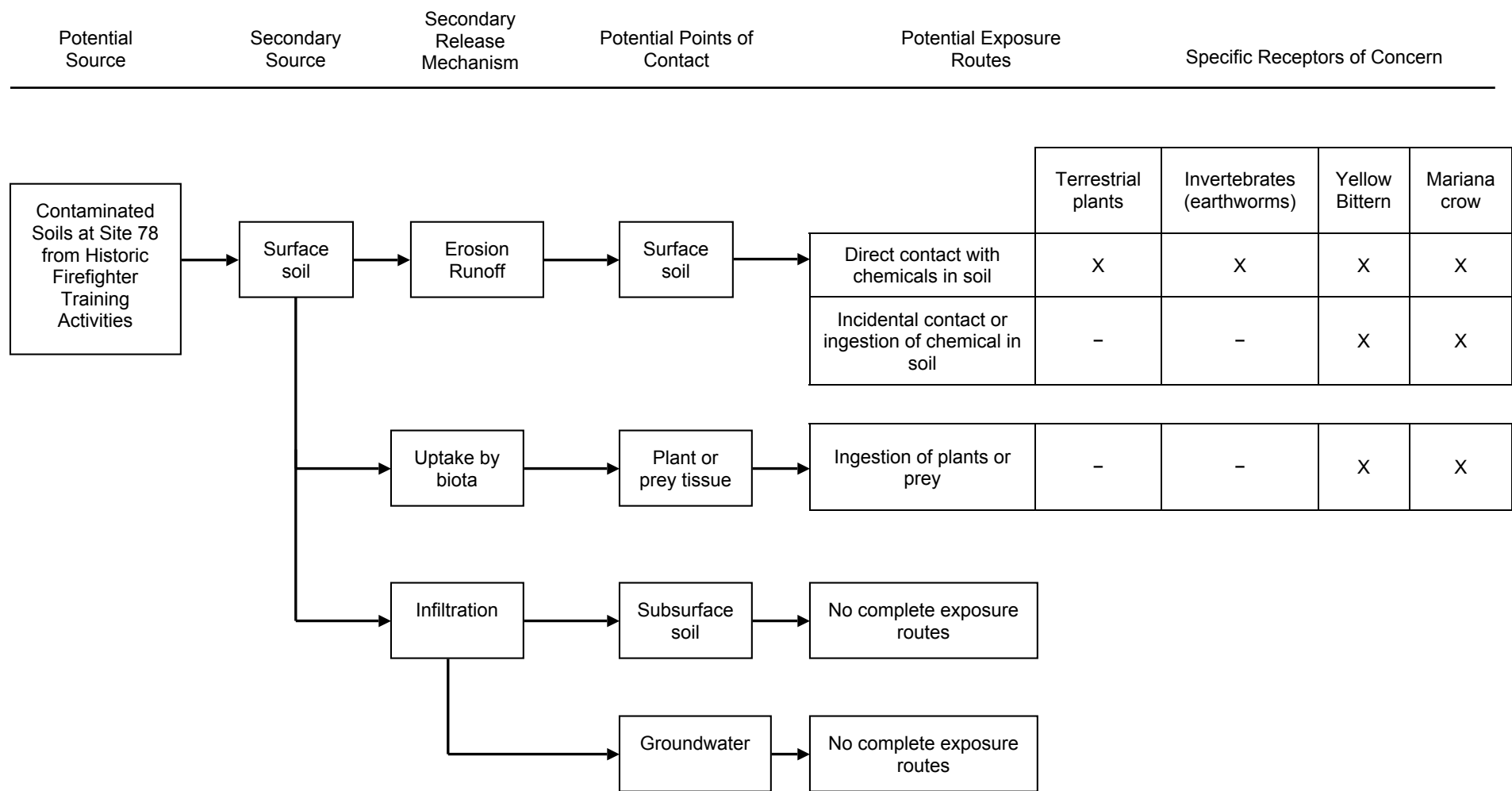
Notes:

X = Complete exposure pathway
 - = Incomplete exposure pathway

** Risks associated with ingestion of wild pig and deer meat at Andersen AFB has been addressed in the two reports (Agency for Toxic Substances and Disease Registry, 2006 and EA, 1995), which

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Figure 2-4 Ecological Risk Conceptual Site Model for Site 78, Andersen AFB, Guam



Notes:

X = Complete exposure pathway
- = Incomplete exposure pathway

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2.6 Current and Potential Future Land and Resource Uses

2.6.1 Land Use

Site 78 is currently inactive and there are no plans to develop it. The current and future access to the site is restricted because the site is within an active military facility and in an area designated for airfield use (operations and maintenance). There are no residential or recreational areas in the vicinity of the site. Although the potential does exist for industrial development, none is currently planned (Andersen AFB 2010).

2.6.2 Groundwater and Surface Water Uses

Site 78 is located above the Northern Guam Lens (NGL) aquifer, which is designated by the USEPA as a sole source aquifer, and supplies Guam with approximately 80% of its drinking water (Barrett 1982). Groundwater at Main Base OU has been monitored regularly as part of the Long-Term Groundwater Monitoring (LTGM) Program at Andersen AFB (PCR 2012). The initial round of groundwater sampling was conducted for all the Main Base monitoring wells in November 1995 (Round 1) and on a semiannual basis (twice a year) thereafter.

This historical groundwater data set for the Main Base has established that there is no connection between the COCs observed in the surface and subsurface soils at Site 78 covered under this ROD and any groundwater contamination. Trichloroethene (TCE) and tetrachloroethene (PCE) have been observed in groundwater samples collected from Main Base monitoring wells at concentrations exceeding the Federal State Drinking Water Act's maximum contaminant levels (MCLs). However, the groundwater contamination has been attributed to a likely TCE/PCE source(s) in the vicinity of Building 18006.

Three (3) monitoring wells (IRP-63, IRP-4, and IRP-41) are located in close proximity to Site 78. These wells have been sampled semiannually since 1995 and no COCs have been detected at concentrations exceeding the screening levels in these wells (PCR 2012). Based on historical groundwater monitoring results, depth to groundwater (approximately 500 ft bgs), and the low concentrations of target analytes detected in the surface and subsurface soils at Site 78, it is concluded that soil contamination at Site 78 has not and will not have a negative impact on the aquifer.

2.7 Summary of Site Risks

This section summarizes the human health and ecological risk assessment completed as part of the RI Report (EA 2010) and includes the basis for the *No Further Action* recommendation at Site 78.

2.7.1 Human Health Risk Assessment

The Human Health Risk Assessment (HHRA) estimates what risks the site poses if no action were taken. It provides the basis for taking action (if any) and identifies the contaminants and exposure pathways that need to be addressed by remedial action. This section summarizes the approach and findings of the HHRA performed at Site 78. The HHRA methodology and results are described in detail in Appendix D1 of the RI for Site 78 (EA 2010).

2.7.1.1 Identification of COCs

This section identifies those chemicals associated with unacceptable risk at the site and that are the basis for the proposed remedial action.

The HHRA identified surface and subsurface soil as the media of concern at Site 78. The risks were estimated for the following receptors:

- Residential (adult and child) exposures to surface and subsurface soil
- Industrial workers exposures to surface soil
- Construction workers exposures to subsurface soil

The risk-based screening results for the receptors and media of concern at Site 78 are presented in Table 2-7 and are summarized as follows:

- Cadmium, copper, lead, thallium, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, Aroclor-1260, and TCDD TEQ were identified as COPCs for residential exposures to surface soil
- Cadmium, lead, benzo(a)pyrene, Aroclor-1260, and TCDD TEQ were identified as COPCs for industrial workers exposure to surface soil
- Aluminum, cadmium, copper, lead, and TCDD TEQ were identified as COPCs for residential exposure to subsurface soil
- Aluminum and cadmium were identified as COPCs for construction workers exposure to subsurface soil

Table 2-7 Chemical of Potential Concerns (COPC) Identified at Site 78

Media	USEPA Region IX PRGs	Identified Chemical of Potential Concerns (COPC)
Surface soil	Residential	Cadmium Copper Lead Thallium Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Aroclor-1260 TCDD TEQ
	Industrial	Cadmium Lead Benzo(a)pyrene Aroclor-1260 TCDD TEQ
Subsurface soil	Residential	Aluminum Cadmium Copper Lead TCDD TEQ
	Industrial	Aluminum Cadmium

2.7.1.2 Exposure Assessment

In the exposure assessment, the human population or groups of individuals potentially exposed to soil (i.e. potential human receptors) were characterized. The exposure pathways, exposure point concentration (EPCs), and exposure intake equations are determined based on site-specific information and are described in detail in Appendix D of the RI Report for Site 78 (EA 2010).

The complete exposure pathways are summarized in Table 2-8 below:

Table 2-8 Summary of Complete Exposure Pathways at Site 78.

SUMMARY OF COMPLETE EXPOSURE PATHWAYS AT SITE 78					
Scenario Timeframe	Medium	Exposure Medium	Receptor Population	Receptor Age	Exposure Route
Current	Soil	Surface Soil	Occasional User	Adolescent	Ingestion
					Dermal
		Air	Occasional User	Adolescent	Inhalation
Future	Soil	Surface Soil	Site Worker	Adult	Ingestion
					Dermal
		Air	Site Worker	Adult	Inhalation
		Surface Soil	Resident	Adult	Ingestion
					Dermal
				Child	Ingestion
					Dermal
		Air	Resident	Adult	Inhalation
				Child	Inhalation
		Subsurface soil	Resident	Adult	Ingestion
					Dermal
				Child	Ingestion
					Dermal
		Air	Resident	Adult	Inhalation
				Child	Inhalation
		Subsurface Soil	Construction Worker	Adult	Ingestion
					Dermal
		Air	Construction Worker	Adult	Inhalation

2.7.1.3 Toxicity Assessment

The toxicity assessment considers the types of potential adverse health effects associated with exposures to COPCs; the relationship between the magnitude of exposure and potential adverse effects; and related uncertainties, such as the weight of evidence of the carcinogenicity of a particular COPC in humans. The toxicity values and chemical-specific parameters utilized in calculating dermal exposure for COPCs are presented in Table 2-9, 2-10, 2-11, and 2-12 (EA 2010).

Various congeners of dioxins and furans were detected in soil samples collected at Site 78. There are no USEPA-published toxicity concentrations for polychlorinated dibenzo-p-dioxin (PCDD) and polychlorinated dibenzofuran (PCDF). Several of these congeners have been shown to cause similar toxic effects as 2,3,7,8-TCDD, the most toxic dioxin (World Health Organization, 2006). As a result of their different chemical properties, the relative concentrations of the various PCDD and PCDF compounds vary from sample to sample. This complex situation makes the evaluation of human health risks from exposure to these mixtures

very difficult. The concept of toxicity equivalency factors (TEFs) was developed to deal with this problem. The TEF concept is based on the evidence that dioxin-like compounds share a common mechanism of action with 2,3,7,8-TCDD. By applying the TEF concept, the relative toxicity of different compounds to that of 2,3,7,8-TCDD is determined based on published scientific data.

Recognizing the need for consistency in applying internationally agreed upon TEFs, the World Health Organization, European Center for Environment and Health, and the International Programme on Chemical Safety initiated a program to derive TEFs for compounds with dioxin-like activity to be used to assess human health risks from exposures to such compounds (World Health Organization, 2006). TEFs for human intake were derived for 17 PCDDs and PCDFs. The analytical data for dioxins and furans were normalized to 2,3,7,8-TCDD using these TEFs and were evaluated as the normalized TCDD TEQ value in the HHRA.

Table 2-9 Non-Cancer Toxicity Data—Oral/ Dermal, Site 78, Andersen AFB, Guam

Contaminant of Potential Concern	Chronic/ Subchronic	Oral RfD Value (mg/kg-day)	Oral to Dermal Adjustment Factor (GI ABS) (1)	Adjusted Dermal RfD (2) (mg/kg bw-day)	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD; Target Organ	Dates of RfD: Target Organ (3) (mm/dd/yyyy)
DIOXIN/FURANS								
TCDD-TEQ	NA	NA	1	NA	NA	NA/NA	HEAST	1997
INORGANICS								
Aluminum	Chronic	1.00E+00	1	1.00E+00	Central Nervous System	100/3	PPRTV	7/26/2001
Cadmiunm	Chronic	1.00E-03	0.025	2.50E-05	Kidneys	10/1	IRIS	8/12/2008
Copper	Chronic	4.00E-02	1	4.00E-02	Liver and Kidney	NA/NA	HEAST	1997
Thallium	Chronic	7.00E-05	1	7.00E-05	Blood	3000/1	IRIS	1/17/2008
Zinc	Chronic	3.00E-01	1	3.00E-01	Blood	3/1	IRIS	8/12/2008
POLYCYCLIC AROMATIC HYDROCARBONS								
Benzo(a)anthracene	NA	NA	1	NA	NA	NA/NA	EPA-NCEA	5/23/2001
Benzo(b)fluoranthene	NA	NA	1	NA	NA	NA/NA	EPA-NCEA	5/23/2001
Benzo(a)pyrene	NA	NA	1	NA	NA	NA/NA	IRIS	8/12/2008
Dibenz(a,h)anthracene	NA	NA	1	NA	NA	NA/NA	EPA-NCEA	5/23/2001
PESTICIDES/PCBs								
Aroclor-1260	NA	NA	1	NA	NA	NA	IRIS	8/12/2008

Notes:

NA= Not Applicable

TCDD TEQ = 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity equivalent

(1) Taken from USEPA 2004a Guidance

(2) Dermal toxicological values adjusted from oral values using USEPA 2004a recommended chemical-specific gastrointestinal absorption factors (GI ABS). RfDs are multiplied by the GI ABS.

(3) IRIS – Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided

HEAST – Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided

EPA-NCEA – National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided

Table 2-10 Non-Cancer Toxicity Data—Inhalation, Site 78, Andersen AFB, Guam

Contaminant of Potential Concern	Chronic/ Subchronic	Value Inhalation (RfC) (mg/m ³)	Adjusted Inhalation (RfD) (mg/kg-day)	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfC: RfD: Target Organ	Dates (1) (mm/dd/yy)
DIOXIN/FURANS							
TCDD-TEQ	NA	NA	NA	NA	NA	HEAST	1997
INORGANICS							
Aluminum	Chronic	1.40E-03	1.40E-03	Respiratory System	NA	PPRTV	7/26/2001
Cadmium	NA	NA	NA	NA	NA	IRIS	8/12/2008
Copper	NA	NA	NA	NA	NA	HEAST	1997
Thallium	NA	NA	NA	NA	NA	IRIS	8/12/2008
Zinc	NA	NA	NA	NA	NA	IRIS	8/12/2008
POLYCYCLIC AROMATIC HYDROCARBONS							
Benzo(a)anthracene	NA	NA	NA	NA	NA	EPA-NCEA	5/23/2001
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	EPA-NCEA	5/23/2001
Benzo(a)pyrene	NA	NA	NA	NA	NA	IRIS	8/12/2008
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	EPA-NCEA	5/23/2001
PESTICIDES/PCBs							
Aroclor-1260	NA	NA	NA	NA	NA	IRIS	8/12/2008

Notes:

NA= Not Applicable

TCDD TEQ = 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity equivalent

(1) IRIS – Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided

HEAST – Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided

EPA-NCEA – National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided

Table 2-11 Cancer Toxicity Data—Dermal, Site 78, Andersen AFB, Guam

Contaminant of Potential Concern	Oral Cancer Slope Factor	Oral Absorption Efficiency for Dermal (GI ABS) (1)	Absorbed Cancer Slope Factor for Dermal (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (3) (mm/dd/yyyy)
DIOXIN/FURANS							
TCDD-TEQ	1.50E+05	1	1.50E+05	per (mg/kg-day)	B2	HEAST	1997
INORGANICS							
Aluminum	NA	1	NA	per (mg/kg-day)	NA	EPA-NCEA	5/30/1997
Cadmium	NA	0.025	NA	per (mg/kg-day)	B1	IRIS	8/12/2008
Copper	NA	1	NA	per (mg/kg-day)	D	IRIS	8/12/2008
Thallium	NA	1	NA	per (mg/kg-day)	D	IRIS	8/12/2008
Zinc	NA	1	NA	per (mg/kg-day)	D	IRIS	8/12/2008
POLYCYCLIC AROMATIC HYDROCARBONS							
Benzo(a)anthracene	7.30E-01	1	7.30E-01	per (mg/kg-day)	B2	EPA-NCEA	5/23/2001
Benzo(b)fluoranthene	7.30E-01	1	7.30E-01	per (mg/kg-day)	B2	EPA-NCEA	5/23/2001
Benzo(a)pyrene	7.30E+00	1	7.30E+00	per (mg/kg-day)	B2	IRIS	8/12/2008
Dibenz(a,h)anthracene	7.30E+00	1	7.30E+00	per (mg/kg-day)	B2	EPA-NCEA	5/23/2001
PESTICIDES/PCBs							
Aroclor-1260	2.00E+00	NA	2.00E+00	per (mg/kg-day)	B2	IRIS	8/12/2008

Notes:

NA= Not Applicable

TCDD TEQ = 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity equivalent

- (1) Taken from USEPA 2004a Guidance
- (2) Dermal Toxicological values adjusted from oral values using USEPA 2004a recommended chemical-specific gastrointestinal absorption factors (GI ABS). CSFs are divided by the GI ABS
- (3) IRIS – Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided
HEAST – Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided
EPA-NCEA – National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided
PPRTV – Provisional Peer Reviewed Toxicity Value

Weight of Evidence:

- A – Human carcinogen
- B1 – Probable human carcinogen – indicate that limited human data are available
- B2 – Probable human carcinogen – indicates sufficient evidence in animals and inadequate or no evidence in humans
- C – Possible human carcinogen
- D – Not classifiable as a human carcinogen
- E – Evidence of noncarcinogenicity

Table 2-12 Cancer Toxicity Data—Inhalation, Site 78, Andersen AFB, Guam

Contaminant of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/ Cancer Guideline Description	Unit Risk – Inhalation CSF	
	Value	Units	Value	Units		Source	Date
DIOXIN/FURANS							
TCDD-TEQ	1.30E+00	1/µg/m³	1.50E+05	per (mg/kg-day)	B2	HEAST	1997
INORGANICS							
Aluminum	NA	1/µg/m³	NA	per (mg/kg-day)	NA	EPA-NCEA	5/30/1997
Cadmium	1.80E-03	1/µg/m³	6.30E+00	per (mg/kg-day)	B1	IRIS	8/12/2008
Copper	NA	1/µg/m³	NA	per (mg/kg-day)	D	IRIS	8/12/2008
Thallium	NA	1/µg/m³	NA	per (mg/kg-day)	D	IRIS	8/12/2008
Zinc	NA	1/µg/m³	NA	per (mg/kg-day)	D	IRIS	8/12/2008
POLYCYCLIC AROMATIC HYDROCARBONS							
Benzo(a)anthracene	8.00E-04	1/µg/m³	3.10E-01	per (mg/kg-day)	B2	EPA-NCEA	5/23/2001
Benzo(b)fluoranthene	8.00E-04	1/µg/m³	3.10E-01	per (mg/kg-day)	B2	EPA-NCEA	5/23/2001
Benzo(a)pyrene	8.00E-04	1/µg/m³	3.10E+00	per (mg/kg-day)	B2	IRIS	8/12/2008
Dibenz(a,h)anthracene	8.00E-04	1/µg/m³	3.10E+00	per (mg/kg-day)	B2	EPA-NCEA	5/23/2001
PESTICIDES/PCBs							
Aroclor-1260	5.70E-04	1/µg/m³	2.00E+00	per (mg/kg-day)	B2	IRIS	8/12/2008

Notes:

NA= Not Applicable

TCDD TEQ = 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity equivalent

- (1) Taken from USEPA 2004a Guidance
- (2) Dermal Toxicological values adjusted from oral values using USEPA 2004a recommended chemical-specific gastrointestinal absorption factors (GI ABS). CSFs are divided by the GI ABS
- (3) IRIS – Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided
HEAST – Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided
EPA-NCEA – National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided
PPRTV – Provisional Peer Reviewed Toxicity Value
CAL EPA- California Environmental Protection Agency

Weight of Evidence:

- A – Human carcinogen
- B1 – Probable human carcinogen – indicate that limited human data are available
- B2 – Probable human carcinogen – indicates sufficient evidence in animals and inadequate or no evidence in humans
- C – Possible human carcinogen
- D – Not classifiable as a human carcinogen
- E – Evidence of noncarcinogenicity

2.7.1.4 Risk Characterization

During the risk assessment, the toxicity values were combined with the estimated chemical intakes for the receptor populations to quantitatively estimate both carcinogenic and non-carcinogenic risks. Risks were estimated for the following receptor populations at Site 78:

- Current and future occasional users/trespassers
- Future site (industrial) workers
- Future construction workers
- Future resident adults and children

The potential health risks from exposures to surface or subsurface soil were assessed for each potential receptor population by combining estimates of exposure and toxic potency for each COPC. The estimates of total risks for non-carcinogenic and carcinogenic effects are presented below for the receptor populations of concern at Site 78. A summary of these non-cancer and cancer risks are presented in Table 2-13 and Table 2-14, respectively.

Occasional User Results- Surface Soil

Under current conditions at the site, the only potential receptors are occasional users, which include potential trespassers. To provide a conservative estimate of the potential trespasser or occasional user exposure, an adolescent aged 7-18 years was evaluated instead of an adult.

The non-carcinogenic risk for occasional user exposure to surface soil was calculated at 0.018, which was below USEPA's risk target of 1.0. Therefore, no unacceptable non-carcinogenic risk was estimated for occasional user exposure to surface soil.

The excess lifetime carcinogenic risk for occasional user exposure to surface soil was 1.9×10^{-6} . This value was within the risk range of 10^{-4} to 10^{-6} . Based on site-specific conditions, as well as the current and anticipated land use at the site, a risk management decision was made that determined there was no unacceptable carcinogenic risk for occasional user exposure to surface soil at Site 78.

Site Worker Results - Surface Soil

The non-carcinogenic risk for site worker exposure to surface soil was 0.0089, which was below USEPA's risk target of 1.0. Therefore, no unacceptable non-carcinogenic risk was estimated for site worker exposure to surface soil.

The excess lifetime carcinogenic risk for the site worker exposure to surface soil was 6.2×10^{-6} . This value was within the risk range of 10^{-4} to 10^{-6} . Based on site-specific conditions, as well as the current and anticipated land use at the site, a risk management decision was made that determined that there was no unacceptable carcinogenic risk for site worker exposure to surface soil at Site 78.

Resident Results - Surface Soil

The non-carcinogenic risk for resident child exposure to surface soil was calculated as 0.52, which was below USEPA's risk target of 1.0. Therefore, no unacceptable non-carcinogenic risk was estimated for the resident child exposure to surface soil.

The excess lifetime carcinogenic risk for the resident adult and child combined lifetime exposure to surface soil was 6.9×10^{-5} . This value was within the risk range of 10^{-4} to 10^{-6} . Based on the site-specific conditions, as well as the current and anticipated land use at the site, a risk management decision was made that determined there was no unacceptable carcinogenic risk for residential exposure to surface soil at Site 78.

Resident Results - Subsurface Soil

The non-carcinogenic risk for resident child exposure to subsurface soil was calculated as 3.5, which was above USEPA's risk target of 1.0. Aluminum was the only individual contaminant in subsurface soil with an HQ that exceeded 1.0. The only target organ that exceeded the 1.0 threshold was the central nervous system, which was driven solely by aluminum. Therefore, unacceptable non-carcinogenic risk was identified for resident child exposure to subsurface soil.

The non-carcinogenic risk for resident adult exposure to subsurface soil was calculated as 0.40, which was below the USEPA's risk target of 1.0. Therefore, no unacceptable non-carcinogenic risk was estimated for the resident adult exposure to subsurface soil.

The excess lifetime carcinogenic risk for the resident adult and child combined lifetime exposure to subsurface soil was 1.7×10^{-6} . This value was within the risk range of 10^{-4} to 10^{-6} . Based on site-specific conditions, as well as the current and anticipated land use at the site, a risk management decision was made that determined there was no unacceptable carcinogenic risk for residential exposure to subsurface soil at Site 78.

Construction Worker Results- Subsurface Soil

The non-carcinogenic risk for construction worker exposure to subsurface soil was calculated at 1.0, which was equal to the USEPA's risk target of 1.0. No individual contaminant had an HI that exceeded 1.0. No target organs exceeded the 1.0 threshold for the construction worker. Therefore, no unacceptable non-carcinogenic risk was identified for construction worker exposure to subsurface soil.

The excess lifetime carcinogenic risk for construction worker exposure to subsurface soil was 3.3×10^{-10} . This value was below the risk range of 10^{-4} to 10^{-6} . Therefore, no unacceptable carcinogenic risk was identified for construction worker exposure to subsurface soil at Site 78.

Table 2-13 Summary of Non-Cancer Risks for Receptors at Site 78

Route of Exposure	Exposure to Surface Soil				Exposure to Subsurface Soil		
	Current Occasional User	Future Site Worker	Future Resident Child	Future Resident Adult	Future Resident Child	Future Resident Adult	Future Construction Worker
Incidental Ingestion of Soil	0.016	0.0058	0.51	0.54	3.4	0.36	1.0
Dermal Contact with Soil	0.0015	0.0031	0.017	0.0026	0.035	0.0053	0.0095
Inhalation of Particles form Soil	–	–	–	–	0.066	0.028	0.020
TOTAL	0.018	0.0089	0.52	0.057	3.5	0.40	1.0

Notes:

Shaded cells indicate non-cancer risks equaling or exceeding risk target of 1.0

Table 2-14 Summary of Cancer Risks for Receptors at Site 78

Route of Exposure	Exposure to Surface Soil					Exposure to Subsurface Soil			
	Current Occasional User	Future Site Worker	Future Resident Child	Future Resident Adult	Future Resident (Adult and Child)	Future Resident Child	Future Resident Adult	Future Resident (Adult and Child)	Future Construction Worker
Incidental Ingestion of Soil	1.2E-06	2.8E-06	1.8E-05	7.9E-06	2.6E-05	7.6E-07	3.2E-07	1.1E-06	–
Dermal Contact with Soil	7.2E-07	3.4E-06	4.1E-06	3.8E-05	4.2E-05	6.3E-08	5.8E-07	6.4E-07	–
Inhalation of Particles form Soil	1.9E-10	1.6E-09	3.7E-09	6.3E-09	1.0E-08	6.4E-09	1.1E-08	1.7E-08	3.3E-10
TOTAL	1.9E-06	6.2E-06	2.2E-05	4.6E-05	6.9E-05	8.2E-07	9.2E-07	1.7E-06	3.3E-10

Notes:

Shaded cells indicate cancer risks exceeding 1×10^{-6}

2.7.2 Exposure to Lead

Lead was detected at concentrations exceeding its screening value in surface and subsurface soil. As a result, risks associated with lead were evaluated further. The probability density functions for modeled exposures and a copy of the IEUBK model outputs are provided in Appendix E of the RI Report for Site 78 (EA 2010).

The surface and subsurface soil modeling demonstrated that there were no unacceptable risks to pregnant workers or resident children exposed to lead at the site. Based on the results of both models, no unacceptable risks were identified for lead exposures in soil at the site under residential or industrial use scenarios.

2.7.2.1 Site-Specific Preliminary Remediation Goals

The COCs were identified as those COPCs that had or contributed to a target-specific HI greater than 1.0. Only one (1) COC was identified; aluminum was identified as a non-carcinogenic COC for subsurface soil. The risk-based site-specific PRG, presented below in Table 2-15, was back-calculated for this COC as a guideline for further consideration in the risk management process.

Section 2.7.3 presents the evaluation of the identified COC within the risk management framework and in the context of the background conditions at Site 78.

Table 2-15 Summary of Site-Specific PRGs for Subsurface Soil at Site 78

COC	EPC (mg/kg)	Calculated HI for all pathways	PRG for HI = 1.0 (mg/kg)	PRG for HI = 0.1 (mg/kg)	USEPA PRG ¹ (mg/kg)	BTV (mg/kg)	Site- Specific PRG (mg/kg)
Resident Child							
Aluminum	190,000	2.5	76,150	Not applicable	76,100	173,500	173,500*

Notes:

¹ For resident adults and children, USEPA Region 9 2004 residential PRG is shown.

* BTV exceeds PRG; therefore, BTV is used as a cleanup goal.

2.7.3 Evaluation of Identified Contaminants of Concern

The HHRA calculated the total risk for each of the contaminants and exposure scenarios identified at Site 78. This conservative approach is an important step in understanding total site risks and making informed risk management decisions. However, the total risk estimates and site-specific preliminary PRGs derived did not differentiate between the inherent risk due to the naturally occurring background site conditions and site risk due to anthropogenic contaminants. Therefore, incremental risk, which estimates only the portion of the risk exceeding background, was calculated and used to evaluate the inorganic COC identified by the HHRA.

The COCs were identified as contaminants whose incremental risk exceeded either the acceptable cumulative risk range or from 10^{-4} to 10^{-6} or the acceptable cumulative non-cancer HI of 1.0 for a given toxic endpoint of concern or target organ. Incremental risk not exceeding either of these risk thresholds are considered acceptable and do not require further action. The COC evaluation and PRG summary table for Site 78 are presented below in Table 2-16.

Table 2-16 Summary of Selected PRG to Address Subsurface Soil Non-Cancer Risks at Site 78

COC	EPC (mg/kg)	BTV (mg/kg)	Total Risk HI	Incremental HI*	PRG for Incremental HI = 1.0 (mg/kg)	PRG for Incremental HI = 0.1 (mg/kg)	USEPA PRG ¹ (mg/kg)	Selected PRG (mg/kg)
Resident Child								
Aluminum	190,000	173,500	3.5	0.2	253,000	Not applicable	76,000	NO ACTION

Notes:

- 1 For resident adults and children, USEPA Region 9 2004 residential PRG is shown.
 * Incremental HI is less than the acceptable threshold (HI = 1.0); no action is required.

Resident Child

Aluminum was identified as the only non-carcinogenic COC with the potential to pose unacceptable risk to the resident child exposed to subsurface soil at Site 78. Only one (1) subsurface soil sample exceeded the BTV and was also used as the EPC for aluminum at the site (190,000 mg/kg). Aluminum was also detected in a subsurface sample of opportunity, which was collected to characterize a corroded metallic substance encountered in one of the test trenches; this sample has been excluded from the risk characterization due to the fact that it was a suspected contaminant and not a representative soil sample. When the risk due to naturally occurring background conditions was factored in, the resulting incremental risk for resident child exposure to aluminum (HI = 0.2) was below the USEPA's acceptable risk threshold (HI = 1.0). This demonstrates that detected concentrations of aluminum in subsurface soil at the site are consistent with background and, therefore, does not require remediation.

Based on this evaluation of site-specific conditions, calculated incremental risk, and the distribution of the single COC identified by HHRA, the potential risks identified for exposure to surface and subsurface soil at Site 78 are considered acceptable and do not require further action.

2.7.4 Uncertainties

The uncertainties associated with the HHRA conducted for Site 78 are discussed in detail in Section 2.6.4 of Appendix D of the RI Report for Site 78 (EA 2010).

2.7.5 Summary and Conclusions of the Human Health Risk Assessment

The results of the HHRA indicated that the only concern for human exposure to soil at Site 78 was for non-carcinogenic risk to the resident child based on concentrations of aluminum in subsurface soil. A risk management decision was made to eliminate aluminum in subsurface soil as a COC for future resident child because there were only two (2) samples over the 10-acre site at concentrations that might pose a risk and future plans for the site will likely be industrial use as part of the flight-line operations. All other scenarios evaluated indicated no human health concerns. These scenarios included both non-carcinogenic and carcinogen evaluations for occasional users, site workers, and construction workers. In addition, there were no concerns for carcinogenic risks to residents.

The surface and subsurface soil modeling predicted elevated risks from lead to pregnant workers and resident children. Based on lead modeling results from both models, no unacceptable risks were associated with potential lead exposure in soil at the site.

2.7.6 Ecological Risk Assessment

An extensive qualitative habitat and biota survey was conducted at Site 78 as part of the RI Report for Site 78 (EA 2010). An ecological risk assessment was completed to determine if under expected exposure conditions, contaminants found at the site are at concentrations that may cause unacceptable risk to ecological organisms using the area. A detailed description of the SLERA process is presented in the RI document (EA 2010).

The results of the SLERA indicated that concentrations of copper detected in surface soil at Site 78 may have the potential to pose slight risks to terrestrial plants, and soil invertebrates at the site. However, given the highly conservative nature of the risk assessment as well as the fact that no evidence of stressed vegetation was observed during the ecological survey, these potential risks are considered to be minimal and do not require further action to address. The avian receptors (Mariana crow and yellow bittern) were unlikely to experience adverse effects due to contaminants present in the surface soil at Site 78.

2.7.7 Basis for Action

No unacceptable risk to public health or welfare to the environment was identified at Site 78; therefore, no further action is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

2.8 Statutory Determinations

Because the soil sample analytical results for Site 78 indicate that there are no unacceptable risks to humans or the environment, the USN has determined *that no further CERCLA remedial action* is necessary at the site. Therefore, no action is required for Site 78 to allow for unrestricted use of and unlimited exposure to the land.

A five-year review is not required as there are currently no hazardous substances, pollutants or containments remaining at the sites above levels that would allow for unlimited use and unrestricted exposure.

2.9 Documentation of Significant Changes

On September 19, 2012, the Proposed Plan for Site 78 was released to the public for review and comments. The Proposed Plan identified *No Further CERCLA Remedial Action* as the selected remedy. A public comment period extended from September 19 to October 18, 2012. A public meeting was held at Guam Marriott Resort and Spa, Tumon, Guam on September 26, 2012, to present the Proposed Plan to the public.

The USN has reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

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3.0 RESPONSIVENESS SUMMARY

This section provides a summary of the public comments regarding the Proposed Plan for remedial action at Site 78 at Andersen AFB, Guam. At the time of the public review period, the USN identified *No Further Action* as the preferred remedy at Site 78. Based upon the verbal comments received, the Proposed Plan was accepted by the public.

3.1 Stakeholder Comments and Lead Agency Responses

A public meeting was held on September 26, 2012, to present details on the proposed plan and to solicit public comment and input. Mr. Gregg Ikehara, Andersen AFB 36 Civil Engineer Squadron/Civil Engineer Environmental Flight (36th CES/CEVR), gave a presentation discussing the proposed plan for Site 78. The presentation provided a brief site history, summary of past investigative studies and related analytical results and a summary of the human health and ecological risk assessments. The preferred remedial alternative was also presented.

There were no verbal comments or questions received during the public meeting specifically related to Site 78.

The public review and comment period was from September 19 to October 18, 2012. During this period, no written comments were received from the public.

3.2 Technical and Legal Issues

No technical or legal issues were identified during the public review period of the Proposed Plan.

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4.0 REFERENCES

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- Young. 1988. *Soil Survey of Territory of Guam*. United States Department of Agriculture, Soil Conservation Service.

Appendix A
Site Photographs



Figure A.1. Debris located at Site 78, Andersen AFB, Guam.



Figure A.2. Partially buried 55-gallon drum and metal debris at Site 78, Andersen AFB, Guam



Figure A.3. Pipe located at Site 78, Andersen AFB, Guam



Figure A.4. Abandoned vehicles at Site 78, Andersen AFB, Guam



Figure A.5. Aircraft fuel bladder at Site 78, Andersen AFB, Guam



Figure A.6. Area of 55-gallon drums at Site 78, Andersen AFB, Guam



Figure A.7. Area of 55-gallon drums at Site 78, Andersen AFB, Guam



Figure A.8. Pipes located at Site 78, Andersen AFB, Guam



Figure A.9. Possible incinerator located at Site 78, Andersen AFB, Guam



Figure A.10. Subsurface pipe located at Site 78, Andersen AFB, Guam



Figure A.11. Pipe leading to the inside of the berm at Site 78, Andersen AFB, Guam



Figure A.12. Trench TT-03 at Site 78, Andersen AFB, Guam



Figure A.13. Grayish material in Trench, TT-06 at Site 78, Andersen AFB, Guam

Appendix B
Public Notifications of
Documents Available

**ANDERSEN AIR FORCE BASE
INSTALLATION RESTORATION PROGRAM
Restoration Advisory Board and Public Meeting
September 26, 2012 at 6:30pm
Guam Marriot Resort & Spa, Latte Room, 2nd Level
627 Pale San Vitores Rd., Tumon, Guam 96913**

The Andersen AFB Installation Restoration Program will hold a combined Restoration Advisory Board and public meeting on September 26, 2012 to discuss the status of the restoration program and to present Proposed Plans for Site 78 and for Areas of Concern (AOC)-4, AOC-7B, AOC-7C, AOC-7D, AOC-9, Solid Waste Management Units (SWMU)-4, SWMU-6, SWMU-8A, SWMU-8B, SWMU-8C, SWMU-9, SWMU-10, SWMU-11, SWMU-12, SWMU-13A, SWMU-15, SWMU-16C, SWMU-17, SWMU-20D, SWMU-20E, SWMU-22A, SWMU-22B, SWMU-22C, SWMU-23B, SWMU-29A, SWMU-29B, SWMU-29C, SWMU-31B, SWMU-32E, SWMU-32F, SWMU-32G, SWMU-33, SWMU-34A, SWMU-35A, SWMU-35C, SWMU-37A, SWMU-40C, SWMU-41, SWMU-42D, SWMU-42E, SWMU-42F, SWMU-43, SWMU-44, SWMU-46A, SWMU-46B, SWMU-47C, SWMU-53B, SWMU-53C, SWMU-53D, SWMU-53F, and SWMU-57, Site-wide Operable Unit of Andersen AFB, Guam. The Proposed Plan discusses the potential risks posed by the site to human and ecological.

The preferred remedy for these sites is No Action. The Proposed Plan and supporting documents are available by contacting the Chief of Environmental Compliance for Andersen AFB, located within the Compliance Section of the 36th Civil Engineer Squadron Environmental Flight.

Public comments will be accepted from September 19, 2012 to October 18, 2012. Copies of the proposed plans are available at information repositories at the Nieves Flores Memorial Library and at the RFK Library at the University of Guam. Written comments must be postmarked on or before October 18, 2012 and mailed to:

Mr. Gregg N. Ikehara, Environmental Restoration Manager
36 CES/CEVR
Unit 14007
APO AP 96543-4007

For further information, please contact the Andersen Air Force Base Public Affairs Office at (671) 366-4202 or -5601.

SECTION 02 82 00

ASBESTOS REMEDIATION
08/25

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 SAFETY PROFESSIONALS (ASSP)

ASSP Z9.2 (2018) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems

ASTM INTERNATIONAL (ASTM)

ASTM D4397 (2016; R 2023) Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications

ASTM E1368 (2023) Standard Practice for Visual Inspection of Asbestos Abatement Projects

COMPRESSED GAS ASSOCIATION (CGA)

CGA G-7 (2019) Standard for Compressed Air for Human Respiration; 6th Edition

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)

ANSI/ISEA Z87.1 (2020) Occupational and Educational Personal Eye and Face Protection Devices

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701 (2023; ERTA 1 2023) Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH NMAM (2020; 5th Ed) NIOSH Manual of Analytical Methods

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2024) Safety -- Safety and Occupational Health (SOH) Requirements

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 340/1-90-018 (1990) Asbestos/NESHAP Regulated Asbestos Containing Materials Guidance

EPA 560/5-85-024 (1985) Guidance for Controlling
Asbestos-Containing Materials in Buildings
(Purple Book)

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.147 The Control of Hazardous Energy (Lock
Out/Tag Out)

29 CFR 1926.51 Sanitation

29 CFR 1926.59 Hazard Communication

29 CFR 1926.103 Respiratory Protection

29 CFR 1926.200 Accident Prevention Signs and Tags

29 CFR 1926.1101 Asbestos

40 CFR 61-SUBPART A General Provisions

40 CFR 61-SUBPART M National Emission Standard for Asbestos

40 CFR 763 Asbestos

42 CFR 84 Approval of Respiratory Protective Devices

49 CFR 107 Hazardous Materials Program Procedures

49 CFR 171 General Information, Regulations, and
Definitions

49 CFR 172 Hazardous Materials Table, Special
Provisions, Hazardous Materials
Communications, Emergency Response
Information, and Training Requirements

49 CFR 173 Shippers - General Requirements for
Shipments and Packagings

49 CFR 174 Carriage by Rail

U.S. NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND (NAVFAC)

NAVFAC P-502 (2017) Asbestos Program Management

ND OPNAV M-5100.23 (2020; Rev G) Navy Safety and Occupational
Health Manual

UL SOLUTIONS (UL)

UL 586 (2009; Reprint Sep 2022) UL Standard for
Safety High-Efficiency Particulate, Air
Filter Units

1.2 DEFINITIONS

1.2.1 Amended Water

Water containing a wetting agent or surfactant with a maximum surface tension of 0.00042 psi.

1.2.2 Area Sampling

Sampling of asbestos fiber concentrations which approximates the concentrations of asbestos in the theoretical breathing zone but is not actually collected in the breathing zone of an employee.

1.2.3 Asbestos

The term asbestos includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite and any of these minerals that have been chemically treated or altered.

1.2.4 Asbestos Containing Material (ACM)

Any material which contains greater than 1 percent asbestos.

1.2.5 Asbestos Containing Construction Material (ACCM)

Any manufactured construction material which contains more than 1/10th of 1 percent asbestos by weight.

1.2.6 Asbestos Control Area

That area where asbestos removal operations are performed which is isolated by physical boundaries which assist in the prevention of the uncontrolled release of asbestos dust, fibers, or debris.

1.2.7 Asbestos Fibers

Those fibers having an aspect ratio of at least 3:1 and longer than 5 micrometers as determined by National Institute for Occupational Safety and Health (NIOSH) Method 7400.

1.2.8 Asbestos Permissible Exposure Limit

0.1 fibers per cubic centimeter of air as an 8-hour time weighted average measured in the breathing zone as defined by 29 CFR 1926.1101 or other Federal legislation having legal jurisdiction for the protection of workers health.

1.2.9 Authorized Person

Any person authorized by the Contractor and required by work duties to be present in the regulated areas.

1.2.10 Background

The ambient airborne asbestos concentration in an uncontaminated area as measured prior to any asbestos hazard abatement efforts. Background concentrations for other (contaminated) areas are measured in similar but asbestos free locations.

1.2.11 Competent Person (CP)

A person meeting the requirements for competent person as specified in 29 CFR 1926.1101 including a person capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, and is specifically trained in a training course which meet the criteria of EPA's Model Accreditation Plan (40 CFR 763) for project designer or supervisor, or its equivalent. The competent person must have a current asbestos contractors or supervisors license.

1.2.12 Contractor

The Contractor is that individual, or entity under contract to perform the herein listed work.

1.2.13 Disposal Bag

A 6 mil thick, leak-tight plastic bag, pre-labeled in accordance with 29 CFR 1926.1101 or applicable state regulations, used for transporting asbestos waste from containment to disposal site.

1.2.14 Disturbance

Activities that disrupt the matrix of ACM or ACCM, crumble or pulverize ACM or ACCM, or generate visible debris from ACM or ACCM. Disturbance includes cutting away small amounts of ACM or ACCM, no greater than the amount which can be contained in one standard sized glovebag or waste bag, not larger than 60 inches in length and width or as required by state or local regulations in order to access a building component.

1.2.15 Encapsulation

The abatement of an asbestos hazard through the appropriate use of a physical barrier or chemical encapsulants.

1.2.16 Encapsulants

Specific materials in various forms used to chemically or physically entrap asbestos fibers in various configurations to prevent these fibers from becoming airborne. There are four types of encapsulants as follows which must comply with performance requirements as specified herein.

- a. Removal Encapsulant (can be used as a wetting agent)
- b. Bridging Encapsulant (used to provide a tough, durable surface coating to asbestos containing material)
- c. Penetrating Encapsulant (used to penetrate the asbestos containing material encapsulating all asbestos fibers and preventing fiber release due to routine mechanical damage)
- d. Lock-Down Encapsulant (used to seal off or "lock-down" minute asbestos fibers left on surfaces from which asbestos containing material has been removed).

1.2.17 Friable Asbestos Material

A term defined in 40 CFR 61-SUBPART M and EPA 340/1-90-018 meaning any material which contains more than 1 percent asbestos, as determined using the method specified in 40 CFR 763, Polarized Light Microscopy (PLM), that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

1.2.18 Glovebag Technique

Those asbestos removal and control techniques put forth in 29 CFR 1926.1101.

1.2.19 HEPA Filter Equipment

High efficiency particulate air (HEPA) filtered vacuum and exhaust ventilation equipment with a filter system capable of collecting and retaining asbestos fibers. Filters must retain 99.97 percent of particles 0.3 microns or larger as indicated in UL 586.

1.2.20 Model Accreditation Plan (MAP)

USEPA training accreditation requirements for persons who work with asbestos as specified in 40 CFR 763.

1.2.21 Negative Pressure Enclosure (NPE)

That engineering control technique described as a negative pressure enclosure in 29 CFR 1926.1101 or applicable state regulations.

1.2.22 NESHAP

National Emission Standards for Hazardous Air Pollutants. The USEPA NESHAP regulation for asbestos is at 40 CFR 61-SUBPART M. Requirements associated with demolition and renovation activities are found in Section 61.145 of the NESHAP while requirements associated with waste disposal are found in Section 61.150.

1.2.23 Nonfriable Asbestos Material

Material that contains asbestos in which the fibers have been immobilized by a bonding agent, coating, binder, or other material so that the asbestos fibers are not normally released during appropriate use, handling, storage or transportation. It is understood that asbestos fibers may be released under other conditions such as demolition, removal, or mishap.

1.2.24 Permissible Exposure Limits (PELs)

1.2.24.1 PEL-Time Weighted Average(TWA)

Concentration of asbestos not in excess of 0.1 fibers per cubic centimeter of air (f/cc) as an 8-hour time weighted average (TWA).

1.2.24.2 PEL-Excursion Limit

An airborne concentration of asbestos not in excess of 1.0 f/cc of air as averaged over a sampling period of 30 minutes.

1.2.25 Personal Sampling

Air sampling which is performed to determine asbestos fiber concentrations within the breathing zone of a specific employee, as performed in accordance with 29 CFR 1926.1101.

1.2.26 Presumed ACM

Any material which cannot be sampled at the time of the initial inspection due to inaccessibility, structural or safety concerns (such as charged electrical components), or could void active warranties (such as roofing materials). Presumed ACM must be managed as ACM unless proven to not be ACM through testing by a qualified and certified asbestos professional.

1.2.27 Private Qualified Person (PQP)

A Registered Architect, Professional Engineer, Certified Industrial Hygienist, consultant or other qualified person who has successfully completed training and is therefore accredited under a legitimate State Model Accreditation Plan as described in 40 CFR 763 as a Building Inspector, Contractor/Supervisor Abatement Worker, and Asbestos Project Designer. The PQP that collects samples and elects to analyze samples on site must successfully complete the National Institute of Occupational Safety and Health (NIOSH) 582 course "Sampling and Evaluating Airborne Asbestos Dust" or equivalent, and must participate in the American Industrial Hygiene Association (AIHA) Asbestos Analysis Registry (AAR). The PQP must be appropriately licensed accordance with the USEPA authorized State (or local) certification and accreditation program.

1.2.28 TEM

Refers to Transmission Electron Microscopy.

1.2.29 Thermal System Insulation

Thermal system insulation (TSI/ACM applied to pipes, fittings, boilers, breeching, tanks, ducts or other structural components to prevent heat loss or gain.

1.2.30 Time Weighted Average (TWA)

The TWA is an 8-hour time weighted average airborne concentration of asbestos fibers.

1.2.31 Transite

A generic name for asbestos cement wallboard and pipe.

1.2.32 Wetting Agent

A chemical added to water to reduce the water's surface tension thereby increasing the water's ability to soak into the material to which it is applied. An equivalent wetting agent must have a surface tension of at most 0.00042 psi.

1.2.33 Worker

Individual (not designated as the Competent Person or a supervisor) who performs asbestos work and has completed asbestos worker training required

by 29 CFR 1926.1101, to include EPA Model Accreditation Plan (MAP) "Worker" training; accreditation, if required by the OSHA Class of work to be performed or by the state where the work is to be performed. The worker must be appropriately licensed accordance with the USEPA authorized State (or local) certification and accreditation program.

1.3 REQUIREMENTS

1.3.1 Description of Work

A hazardous material survey report is attached at the end of this section. The approximate locations and amounts are presented in the hazardous material survey report. The following table provides a summary of ACM and estimated quantities.

Location	Asbestos Containing Materials	Estimated Quantities to Use as Basis of Bidding*	Remarks
B2550, B2551, and B2552	Vinyl floor tiles, mastic, floor coating materials, roof paint/skim coat, caulking, etc.	Refer to HAZMAT Survey Report. Table 2 and Drawings C-1 to C-7 for the Estimated Quantities and Locations.	None
IRP Field Office Drainage Pipes -Concrete Cement Pipe	Assumed Asbestos Cement Pipes (ACP)	400 linear ft. Refer to HAZMAT Survey Report, Table 2 and Figure 3 for the information.	No asbestos sampling was conducted during the HAZMAT Survey.
Areas to be cleared/grubbed	Abandoned ACP	390 linear ft. Refer to HAZMAT Survey Report, Table 2 and Figure C-8 for the information.	The 130 of 390 ft abandoned ACP (HM ID 66, 67, and 68) are located in the Bid Option Area (Area 9). However, the removal of 130-ft ACP must be included in the base bid.
Areas to be cleared/grubbed	Abandoned black coating metal debris	40 square ft. Refer to HAZMAT Survey Report, Table 2 and Figure C-8 for the information.	None

Location	Asbestos Containing Materials	Estimated Quantities to Use as Basis of Bidding*	Remarks
Existing waterlines to be removed	ACP	6,700 linear ft. Assume ACP for all existing waterlines to be removed in accordance with CD-Series, Demolition Plan.	None

~~*Estimated Quantities: The Contractor must verify, prior to bidding, the location and volumes of hazardous materials and determine the appropriate hazard control measures based on the area and material to be disturbed. The estimated quantities of materials provided in this section and the survey report are based on visual approximations during the survey or available drawings/references and must not be used for bidding purposes.~~

The work covered by this section includes the handling and control of asbestos containing materials and describes some of the resultant procedures and equipment required to protect workers, the environment and occupants of the building or area, or both, from contact with airborne asbestos fibers. The work also includes the disposal of any asbestos containing materials generated by the work. More specific operational procedures must be outlined in the Asbestos Hazard Abatement Plan called for elsewhere. The asbestos work includes the demolition and removal which is governed by 40 CFR 763 and NAVFAC P-502. Under normal conditions non-friable or chemically bound materials containing asbestos would not be considered hazardous; however, this material may release airborne asbestos fibers during demolition and removal and therefore must be handled in accordance with the removal and disposal procedures as specified herein. Provide negative pressure enclosure or wet removal techniques as outlined. The building or work area must be evacuated during the asbestos abatement work. A competent person must supervise asbestos removal work as specified herein.

1.3.2 Unexpected Discovery of Asbestos

Notify the Contracting Officer if any previously untested building components suspected to contain asbestos are impacted by the work.

The project site includes multiple waste debris/stockpiles as shown in the Demolition Plan. Collect up to 50 suspected asbestos materials at no additional cost to the Government, to characterize unforeseen suspect ACM that were previously not tested or to be assumed to contain asbestos. Use a triplicate sampling method (i.e. collect 3 samples from a suspected asbestos material). Submit the [Asbestos Sampling and Analytical Report](#).

1.3.3 Medical Requirements

Provide medical requirements including but not limited to medical surveillance and medical record keeping as listed in 29 CFR 1926.1101.

1.3.3.1 Medical Examinations

Contractor must submit documentation of workers who perform activities potentially impacted ACM or ACCM including the name of each employee, type of exam received, and date of the exam. The documentation must also

include a signed statement that the medical examination was reviewed by the contractor's Safety Manager and Industrial Hygienist stating that the listed personnel have received the required medical examination in accordance with [29 CFR 1926.1101](#) and the exam results are saved. This requirement must have been satisfied within the 12 months prior to the start of work on this contract. The same medical examination must be given on an annual basis to employees engaged in an occupation involving asbestos and within 30 calendar days before or after the termination of employment in such occupation. Specifically identify x-ray films of asbestos workers to the consulting radiologist and mark medical record jackets with the word "ASBESTOS."

1.3.3.2 Medical Records

Maintain complete and accurate records of employees' medical examinations, medical records, and exposure data for a period of indefinite time after termination of employment and make records of the required medical examinations and exposure data available for inspection and copying to: The Assistant Secretary of Labor for Occupational Safety and Health (OSHA), or authorized representatives of them, and an employee's physician upon the request of the employee or former employee.

1.3.4 Employee Training

Submit certificates, prior to the start of work but after the main abatement submittal, signed by each employee indicating that the employee has received training in the proper handling of materials and wastes that contain asbestos in accordance with [40 CFR 763](#); understands the health implications and risks involved, including the illnesses possible from exposure to airborne asbestos fibers; understands the use and limits of the respiratory equipment to be used; and understands the results of monitoring of airborne quantities of asbestos as related to health and respiratory equipment as indicated in [29 CFR 1926.1101](#) on an initial and annual basis. Organize certificates by individual worker, not grouped by type of certification. Make training requirement records readily available in accordance with [40 CFR 763](#). Train personnel involved in the asbestos control work in accordance with United States Environmental Protection Agency (USEPA) Asbestos Hazard Emergency Response Act (AHERA) training criteria or State training criteria whichever is more stringent. Document the training by providing: dates of training, training entity, course outline, names of instructors, and qualifications of instructors upon request by the Contracting Officer. Furnish each employee with respirator training and fit testing administered by the PQP as required by [29 CFR 1926.1101](#) and [29 CFR 1926.103](#). Fully cover engineering and other hazard control techniques and procedures. Asbestos workers must have a current in accordance with the USEPA authorized State (or local) certification and accreditation program.

1.3.5 Permits, Licenses, and Notifications

Prior to the start of work, obtain necessary [permits and licenses](#) in conjunction with asbestos removal, encapsulation, hauling, and disposition, and furnish notification of such actions required by Federal, State, regional, and local authorities. Notify the GEPA air pollution control district/agency and the Contracting Officer in writing 30 working days prior to commencement of work in accordance with [40 CFR 61-SUBPART M](#) and applicable GEPA requirements. Notify the Contracting Officer and other appropriate Government agencies in writing 20 working days prior to the start of asbestos work as indicated in applicable laws, ordinances,

criteria, rules, and regulations. Submit copies of all [Notifications](#) to the Contracting Officer.

1.3.6 Environment, Safety and Health Compliance

In addition to detailed requirements of this specification, comply with those applicable laws, ordinances, criteria, rules, and regulations of Federal, State, regional, and local authorities regarding handling, storing, transporting, and disposing of asbestos waste materials. Comply with the applicable requirements of the current issue of [EM 385-1-1](#), [29 CFR 1926.1101](#), [40 CFR 61-SUBPART A](#), [40 CFR 61-SUBPART M](#), [40 CFR 763](#) and [ND OPNAV M-5100.23](#). Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting the work. Where the requirements of this specification, applicable laws, rules, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirement as defined by the Government apply. The following laws, ordinances, criteria, rules and regulations regarding removal, handling, storing, transporting and disposing of asbestos materials apply:

- a. (2020 or most current) Installation Hazardous Materials Management Plan

1.3.7 [Respiratory Protection Program](#)

Establish and implement a respirator program as required by [29 CFR 1926.1101](#), and [29 CFR 1926.103](#) and applicable state and local regulations. Submit a written description of the program to the Contracting Officer. Submit a written program manual or operating procedure including methods of compliance with regulatory statutes.

1.3.7.1 [Respirator Program Records](#)

Submit records of the respirator program as required by [29 CFR 1926.103](#), and [29 CFR 1926.1101](#).

1.3.7.2 Respirator Fit Testing

The Contractor's PQP must conduct a qualitative or quantitative fit test conforming to [29 CFR 1926.103](#) for each worker required to wear a respirator, and any authorized visitors who enter a regulated area where respirators are required to be worn. A respirator fit test must be performed prior to initially wearing a respirator and every 12 months thereafter. If physical changes develop that affects the fit, a new fit test must be performed. Functional fit checks must be performed each time a respirator is put on and in accordance with the manufacturer's recommendation.

1.3.7.3 Respirator Selection and Use Requirements

Provide respirators, and ensure that they are used as required by [29 CFR 1926.1101](#) and in accordance with [CGA G-7](#) and the manufacturer's recommendations. Respirators must be approved by the National Institute for Occupational Safety and Health NIOSH, under the provisions of [42 CFR 84](#), for use in environments containing airborne asbestos fibers. For air-purifying respirators, the particulate filter must be high-efficiency particulate air (HEPA)/(N-,R-,P-100). The initial respirator selection and the decisions regarding the upgrading or downgrading of respirator type must be made by the Contractor's Designated IH based on the measured

or anticipated airborne asbestos fiber concentrations to be encountered.

1.3.8 Asbestos Hazard Control Supervisor

The Contractor must be represented on site by a supervisor, trained using the model Contractor accreditation plan as indicated in the Federal statutes for all portions of the herein listed work.

1.3.9 Hazard Communication

Adhere to all parts of [29 CFR 1926.59](#) and provide the Contracting Officer with a copy of the [Safety Data Sheets \(SDS\)](#) for all materials brought to the site.

1.3.10 Asbestos Hazard Abatement Plan

Submit a detailed plan of the safety precautions such as lockout, tagout, tryout, fall protection, and confined space entry procedures and equipment and work procedures to be used in the removal and demolition of materials containing asbestos. The plan, not to be combined with other hazard abatement plans, must be prepared, signed, and sealed by the PQP. Provide a Table of Contents for each abatement submittal, which follows the sequence of requirements in the contract. The plan must include but not be limited to the precise personal protective equipment to be used including, but not limited to, respiratory protection, type of whole-body protection and if reusable coveralls are to be employed, an outer disposable layer such as disposable whole body cover must be employed over the top of the coveralls, the location of asbestos control areas including clean and dirty areas, buffer zones, showers, storage areas, change rooms, removal method, interface of trades involved in the construction, sequencing of asbestos related work, disposal plan, type of wetting agent and asbestos sealer to be used, locations of local exhaust equipment, planned air monitoring strategies, and a detailed description of the method to be employed in order to control environmental pollution. The plan must also include (both fire and medical emergency) response plans and an Activity Hazard Analyses (AHAs) in accordance with [EM 385-1-1](#). The Asbestos Hazard Abatement Plan must be approved in writing prior to starting any asbestos work. The Contractor, Asbestos Hazard Control Supervisor, CP and PQP must meet with the Contracting Officer prior to beginning work, to discuss in detail the Asbestos Hazard Abatement Plan, including work procedures and safety precautions. Once approved by the Contracting Officer, the plan will be enforced as if an addition to the specification. Any changes required in the specification as a result of the plan must be identified specifically in the plan to allow for free discussion and approval by the Contracting Officer prior to starting work.

1.3.11 Testing Laboratory

Submit the name, address, telephone number, and applicable laboratory certification(s) of each testing laboratory selected for the sampling, analysis, and reporting of airborne concentrations of asbestos fibers along with evidence that each laboratory selected holds the appropriate State license and permits and certification that each laboratory is American Industrial Hygiene Association (AIHA) accredited and that persons counting the samples have been judged proficient by current inclusion on the AIHA Asbestos Analysis Registry (AAR) and successful participation of the laboratory in the Proficiency Analytical Testing (PAT) Program. Where analysis to determine asbestos content in bulk materials or transmission electron microscopy is required, submit evidence that the laboratory is

accredited by the National Institute of Science and Technology (NIST) under National Voluntary Laboratory Accreditation Program (NVLAP) for asbestos analysis. The testing laboratory firm must be independent of the asbestos contractor and must have no employee or employer relationship which could constitute a conflict of interest.

1.3.12 Landfill Approval

Submit written evidence that the landfill is approved for asbestos disposal by the U.S. Environmental Protection Agency and GEPA. Within three working days after delivery, submit detailed [delivery tickets](#), prepared, signed, and dated by an agent of the landfill, certifying the amount of asbestos materials delivered to the landfill. Submit a copy of the [waste shipment records](#) within one day of the shipment leaving the project site.

1.3.13 Transporter Certification

Submit written evidence that the transporter is approved to transport asbestos waste in accordance with the DOT requirements of [49 CFR 171](#), [49 CFR 172](#), [49 CFR 173](#), [49 CFR 174](#), IMDG DGR for water transportation, as well as registration requirements of [49 CFR 107](#) and all other State and local regulatory agency requirements.

1.3.14 Medical Certification

Provide a written certification for each worker and supervisor, signed by a licensed physician indicating that the worker and supervisor has met or exceeded all of the medical prerequisites listed herein and in [29 CFR 1926.1101](#) and [29 CFR 1926.103](#) as prescribed by law. Submit certificates prior to the start of work but after the main abatement submittal.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. [Submittals not having a "G" or "S" classification are for Contractor Quality Control approval.](#) Submit the following in accordance with Section [01 33 00](#) SUBMITTAL PROCEDURES:

[SD-01 Preconstruction Submittals](#)

[Asbestos Sampling And Analytical Report; G](#)

[SD-03 Product Data](#)

[Amended Water; G](#)

[Safety Data Sheets \(SDS\) for All Materials; G](#)

[Respirators; G](#)

[Local Exhaust Equipment; G](#)

[Pressure Differential Automatic Recording Instrument; G](#)

[Vacuums; G](#)

[Glovebags; G](#)

SD-06 Test Reports

Air Sampling Results; G
Pressure Differential Recordings for Local Exhaust System; G
Clearance Sampling; G
Asbestos Disposal Quantity Report; G

SD-07 Certificates

Employee Training; G
Notifications; G
Respiratory Protection Program; G
Asbestos Hazard Abatement Plan; G
Testing Laboratory; G
Landfill Approval; G
Delivery Tickets; G
Waste Shipment Records; G
Transporter Certification; G
Medical Certification; G
Private Qualified Person Documentation; G
Designated Competent Person; G
Worker's License; G
Contractor's License; G
Federal, State or Local Citations on Previous Projects; G
Equipment Used to Contain Airborne Asbestos Fibers; G
Water Filtration Equipment; G
Vacuums; G
Ventilation Systems; G

SD-11 Closeout Submittals

Permits and Licenses; G
Notifications; G
Respirator Program Records; G

Rental Equipment; G

1.5 QUALITY ASSURANCE

1.5.1 Private Qualified Person Documentation

Submit the name, address, and telephone number of the PQP selected to prepare the Asbestos Hazard Abatement Plan, direct monitoring and training, and documented evidence that the PQP has successfully completed training in and is accredited and where required is certified as, a Building Inspector, Contractor/Supervisor Abatement Worker, and Asbestos Project Designer as described by 40 CFR 763 . The PQP must be appropriately licensed by the USEPA authorized State (or local) certification and accreditation program as a Project Monitor. The PQP and the asbestos contractor must not have an employee/employer relationship or financial relationship which could constitute a conflict of interest. The PQP must be a first tier subcontractor.

1.5.2 Designated Competent Person Documentation

The Designated Competent Person must be experienced in the administration and supervision of asbestos abatement projects including exposure assessment and monitoring, work practices, abatement methods, protective measures for personnel, setting up and inspecting asbestos abatement work areas, evaluating the integrity of containment barriers, placement and operation of local exhaust systems, ACM generated waste containment and disposal procedures, decontamination units installation and maintenance requirements, site safety and health requirements, notification of other employees onsite. The Designated Competent Person must be on-site at all times when asbestos abatement activities are underway. Submit training certification and a current USEPA authorized State or local Asbestos Contractor's and Supervisor's License. Submit evidence that the Designated Competent Person has a minimum of 2 years of on-the-job asbestos abatement experience relevant to OSHA designated competent person requirements. The Designated Competent Person must be a first tier subcontractor.

1.5.3 Worker's License

Submit documentation that workers meet the requirements of 29 CFR 1926.1101, 40 CFR 61-SUBPART M and have a current USEPA authorized State (or local) Asbestos Workers License.

1.5.4 Contractor's License

Submit a copy of the asbestos contractor's license issued by the USEPA authorized State (or local). Submit the following certification along with the license: "I certify that the personnel I am responsible for during the course of this project fully understand the contents of 29 CFR 1926.1101, 40 CFR 61-SUBPART MEM 385-1-1, and the Federal, State and local requirements for those asbestos abatement activities that they will be involved in." This certification statement must be signed by the Company's President or Chief Executive.

1.5.5 Air Sampling Results

Complete fiber counting and provide results to the PQP for review within 16 hours of the "time off" of the sample pump. Notify the Contracting Officer immediately of any airborne levels of asbestos fibers in excess of the acceptable limits. Submit sampling results to the Contracting Officer

and the affected Contractor employees where required by law within three working days, signed by the testing laboratory employee performing air sampling, the employee that analyzed the sample, and the PQP. Notify the Contractor and the Contracting Officer immediately of any variance in the pressure differential which could cause adjacent unsealed areas to have asbestos fiber concentrations in excess of 0.01 fibers per cubic centimeter or background whichever is higher. In no circumstance must levels exceed 0.1 fibers per cubic centimeter.

1.5.6 Pressure Differential Recordings for Local Exhaust System

Provide a local exhaust system that creates a negative pressure of at least 0.02 inches of water relative to the pressure external to the enclosure and operate it continuously, 24-hours a day, until the temporary enclosure of the asbestos control area is removed. Submit pressure differential recordings for each work day to the PQP for review and to the Contracting Officer within 24-hours from the end of each work day.

1.5.7 Federal, State or Local Citations on Previous Projects

Submit a statement, signed by an officer of the company, containing a record of any citations issued by Federal, State or local regulatory agencies relating to asbestos activities within the last 5 years (including projects, dates, and resolutions); a list of penalties incurred through non-compliance with asbestos project specifications, including liquidated damages, overruns in scheduled time limitations and resolutions; and situations in which an asbestos-related contract has been terminated (including projects, dates, and reasons for terminations). If there are none, a negative declaration signed by an officer of the company must be provided and this must be applicable for the Contractor and all Subcontractors.

1.5.8 Preconstruction Conference

Conduct a safety preconstruction conference to discuss the details of the Asbestos Hazard Abatement Plan, Accident Prevention Plan (APP) including the AHAs required in specification Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS. The safety preconstruction conference must include the Contractor and their Designated Competent Person, Designated IH and Project Supervisor and the Contracting Officer. Deficiencies in the APP must be discussed. Onsite work must not begin until the APP has been accepted.

1.6 SECURITY

Site security must be provided for each regulated area. A log book must be kept documenting entry into and out of the regulated area. Entry into regulated areas must only be by personnel authorized by the Contractor and the Contracting Officer. Personnel authorized to enter regulated areas must be trained, medically evaluated, and wear the required personal protective equipment.

1.7 EQUIPMENT

1.7.1 Rental Equipment

Provide a copy of the written notification to the rental company concerning the intended use of the equipment and the possibility of asbestos contamination of the equipment.

PART 2 PRODUCTS

2.1 DUCT TAPE

Industrial grade duct tape of appropriate widths suitable for bonding sheet plastic and disposal container.

2.2 DISPOSAL CONTAINERS

Leak-tight (defined as solids, liquids, or dust that cannot escape or spill out) disposal containers must be provided for ACM wastes, and presumed ACM wastes, as required by 29 CFR 1926.1101 and state and local regulatory requirements. Disposal containers can be in the form of:

- a. Disposal Bags
- b. Fiberboard Drums
- c. Cardboard Boxes

2.3 SHEET PLASTIC

Sheet plastic must be polyethylene of 6 mil minimum thickness and must be provided in the largest sheet size necessary to minimize seams. Film must be clear, frosted, or black and conform to ASTM D4397, except as specified below

2.3.1 Reinforced

Reinforced sheets must be provided where high skin strength is required, such as where it constitutes the only barrier between the regulated area and the outdoor environment. The sheet stock must consist of translucent, nylon-reinforced or woven-polyethylene thread laminated between two layers of polyethylene film. Film must meet flame resistant standards of NFPA 701.

2.4 MASTIC REMOVING SOLVENT

Mastic removing solvent must be nonflammable and must not contain methylene chloride, glycol ether, or halogenated hydrocarbons. Solvents used onsite must have a flash point greater than 140 degrees F.

Prior to approving the use of mastic removing solvent for renovation projects where a new material is placed on the treated surface, the treated surface with mastic removing solvent must be completely removed. Remaining mastic removing solvent may react with glues and mastic of the new product.

2.5 LEAK-TIGHT WRAPPING

Two layers of 6 mil minimum thick polyethylene sheet stock must be used for the containment of removed asbestos-containing components or materials such as large tanks, boilers, insulated pipe segments and other materials. Upon placement of the ACM component or material, each layer must be individually leak-tight sealed with duct tape.

2.6 VIEWING INSPECTION WINDOW

Where feasible, a minimum of one clear, 1/8 inch thick, acrylic sheet, 18

by 24 inches, must be installed as a viewing inspection window at eye level on a wall in each containment enclosure. The windows must be sealed leak-tight with industrial grade duct tape.

2.7 WETTING AGENTS

Removal encapsulant (a penetrating encapsulant) must be provided when conducting removal abatement activities that require a longer removal time or are subject to rapid evaporation of amended water. The removal encapsulant must be capable of wetting the ACM and retarding fiber release during disturbance of the ACM greater than or equal to that provided by amended water. Performance requirements for penetrating encapsulants are specified in paragraph ENCAPSULANTS above.

PART 3 EXECUTION

3.1 EQUIPMENT

Provide manufacturer's certificate of compliance for all equipment used to contain airborne asbestos fibers.

3.1.1 Air Monitoring Equipment

The Contractor's PQP must approve air monitoring equipment. The equipment must include, but must not be limited to:

- a. High-volume sampling pumps that can be calibrated and operated at a constant airflow up to 16 liters per minute.
- b. Low-volume, battery powered, body-attachable, portable personal pumps that can be calibrated to a constant airflow up to approximately 3.5 liters per minute, and a self-contained rechargeable power pack capable of sustaining the calibrated flow rate for a minimum of 10 hours. The pumps must also be equipped with an automatic flow control unit which must maintain a constant flow, even as filter resistance increases due to accumulation of fiber and debris on the filter surface.
- c. Single use standard 25 mm diameter cassette, open face, 0.8 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive extension cowl, and shrink bands for personal air sampling.
- d. Single use standard 25 mm diameter cassette, open face, 0.45 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive cowl, and shrink bands when conducting environmental area sampling using NIOSH NMAM Methods 7400 and 7402, (and the transmission electric microscopy method specified at 40 CFR 763 if required).
- e. A flow calibrator capable of calibration to within plus or minus 2 percent of reading over a temperature range of minus 4 to plus 140 degrees F and traceable to a NIST primary standard.

3.1.2 Respirators

Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

3.1.2.1 Respirators for Handling Asbestos

Provide personnel engaged in pre-cleaning, cleanup, handling, removal or demolition of asbestos materials with respiratory protection as indicated in 29 CFR 1926.1101 and 29 CFR 1926.103. Breathing air must comply with CGA G-7.

3.1.3 Exterior Whole Body Protection

3.1.3.1 Outer Protective Clothing

Provide personnel exposed to asbestos with disposable "non-breathable," whole body outer protective clothing, head coverings, gloves, and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber gloves for comfort, but must not be used alone. Make sleeves secure at the wrists, make foot coverings secure at the ankles, and make clothing secure at the neck by the use of tape.

3.1.3.2 Personal Decontamination Unit

Provide a temporary, negative pressure unit with a separate decontamination locker room and clean locker room with a shower that complies with 29 CFR 1926.51(f)(4)(ii) through (V) in between for personnel required to wear whole body protective clothing. Provide two separate lockers for each asbestos worker, one in each locker room. Keep street clothing and street shoes in the clean locker. HEPA vacuum and remove asbestos contaminated disposable protective clothing while still wearing respirators at the boundary of the asbestos work area and seal in impermeable bags or containers for disposal. Do not wear work clothing between home and work. Locate showers between the decontamination locker room and the clean locker room and require that all employees shower before changing into street clothes. Collect used shower water and filter with approved water filtration equipment to remove asbestos contamination. Wastewater filters must be installed in series with the first stage pore size 20 microns and the second stage pore size of 5 microns. Dispose of filters and residue as asbestos waste. Discharge clean water to the sanitary system. Dispose of asbestos contaminated work clothing as asbestos contaminated waste. Keep the floor of the decontamination unit's clean room dry and clean at all times. Proper housekeeping and hygiene requirements must be maintained. Provide soap and towels for showering, washing and drying. Cloth towels provided must be disposed of as ACM waste. Physically attach the decontamination units to the asbestos control area. Construct both a personnel decontamination unit and an equipment decontamination unit onto and integral with each asbestos control area.

3.1.3.3 Eye Protection

Provide eye protection that complies with ANSI/ISEA Z87.1 when operations present a potential eye injury hazard. Provide goggles to personnel engaged in asbestos abatement operations when the use of a full face respirator is not required.

3.1.4 Regulated Areas

All Class I, II, and III asbestos work must be conducted within regulated areas. The regulated area must be demarcated to minimize the number of

persons within the area and to protect persons outside the area from exposure to airborne asbestos. Control access to regulated areas, ensure that only authorized personnel enter, and verify that Contractor required medical surveillance, training and respiratory protection program requirements are met prior to allowing entrance.

3.1.5 Load-out Unit

Provide a temporary load-out unit that is adjacent and connected to the regulated area. Attach the load-out unit in a leak-tight manner to each regulated area.

3.1.6 Warning Signs and Labels

Provide warning signs printed in English at all approaches to asbestos control areas. Locate signs at such a distance that personnel may read the sign and take the necessary protective steps required before entering the area. Provide labels and affix to all asbestos materials, scrap, waste, debris, and other products contaminated with asbestos. Containers with preprinted warning labels conforming to the requirements are acceptable

3.1.6.1 Warning Sign

Provide vertical format conforming to 29 CFR 1926.200 and 29 CFR 1926.1101 minimum 20 by 14 inches displaying the following legend in the lower panel:

Legend	Notation
DANGER	one inch Sans Serif Gothic or Block
ASBESTOS	one inch Sans Serif Gothic or Block
MAY CAUSE CANCER	one inch Sans Serif Gothic or Block
CAUSES DAMAGE TO LUNGS	1/4 inch Sans Serif Gothic or Block
AUTHORIZED PERSONNEL ONLY	1/4 inch Sans Serif Gothic or Block
WEAR RESPIRATORY PROTECTION AND PROTECTIVE CLOTHING IN THIS AREA	1/4 inch Sans Serif Gothic or Block

Spacing between lines must be at least equal to the height of the upper of any two lines.

3.1.6.2 Warning Labels

Provide labels conforming to Guam regulations and 29 CFR 1926.1101 of sufficient size to be clearly legible, displaying the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST AVOID CREATING DUST

3.1.7 Local Exhaust System

Provide a local exhaust system in the asbestos control area in accordance with ASSP Z9.2 and 29 CFR 1926.1101 that provides at least four air changes per hour inside of the negative pressure enclosure. Local exhaust equipment must be operated 24-hours per day, until the asbestos control area is removed and must be leak proof to the filter and equipped with HEPA filters. Maintain a minimum pressure differential in the control area of minus 0.02 inch of water column relative to adjacent, unsealed areas. Provide continuous 24-hour per day monitoring of the pressure differential with a pressure differential automatic recording instrument. The building ventilation system must not be used as the local exhaust system for the asbestos control area. Filters on exhaust equipment must conform to ASSP Z9.2 and UL 586. Terminate the local exhaust system out of doors and remote from any public access or ventilation system intakes.

3.1.8 Tools

Vacuums must be leak proof to the filter and equipped with HEPA filters. Filters on vacuums must conform to ASSP Z9.2 and UL 586. Do not use power tools to remove asbestos containing materials unless the tool is equipped with effective, integral HEPA filtered exhaust ventilation systems. Remove all residual asbestos from reusable tools prior to storage or reuse. Reusable tools must be thoroughly decontaminated prior to being removed from the regulated areas.

3.1.9 Rental Equipment

If rental equipment is to be used, furnish written notification to the rental agency concerning the intended use of the equipment and the possibility of asbestos contamination of the equipment.

3.1.10 Glovebags

Submit written manufacturers proof that glovebags do not break down under expected temperatures and conditions.

3.1.11 Single Stage Decontamination Area

A decontamination area (equipment room/area) must be provided for Class I work involving less than 25 feet or 10 square feet of TSI or surfacing ACM, and for Class II and Class III asbestos work operations where exposures exceed the PELs or where there is no negative exposure assessment. The equipment room or area must be adjacent to the regulated area for the decontamination of employees, material, and their equipment which could be contaminated with asbestos. The area must be covered by an impermeable drop cloth on the floor or horizontal working surface. The area must be of sufficient size to accommodate cleaning of equipment and

removing personal protective equipment without spreading contamination beyond the area.

3.1.12 Decontamination Area Exit Procedures

Ensure that the following procedures are followed:

- a. Before leaving the regulated area, remove all gross contamination and debris from work clothing using a HEPA vacuum.
- b. Employees must remove their protective clothing in the equipment room and deposit the clothing in labeled impermeable bags or containers for disposal.
- c. Employees must not remove their respirators until showering.
- d. Employees must shower prior to entering the clean room. If a shower has not been located between the equipment room and the clean room or the work is performed outdoors, ensure that employees engaged in Class I asbestos jobs: a) Remove asbestos contamination from their work suits in the equipment room or decontamination area using a HEPA vacuum before proceeding to a shower that is not adjacent to the work area; or b) Remove their contaminated work suits in the equipment room, without cleaning worksuits, and proceed to a shower that is not adjacent to the work area.

3.2 WORK PROCEDURE

Perform asbestos related work in accordance with 29 CFR 1926.1101, 40 CFR 61-SUBPART M, NAVFAC P-502, and as specified herein. Use wet or removal procedures as listed in the asbestos hazard abatement plan and/or negative pressure enclosure techniques. Wear and utilize protective clothing and equipment as specified herein. No eating, smoking, drinking, chewing gum, tobacco, or applying cosmetics is permitted in the asbestos work or control areas. Personnel of other trades not engaged in the removal and demolition of asbestos containing material must not be exposed at any time to airborne concentrations of asbestos unless all the personnel protection and training provisions of this specification are complied with by the trade personnel. Seal all roof top penetrations, except plumbing vents, prior to asbestos roofing work. Power to the regulated area must be locked-out and tagged in accordance with 29 CFR 1910.147. Disconnect electrical service when wet removal is performed and provide temporary electrical service with verifiable ground fault circuit interrupter (GFCI) protection prior to the use of any water. All electrical work must be performed by a licensed electrician. Stop abatement work in the regulated area immediately when the airborne total fiber concentration: (1) equals or exceeds 0.01 f/cc, or the pre-abatement concentration, whichever is greater, outside the regulated area; or (2) equals or exceeds 1.0 f/cc inside the regulated area. Correct the condition to the satisfaction of the Contracting Officer, including visual inspection and air sampling. Work must resume only upon notification by the Contracting Officer. Corrective actions must be documented. If an asbestos fiber release or spill occurs outside of the asbestos control area, stop work immediately, correct the condition to the satisfaction of the Contracting Officer including clearance sampling, prior to resumption of work.

3.2.1 Protection of Existing Work to Remain

Perform work without damage or contamination of adjacent work. Where such work is damaged or contaminated as verified by the Contracting Officer using visual inspection or sample analysis, it must be restored to its original condition or decontaminated by the Contractor as deemed appropriate by the Contracting Officer. This includes inadvertent spill of dirt, dust, or debris in which it is reasonable to conclude that asbestos may exist. When these spills occur, stop work immediately. Then clean up the spill. When satisfactory visual inspection and air sampling results are obtained from the PQP work may proceed at the discretion of the Contracting Officer.

3.2.2 Precleaning

Wet wipe and HEPA vacuum all surfaces potentially contaminated with asbestos prior to establishment of an enclosure.

3.2.3 Asbestos Control Area Requirements

3.2.3.1 Negative Pressure Enclosure

Removal of asbestos contaminated acoustical ceiling tiles, spray applied fireproofing, thermal system insulation, gypsum wallboard/joint compound require the use of a negative pressure enclosure. Block and seal openings in areas where the release of airborne asbestos fibers can be expected. Establish an asbestos negative pressure enclosure with the use of curtains, portable partitions, or other enclosures in order to prevent the escape of asbestos fibers from the contaminated asbestos work area. Negative pressure enclosure development must include protective covering of uncontaminated walls, and ceilings with a continuous membrane of two layers of minimum 6-mil plastic sheet sealed with tape to prevent water or other damage. Provide two layers of 6-mil plastic sheet over floors and extend a minimum of 12 inches up walls. Seal all joints with tape. Provide local exhaust system in the asbestos control area. Openings are allowed in enclosures of asbestos control areas for personnel and equipment entry and exit, the supply and exhaust of air for the local exhaust system and the removal of properly containerized asbestos containing materials. Replace local exhaust system filters as required to maintain the efficiency of the system.

3.2.3.2 Glovebag

If the construction of a negative pressure enclosure is infeasible for the removal, use alternate techniques as indicated in 29 CFR 1926.1101. Establish designated limits for the asbestos regulated area with the use of rope or other continuous barriers, and maintain all other requirements for asbestos control areas. The PQP must conduct personal samples of each worker engaged in asbestos handling (removal, disposal, transport and other associated work) throughout the duration of the project. If the quantity of airborne asbestos fibers monitored at the breathing zone of the workers at any time exceeds background or 0.01 fibers per cubic centimeter whichever is greater, stop work, evacuate personnel in adjacent areas or provide personnel with approved protective equipment at the discretion of the Contracting Officer. This sampling may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those obtained by the Contractor, the Government will determine which results predominate. If adjacent areas are contaminated as determined by the Contracting

Officer, clean the contaminated areas, monitor, and visually inspect the area as specified herein.

3.2.3.3 Regulated Area for Class II Removal

Removal of asbestos containing floor tile/mastic, carpet/mastic, or sealants are Class II removal activities. Establish designated limits for the asbestos regulated work area with the use of red barrier tape; install critical barriers, splash guards and signs, and maintain all other requirements for asbestos control area except local exhaust. Place impermeable dropcloths on surfaces beneath removal activity extending out 3 feet in all directions. A detached decontamination system may be used. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If the airborne fiber concentration of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work immediately and correct the situation.

3.2.4 Removal Procedures

Wet asbestos material with a fine spray of amended water during removal, cutting, or other handling so as to reduce the emission of airborne fibers. Remove material and immediately place in 6 mil plastic disposal bags. Remove asbestos containing material in a gradual manner, with continuous application of the amended water or wetting agent in such a manner that no asbestos material is disturbed prior to being adequately wetted. Where unusual circumstances prohibit the use of 6 mil plastic bags, submit an alternate proposal for containment of asbestos fibers to the Contracting Officer for approval. For example, in the case where both piping and insulation are to be removed, the Contractor may elect to wet the insulation, wrap the pipes and insulation in plastic and remove the pipe by sections. Containerize asbestos containing material while wet. Do not allow asbestos material to accumulate or become dry. Lower and otherwise handle asbestos containing material as indicated in 40 CFR 61-SUBPART M.

3.2.4.1 Sealing Contaminated Items Designated for Disposal

Remove contaminated architectural, mechanical, and electrical appurtenances such as venetian blinds, full-height partitions, carpeting, duct work, pipes and fittings, radiators, light fixtures, conduit, panels, and other contaminated items designated for removal by completely coating the items with an asbestos lock-down encapsulant at the demolition site before removing the items from the asbestos control area. These items need not be vacuumed. The asbestos lock-down encapsulant must be tinted a contrasting color and spray-applied by airless method. Thoroughness of sealing operation must be visually gauged by the extent of colored coating on exposed surfaces. Lock-down encapsulants must comply with the performance requirements specified herein.

3.2.4.2 Exposed Pipe Insulation Edges

Contain edges of asbestos insulation to remain that are exposed by a removal operation. Wet and cut the rough ends true and square with sharp tools and then encapsulate the edges with a 1/4 inch thick layer of non-asbestos containing insulating cement troweled to a smooth hard finish. When cement is dry, lag the end with a layer of non-asbestos lagging cloth, overlapping the existing ends by at least 4 inches. When

insulating cement and cloth is an impractical method of sealing a raw edge of asbestos, take appropriate steps to seal the raw edges as approved by the Contracting Officer.

3.2.4.3 Presumed ACM

Presumed ACM must be treated as ACM throughout the abatement and disposal process. Testing can be performed by a trained and certified asbestos professional following applicable local, state, and federal regulations to either confirm the material is ACM or non-ACM. If testing proves asbestos is not present, the material can be managed as non-ACM.

3.2.5 Methods of Compliance

3.2.5.1 Mandated Practices

The specific abatement techniques and items identified must be detailed in the Contractor's Asbestos Hazard Abatement Plan (AHAP). Use the following engineering controls and work practices in all operations, regardless of the levels of exposure:

- a. Vacuum cleaners equipped with HEPA filters.
- b. Wet methods or wetting agents except where it can be demonstrated that the use of wet methods is unfeasible due to the creation of electrical hazards, equipment malfunction, and in roofing.
- c. Prompt clean-up and disposal.
- d. Inspection and repair of polyethylene.
- e. Cleaning of equipment and surfaces of containers prior to removing them from the equipment room or area.

3.2.5.2 Control Methods

Use the following control methods:

- a. Local exhaust ventilation equipped with HEPA filter;
- b. Enclosure or isolation of processes producing asbestos dust;
- c. Where the feasible engineering and work practice controls are not sufficient to reduce employee exposure to or below the PELs, use them to reduce employee exposure to the lowest levels attainable and must supplement them by the use of respiratory protection.

3.2.5.3 Unacceptable Practices

The following work practices must not be used:

- a. High-speed abrasive disc saws that are not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air.
- b. Compressed air used to remove asbestos containing materials, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air.

- c. Dry sweeping, shoveling, or other dry clean up.
- d. Employee rotation as a means of reducing employee exposure to asbestos.

3.2.6 Class I Work Procedures

In addition to requirements of paragraphs MANDATED PRACTICES and CONTROL METHODS, the following engineering controls and work practices must be used:

- a. A Competent Person must supervise the installation and operation of the control methods.
- b. For jobs involving the removal of more than 25 feet or 10 square feet of TSI or surfacing material, place critical barriers over all openings to the regulated area.
- c. HVAC systems must be isolated in the regulated area by sealing with a double layer of plastic or air-tight rigid covers.
- d. Impermeable dropcloths (6 mil or greater thickness) must be placed on surfaces beneath all removal activity.
- e. Where a negative exposure assessment has not been provided or where exposure monitoring shows the PEL was exceeded, the regulated area must be ventilated with a HEPA unit and employees must use PPE.

3.2.7 Specific Control Methods for Class I Work

Use Class I work procedures, control methods and removal methods for the following ACM:

- a. Spray Applied Fireproofing
- b. Gypsum Wallboard and Joint Compound
- c. Thermal System Insulation and Mudded Pipe Fittings
- d. Plaster and Textured Ceilings and Walls
- e. Vermiculite insulation

3.2.7.1 Negative Pressure Enclosure (NPE) System

The system must provide at least four air changes per hour inside the containment. The local exhaust unit equipment must be operated 24-hours per day until the containment is removed. The NPE must be smoke tested for leaks at the beginning of each shift and be sufficient to maintain a minimum pressure differential of minus 0.02 inch of water column relative to adjacent, unsealed areas. Pressure differential must be monitored continuously, 24-hours per day, with an automatic manometric recording instrument and records must be provided daily on the same day collected to the Contracting Officer. The Contracting Officer must be notified immediately if the pressure differential falls below the prescribed minimum. The building ventilation system must not be used as the local exhaust system for the regulated area. The NPE must terminate outdoors unless an alternate arrangement is allowed by the Contracting Officer. All filters used must be new at the beginning of the project and must be periodically changed as necessary and disposed of as ACM waste.

3.2.7.2 Glovebag Systems

Glovebags must be used without modification, smoke-tested for leaks, and completely cover the circumference of pipe or other structures where the work is to be done. Glovebags must be used only once and must not be moved. Glovebags must not be used on surfaces that have temperatures exceeding 150 degrees F. Prior to disposal, glovebags must be collapsed using a HEPA vacuum. Before beginning the operation, loose and friable material adjacent to the glovebag operation must be wrapped and sealed in two layers of plastic or otherwise rendered intact. At least two persons must perform glovebag removal. Asbestos regulated work areas must be established for glovebag abatement. Designated boundary limits for the asbestos work must be established with rope or other continuous barriers and all other requirements for asbestos control areas must be maintained, including area signage and boundary warning tape.

- a. Attach HEPA vacuum systems to the bag to prevent collapse during removal of ACM.
- b. The negative pressure glove boxes must be fitted with gloved apertures and a bagging outlet and constructed with rigid sides from metal or other material which can withstand the weight of the ACM and water used during removal. A negative pressure must be created in the system using a HEPA filtration system. The box must be smoke tested for leaks prior to each use.

3.2.7.3 Mini-Enclosure

Mini-containment (small walk-in enclosure) to accommodate no more than two persons, may be used if the disturbance or removal can be completely contained by the enclosure. The mini-enclosure must be inspected for leaks and smoke tested before each use. Air movement must be directed away from the employee's breathing zone within the mini-enclosure.

3.2.7.4 Wrap and Cut Operation

Prior to cutting pipe, the asbestos-containing insulation must be wrapped with polyethylene and securely sealed with duct tape to prevent asbestos becoming airborne as a result of the cutting process. The following steps must be taken: install glovebag, strip back sections to be cut 6 inches from point of cut, and cut pipe into manageable sections.

3.2.7.5 Class I Removal Method

Class I ACM must be removed using a control method described above. Prepare work area as previously specified. Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers, signs, and maintain all other requirements for asbestos control area. Spread one layer of 6-mil seamless plastic sheeting on the floor below the work area. Remove asbestos containing spray applied fireproofing using a scraper and wet methods and immediately place into 6-mil thickness disposal bag. After removal of the material use a wire brush to clean the exposed substrate to remove residual material. Continue wet cleaning until surfaces are free of visible debris. Cut manageable sections of gypsum wallboard and joint compound and immediately place into a 6-mil minimum thickness disposal bag or other approved container. Make every effort to keep the material from falling to the floor of the work area. Use a wire brush and wet clean to remove residual

material from studs. Continue wet cleaning until the surface is clean of visible material and encapsulate stud walls. Remove ACM thermal system insulation and mudded pipe fittings using mechanical means and wet methods and immediately place into 6-mil thickness disposal bag. Continue wet cleaning until surfaces are free of visible debris. Remove ACM plaster ceilings or walls using mechanical means and adequately wet methods and immediately place into 6-mil thickness disposal bag. Make every effort to keep the material from falling to the floor of the work area. Continue wet cleaning until surfaces are free of visible debris. Remove ACM textured ceiling finish using a scraper and wet methods and immediately place into 6-mil thickness disposal bag. Floors are considered contaminated from fallen textured ceiling finish. Clean up debris on floor and dispose of carpet as asbestos contaminated material. After removal of the material use a wire brush to clean the exposed concrete ceiling to remove residual material. Continue wet cleaning until surfaces are free of visible debris. Remove ACM vermiculite using mechanical means and adequately wet methods and immediately place into 6-mil thickness disposal bag. Make every effort to keep the material from falling to the floor of the work area. Continue wet cleaning until surfaces are free of visible debris. Bag all asbestos debris which has fallen to the floor as asbestos-containing debris. Place all debris in plastic disposal bags of 6-mil minimum thickness. Once the material is in the disposal bag, apply additional water as needed to achieve "adequately wet" conditions for NESHAP compliance. Place bagged asbestos waste under negative pressure with the use of a HEPA vacuum, goose neck and duct tape to seal the bag, wash to remove any visible contamination and place into a second 6-mil minimum thickness disposal bag. Containerize asbestos containing waste while wet. Lower and otherwise handle asbestos containing materials as indicated in 40 CFR 61-SUBPART M. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If the quantity of airborne asbestos fibers monitored at the breathing zone of the workers or the designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work, and immediately correct the situation.

3.2.8 Class II Work Procedures

In addition to the requirements of paragraphs MANDATED PRACTICES and CONTROL METHODS, the following engineering controls and work practices must be used:

- a. A Competent Person must supervise the work.
- b. For indoor work, critical barriers must be placed over all openings to the regulated area.
- c. Impermeable dropcloths must be placed on surfaces beneath all removal activity.

3.2.9 Specific Control Methods for Class II Work

3.2.9.1 Vinyl and Asphaltic Flooring Materials, Carpet and Mastic

Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers, signs, and maintain all other requirements for asbestos control area except local exhaust. A detached decontamination system may be used. When removing vinyl floor tile and mastic, carpet and mastic which contains ACM, use the following

practices. Remove floor tile and mastic, carpet and mastic using adequately wet methods. Remove floor tiles, carpet and mastic intact (if possible). Wetting is not required when floor tiles are heated and removed intact. Do not sand flooring or its backing. Scrape residual adhesive and backing using wet methods. Mechanical chipping is prohibited unless performed in a negative pressure enclosure. Dry sweeping is prohibited. Use vacuums equipped with HEPA filter, disposable dust bag, and metal floor tool (no brush) to clean floors. Place debris into a 6-mil minimum thickness disposal bag or other approved container. Once the material is in the disposal bag, apply additional water as needed to achieve "adequately wet" conditions for NESHAP compliance. Place bagged asbestos waste under negative pressure with the use of a HEPA vacuum, goose neck and duct tape to seal the bag, wash to remove any visible contamination and place into a second 6-mil minimum thickness disposal bag. Containerize asbestos containing waste while wet. Lower and otherwise handle asbestos containing materials as indicated in 40 CFR 61-SUBPART M. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If the airborne fiber concentration of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work immediately and correct the situation.

3.2.9.2 Sealants and Mastic

Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers and signs, and maintain all other requirements for asbestos control area except local exhaust. Spread 6-mil plastic sheeting on the ground around the perimeter of the work area extending out in all directions. Using adequately wet methods, carefully remove the ACM sealants and mastics using a scraper or knife blade. As it is removed place the material into a disposal bag. Make every effort to keep the asbestos material from falling to the ground or work area floor below. Dry sweeping is prohibited. Use vacuums equipped with HEPA filter and disposable dust bag. Place debris into a 6-mil minimum thickness disposal bag or other approved container. Once the material is in the disposal bag, apply additional water as needed to achieve "adequately wet" conditions for NESHAP compliance. Place bagged asbestos waste under negative pressure with the use of a HEPA vacuum, goose neck and duct tape to seal the bag, wash to remove any visible contamination and place into a second 6-mil minimum thickness disposal bag. Containerize asbestos containing waste while wet. Lower and otherwise handle asbestos containing materials as indicated in 40 CFR 61-SUBPART M. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If the airborne fiber concentration of the workers or at designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work immediately and correct the situation.

3.2.9.3 Roofing Materials

Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers, signs, and maintain all other requirements for asbestos control area except local exhaust. When removing roofing materials which contain ACM as described in 29 CFR 1926.1101(g)(8)(ii), use the following practices. Roofing material must be removed in an intact state. Wet methods must be used to remove roofing materials that are not intact, or to be rendered not intact during

removal, unless such wet methods are not feasible or create safety hazards. When removing built-up roofs, with asbestos-containing roofing felts and an aggregate surface, using a power roof cutter, all dust resulting from the cutting operations must be collected by a HEPA dust collector, or must be HEPA vacuumed by vacuuming along the cut line. Asbestos-containing roofing material must not be dropped or thrown to the ground, but must be lowered to the ground via covered, dust-tight chute, crane, hoist or other method approved by the Contracting Officer. Any ACM that is not intact must be lowered to the ground as soon as practicable, but not later than the end of the work shift. While the material remains on the roof it must be kept wet or placed in an impermeable waste bag or wrapped in plastic sheeting. Intact ACM must be lowered to the ground as soon as practicable, but not later than the end of the work shift. Unwrapped material must be transferred to a closed receptacle. Critical barriers must be placed over roof level heating and ventilation air intakes. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If the airborne fiber concentration of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work immediately and correct the situation.

3.2.9.4 Cementitious Siding and Shingles or Transite Panels

Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers, signs, and maintain all other requirements for asbestos control area except local exhaust. When removing cementitious asbestos-containing siding, shingles or Transite panels use the following work practices. Intentionally cutting, abrading or breaking is prohibited. Each panel or shingle must be sprayed with amended water or wetting agent prior to removal. Nails must be cut with flat, sharp instruments. Unwrapped or unbagged panels or shingles must be immediately lowered to the ground via covered dust-tight chute, crane or hoist, or placed in an impervious waste bag or wrapped in plastic sheeting and lowered to the ground no later than the end of the work shift. Place debris into a 6-mil minimum thickness disposal bag or other approved container. Once the material is in the disposal bag, apply additional water as needed to achieve "adequately wet" conditions for NESHAP compliance. Place bagged asbestos waste under negative pressure with the use of a HEPA vacuum, goose neck and duct tape to seal the bag, wash to remove any visible contamination and place into a second 6-mil minimum thickness disposal bag. Containerize asbestos containing waste while wet. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If the airborne fiber concentration of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work immediately and correct the situation.

3.2.9.5 Gaskets

Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers, signs, and maintain all other requirements for asbestos control area except local exhaust. Gaskets must be thoroughly wetted with amended water or wetting agent prior to removal and immediately placed in a disposal container. If a gasket is visibly deteriorated and unlikely to be removed intact, removal must be undertaken within a glovebag. Any scraping to remove residue must be performed wet. Place debris into a 6-mil minimum thickness disposal bag or other approved

container. Once the material is in the disposal bag, apply additional water as needed to achieve "adequately wet" conditions for NESHAP compliance. Place bagged asbestos waste under negative pressure with the use of a HEPA vacuum, goose neck and duct tape to seal the bag, wash to remove any visible contamination and place into a second 6-mil minimum thickness disposal bag. Containerize asbestos containing waste while wet. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If the airborne fiber concentration of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work immediately and correct the situation.

3.2.10 Abatement of Asbestos Contaminated Soil

Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers, signs, and maintain all other requirements for asbestos control area except local exhaust. Asbestos contaminated soil must be removed from areas to a minimum depth of 2 inches. Abatement of asbestos contaminated soil must be performed in accordance with all federal, state, and local regulations. Soil must be thoroughly dampened with amended water and then removed by manual shoveling into labeled containers. Place debris into a 6-mil minimum thickness disposal bag or other approved container. Once the material is in the disposal bag, apply additional water as needed to achieve "adequately wet" conditions for NESHAP compliance. Place bagged asbestos waste under negative pressure with the use of a HEPA vacuum, goose neck and duct tape to seal the bag, wash to remove any visible contamination and place into a second 6-mil minimum thickness disposal bag. Containerize asbestos containing waste while wet. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If the airborne fiber concentration of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work immediately and correct the situation.

3.2.11 Air Sampling

Perform sampling of airborne concentrations of asbestos fibers in accordance with 29 CFR 1926.1101, the Contractor's air monitoring plan, applicable local, state and federal regulations, and as specified herein. Sampling performed in accordance with 29 CFR 1926.1101 must be performed by the PQP. Sampling performed for environmental and quality control reasons must be performed by the PQP. Unless otherwise specified, use NIOSH Method 7400 for sampling and analysis. Monitoring may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those results obtained by the Contractor, the Government will determine which results predominate. Results of breathing zone samples must be made available to the tested employees and Contracting Officer.. Submit all documentation regarding initial exposure assessments, negative exposure assessments, and air-monitoring results.

3.2.11.1 Sampling Prior to Asbestos Work

Provide area air sampling and establish the baseline one day prior to the masking and sealing operations for each demolition or removal site. Establish the background by performing area sampling in similar but uncontaminated sites in the building.

3.2.11.2 Sampling During Asbestos Work

The PQP must provide personal and area sampling as indicated in [29 CFR 1926.1101](#) and governing environmental regulations. Breathing zone samples must be taken for at least 25 percent of the workers in each shift, or a minimum of two, whichever is greater. Air sample fiber counting must be completed and results provided within 24-hours (breathing zone samples), and 24 hours (environmental/clearance monitoring) after completion of a sampling period. In addition, provided the same type of work is being performed, provide area sampling at least once every work shift close to the work inside the enclosure, outside the clean room entrance to the enclosure, and at the exhaust opening of the local exhaust system. If sampling outside the enclosure shows airborne levels have exceeded background or 0.01 fibers per cubic centimeter, whichever is greater, stop all work, correct the condition(s) causing the increase, and notify the Contracting Officer immediately. Where alternate methods are used, perform personal and area air sampling at locations and frequencies that accurately characterize the evolving airborne asbestos levels. The written results must be signed by testing laboratory analyst, testing laboratory principal and the Contractor's PQP. The air sampling results must be documented on a Contractor's daily air monitoring log.

3.2.11.3 Final Clearance Requirements, NIOSH PCM Method

For PCM sampling and analysis using [NIOSH NMAM](#) Method 7400, the fiber concentration inside the abated regulated area, for each airborne sample, must be less than 0.01 f/cc. The abatement inside the regulated area is considered complete when every PCM final clearance sample is below the clearance limit. If any sample result is greater than 0.01 total f/cc, the asbestos fiber concentration (asbestos f/cc) must be confirmed from that same filter using [NIOSH NMAM](#) Method 7402 (TEM) at no additional cost to the Government. If any confirmation sample result is greater than 0.01 asbestos f/cc, abatement is incomplete and cleaning must be repeated at no additional cost to the Government. Upon completion of any required recleaning, resampling with results to meet the above clearance criteria must be done at no additional cost to the Government.

3.2.11.4 Sampling After Final Clean-Up ([Clearance Sampling](#))

Provide area sampling of asbestos fibers using aggressive air sampling techniques as defined in the [EPA 560/5-85-024](#) and establish an airborne asbestos concentration of less than 0.01 fibers per cubic centimeter after final clean-up but before removal of the enclosure or the asbestos work control area. After final cleanup and the asbestos control area is dry but prior to clearance sampling, the PQP must perform a visual inspection in accordance with [ASTM E1368](#) to ensure that the asbestos control and work area is free of any accumulations of dirt, dust, or debris. Prepare a written report signed and dated by the PQP documenting that the asbestos control area is free of dust, dirt, and debris and all waste has been removed.

3.2.11.5 Air Clearance Failure

If clearance sampling results fail to meet the final clearance requirements, pay all costs associated with the required recleaning, resampling, and analysis, until final clearance requirements are met.

3.2.12 Lock-Down

Prior to removal of plastic barriers and after pre-clearance clean up of gross contamination, the PQP must conduct a visual inspection of all areas affected by the removal in accordance with [ASTM E1368](#). Inspect for any visible fibers, and to ensure that encapsulants were applied evenly and appropriately. Spray apply a post removal (lock-down) encapsulant to ceiling, walls, floors and other areas exposed in the removal area. The exposed area includes but is not limited to plastic barriers, furnishings and articles to be discarded as well as dirty change room, air locks for bag removal and decontamination chambers.

3.2.13 Site Inspection

While performing asbestos engineering control work, the Contractor must be subject to on-site inspection by the Contracting Officer who may be assisted by or represented by safety or industrial hygiene personnel. If the work is found to be in violation of this specification, the Contracting Officer or his representative will issue a stop work order to be in effect immediately and until the violation is resolved. All related costs including standby time required to resolve the violation must be at no additional cost to the Government.

3.3 CLEAN-UP AND DISPOSAL

3.3.1 Housekeeping

Essential parts of asbestos dust control are housekeeping and clean-up procedures. Maintain surfaces of the asbestos control area free of accumulations of asbestos fibers. Give meticulous attention to restricting the spread of dust and debris; keep waste from being distributed over the general area. Use HEPA filtered vacuum cleaners. DO NOT BLOW DOWN THE SPACE WITH COMPRESSED AIR. When asbestos removal is complete, all asbestos waste is removed from the work-site, and final clean-up is completed, the Contracting Officer will attest that the area is safe before the signs can be removed. After final clean-up and acceptable airborne concentrations are attained but before the HEPA unit is turned off and the enclosure removed, remove all pre-filters on the building HVAC system and provide new pre-filters. Dispose of filters as asbestos contaminated materials. Reestablish HVAC mechanical, and electrical systems in proper working order. The Contracting Officer will visually inspect all surfaces within the enclosure for residual material or accumulated dust or debris. The Contractor must re-clean all areas showing dust or residual materials. If re-cleaning is required, air sample and establish an acceptable asbestos airborne concentration after re-cleaning. The Contracting Officer must agree that the area is safe in writing before unrestricted entry is permitted. The Government must have the option to perform monitoring to determine if the areas are safe before entry is permitted.

3.3.2 Title to Materials

All waste materials, except as specified otherwise, become the property of the Contractor and must be disposed of as specified in applicable local, State, and Federal regulations and herein.

3.3.3 Disposal of Asbestos

3.3.3.1 Procedure for Disposal

Coordinate all waste disposal manifests with the Contracting Officer and host installation environmental function. Collect asbestos waste, contaminated waste water filters, asbestos contaminated water, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing which may produce airborne concentrations of asbestos fibers and place in sealed fiber-proof, waterproof, non-returnable containers (e.g. double plastic bags 6 mils thick, cartons, drums or cans). Wastes within the containers must be adequately wet in accordance with 40 CFR 61-SUBPART M. Affix a warning and Department of Transportation (DOT) label to each container including the bags or use at least 6 mils thick bags with the approved warnings and DOT labeling preprinted on the bag. Clearly indicate on the outside of each container the name of the waste generator and the location at which the waste was generated. Prevent contamination of the transport vehicle (especially if the transport vehicle is a rented truck likely to be used in the future for non-asbestos purposes). These precautions include lining the vehicle cargo area with plastic sheeting (similar to work area enclosure) and thorough cleaning of the cargo area after transport and unloading of asbestos debris is complete. Dispose of waste asbestos material at an Environmental Protection Agency (EPA) or State-approved asbestos landfill off Government property. For temporary storage, store sealed impermeable bags in asbestos waste drums or skids. An area for interim storage of asbestos waste-containing drums or skids must be assigned by the Contracting Officer or his authorized representative. Comply with 40 CFR 61-SUBPART M, State, regional, and local standards for hauling and disposal. Sealed plastic bags may be dumped from drums into the burial site unless the bags have been broken or damaged. Damaged bags must remain in the drum and the entire contaminated drum must be buried. Uncontaminated drums may be recycled. All persons handling containers with asbestos containing wastes must comply with applicable federal, state, and local regulations.

3.3.3.2 Asbestos Disposal Quantity Report

Direct the PQP to record and report, to the Contracting Officer, the amount of asbestos containing material removed and released for disposal. Deliver the report for the previous day at the beginning of each day shift with amounts of material removed during the previous day reported in linear feet or square feet and in cubic feet as well as tons for the amount of asbestos containing material released for disposal.

Allow the PQP to inspect, record and report the amount of asbestos containing material removed and released for disposal on a daily basis. Exclude hazardous waste from waste reduction calculations in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

Attachment:

- A. Hazardous Material Survey Report for MCAF Project P-012/AJJY183012 North Aircraft Parking Ramp Joint Region Marianas, Andersen Air Force Base, Guam dated 10 November 2023 prepared by MNA Environmental

-- End of Section --

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SECTION 31 00 00

EARTHWORK
08/23

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 ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

- AASHTO T 180 (2017) Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
- AASHTO T 85 (2025) Standard Method of Test for Specific Gravity and Absorption of Course Aggregate
- AASHTO T 210 (2025) Standard Method of Test for Aggregate Durability Index

ASTM INTERNATIONAL (ASTM)

- ASTM C33/C33M (2024a) Standard Specification for Concrete Aggregates
- ASTM C117 (2023) Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
- ASTM C136/C136M (2019) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
- ASTM C144 (2018) Standard Specification for Aggregate for Masonry Mortar
- ASTM D1140 (2017) Standard Test Methods for Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing
- ASTM D1557 (2012; E 2015) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2700 kN-m/m³)
- ASTM D1883 (2021) Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils
- ASTM D2321 (2020) Standard Practice for Underground

Installation of Thermoplastic Pipe for
Sewers and Other Gravity-Flow Applications

ASTM D2453	(2015; R 2020; E 2020) Standard Test Method for Shrinkage and Tenacity of Oil- and Resin-Base Caulking Compounds
ASTM D2487	(2017; E 2020) Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D2974	(2020; E 2020) Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
ASTM D3740	(2019) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM D3786/D3786M	(2018; R 2023) Standard Test Method for Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method
ASTM D4253	(2016; E 2019) Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4254	(2016) Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
ASTM D4318	(2017; E 2018) Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4533	(2011; R 2023) Trapezoid Tearing Strength of Geotextiles
ASTM D4632/D4632M	(2015a; R2023) Grab Breaking Load and Elongation of Geotextiles
ASTM D4829	(2021) Standard Test Method for Expansion Index of Soils
ASTM D4833/D4833M	(2007; R 2020) Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
ASTM D6431	(2018) Standard Guide for Using the Direct Current Resistivity Method for Subsurface Site Characterization
ASTM D6938	(2017a) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

ASTM G57 (2020) Standard Test Method for
Measurement of Soil Resistivity Using the
Wenner Four-Electrode Method

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2024) Safety and Occupational Health
(SOH) Requirements

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 600/4-79/020 (1983) Methods for Chemical Analysis of
Water and Wastes

EPA SW-846.3-3 (1999, Third Edition, Update III-A) Test
Methods for Evaluating Solid Waste:
Physical/Chemical Methods

1.2 DEFINITIONS

1.2.1 Structural Fill

Soil material placed to support buildings, walls, pads, and other similar facilities.

1.2.2 Embankment Fill

Soil material placed to construct embankment.

1.2.3 Porous Fill

Free-draining material placed for subsurface drainage, as a capillary break, or another specific purpose.

1.2.4 Topsoil

Surface layer of primarily organic soil capable of supporting vegetation growth.

1.2.5 Utility Bedding Material

Fill placed to directly support pipes, conduits, cables, and appurtenant structures. Bedding may also be used to provide a cushion between utilities and bedrock, obstacles, obstructions and other unyielding materials.

1.2.6 Flowable Fill

Fill placed in a plastic or liquid form that flows to near its final placement location with limited assistance and subsequently cures or solidifies to provide a stable or impermeable barrier.

1.2.7 Satisfactory Materials

Satisfactory materials for fill and backfill, and/or any in-situ soils to remain in place comprise any materials classified by ASTM D2487 as GW, GP, GM, GP-GM, GW-GM, SW, SP, SM, SW-SM, and SP-SM. In situ soils defined as CH, CL, MH, ML, CL-ML must be removed in their entirety; however they can be reconditioned and reused in landscape and non-loaded areas only and not

under structures and pavements. Maximum particle size to be no greater than 3 inches in any dimension.

1.2.8 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; roots and other organic matter or frozen material. Notify the Contracting Officer when encountering any contaminated materials. Perform testing, for classifying high organic content materials in accordance with ASTM D2974. High organic content material are considered unsatisfactory, except for use as topsoil.

1.2.9 Cohesionless Materials

Cohesionless materials include materials classified in ASTM D2487 as GW, GP, SW, and SP. Materials classified as GM, SM, GP-GM, GW-GM, SP-SM and SW-SM will be identified as cohesionless only when the fines are nonplastic. Perform testing, required for classifying materials, in accordance with ASTM D4318, ASTM C117, ASTM C136/C136M and ASTM D1140.

1.2.10 Cohesive Materials

Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM, SM, GP-GM, GW-GM, SP-SM and SW-SM will be identified as cohesive only when the fines are plastic. Perform testing, required for classifying materials, in accordance with ASTM D4318, ASTM C117, ASTM C136/C136M and ASTM D1140.

1.2.11 Hard/Unyielding Materials

Hard/Unyielding materials comprise weathered rock, dense consolidated deposits, or conglomerate materials which are not included in the definition of "rock" with stones greater than 3 inch in any dimension or as defined by the pipe manufacturer, whichever is smaller. These materials usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal. Boulder size and smaller hard materials are present on the site.

1.2.12 Unstable Material

Unstable materials are too weak to adequately support the utility pipe, conduit, equipment, or appurtenant structure. Satisfactory material may become unstable due to ineffective drainage, dewatering, becoming frozen, excessive loading.

1.2.13 Expansive Soils

Expansive soils are defined as soils that have an expansion index greater than 20 when tested in accordance with ASTM D4829.

1.2.14 Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried

masonry, or concrete other than pavement exceeding 1/2 cubic yard in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling that is performed merely to increase production. Shallow bedrock is expected to be encountered across most of the site, anticipate most excavation will be in rock.

1.2.15 Capillary Water Barrier

A layer of clean, poorly graded crushed rock, stone, or natural or manufactured sand or gravel having a high porosity which is placed beneath a building slab with or without a vapor barrier to cut off the capillary flow of pore water to the area immediately below a slab.

1.2.16 Degree of Compaction (Proctor)

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D1557 abbreviated as a percent of laboratory maximum density. Since ASTM D1557 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, express the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve as a percentage of the maximum density in accordance with AASHTO T 180-21 paragraph 1.5, Note 1.

1.2.17 Degree of Compaction (Relative Density)

Degree of compaction required for soils with less than 5 percent passing the No. 200 sieve, is expressed as a relative percentage of the maximum index density/dry unit weight and minimum index density/dry unit weight, obtained by the test procedures in accordance with ASTM D4253 and ASTM D4254, respectively, abbreviated as a percent of laboratory relative density.

1.2.18 Borrow

Soil brought to the project site from an external location for the purposes of project construction.

1.2.19 Subgrade

Earth materials directly below foundations and directly below granular base materials in building slab and pavement areas including shoulders.

1.2.20 Sand Filter Fill

Soil material placed above geotextile-encapsulated crushed stone for karst feature repairs as shown on the drawings.

1.3 SUBSURFACE DATA

Subsurface soil boring logs are shown in project plans. These data represent available subsurface information; however, variations may exist between boring locations.

1.4 CRITERIA FOR BIDDING

Base bids on the following criteria:

- a. Surface elevations are as indicated.
- b. Pipes or other artificial obstructions, except those indicated, will not be encountered.
- c. Subsurface conditions and ground water elevations indicated by the boring log were those existing at the time subsurface investigations were made and do not necessarily represent subsurface and ground water elevation at the time of construction.
- d. Material character is indicated by the boring logs.
- e. Hard materials and rock will be encountered as indicated in boring logs.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Excavation and Trenching Plan; G

Borrow Plan; G

Dewatering Work Plan; G

Disposition of Surplus Materials; G

Preconstruction Meeting; G

SD-06 Test Reports

Material Test Report; G

Borrow Site Testing; G

Pipe Inspection Report; G

Geotechnical Evaluation Report; G

Subsurface Extents of Karst Features Report; G

Karst Feature Repair Methodology and Hydrogeologic Assessment Report; G

1.6 QUALITY CONTROL

1.6.1 Geotechnical Engineer

Provide a Professional Geotechnical Engineer to provide inspection of excavations and soil/groundwater conditions throughout construction. The Geotechnical Engineer is responsible for performing pre-construction and periodic site visits throughout construction to assess site conditions. The Geotechnical Engineer must visit the site within two weeks of earthwork operations beginning and a minimum of every two months

thereafter or whenever earthwork operations begin in a new area or when subsurface conditions change. The Geotechnical Engineer or their representative is responsible for preparing and updating the Excavation and Trenching Plan and Dewatering Work Plan as construction progresses to reflect changing conditions and submit an updated plan if necessary. Submit a monthly [Geotechnical Evaluation report](#), informing the Contractor and Contracting Officer of the status of the plan and an accounting of the Contractor's adherence to the plan addressing any present or potential problems. The Contractor is responsible for arranging meetings with the Geotechnical Engineer and Contracting Officer throughout the contract duration.

1.6.2 Geotechnical Field Representative

Provide a Geotechnical Field Representative to inspect, monitor, sample, and performing field testing. The Geotechnical Representative qualifications need to have or be a current National Institute for Certification in Engineering Technologies (NICET) Level II minimum certification in Construction Materials Testing Soils and certified by ACI per Section [03 30 00](#) CAST-IN-PLACE CONCRETE, paragraph FIELD TESTING TECHNICIAN AND TESTING AGENCY; be one of the following; Geologist-in-Training; an Engineer-in-Training; a Registered Geologist; or a Professional Engineer.

The Geotechnical Field Representative must have a minimum of 5 years of experience in site development, mass grading and foundation construction with similar subsurface materials for this Contract. If the Geotechnical Engineer is not able to be on-site to perform their role, the Geotechnical Field Representative can perform the on-site duties of the Geotechnical Engineer provided they are in direct contact with the Geotechnical Engineer while performing these functions. The role of the Geotechnical Field Representative in no way eliminates the requirement of the Geotechnical Engineer to perform site visits as specified in paragraph GEOTECHNICAL ENGINEER. The Geotechnical Field Representative must be present for all earthwork activities when the Geotechnical Engineer is not on site.

1.6.3 Lab Validation

Perform testing by a Corps validated commercial testing laboratory or Contractor established testing laboratory meeting the requirements of Section [01 45 00](#) (or similar number) entitled QUALITY CONTROL and approved by the Contracting Officer. Submit testing laboratory validation for the testing to be performed. Do not permit work requiring testing until testing facilities have been inspected, Corps validated and approved by the Contracting Officer.

1.6.4 Preconstruction Meeting

Conduct a preconstruction meeting at the jobsite at least five business days prior to the start of earthwork operations on the project. The [preconstruction meeting](#) is to be arranged by the Contractor and is to follow the written agenda submitted prior to the meeting. The purpose of this meeting is to review the requirements of this specification and the associated plans. The following individuals must be in attendance at this meeting: Contractor's Project Manager and Project Superintendent, earthwork subcontractor's Project Manager and Site Foreman, Contractor's Geotechnical Engineer and Testing Agency, Government Geotechnical Engineer and Civil Engineer, and Government Construction Manager and Engineering

Technician.

The minutes of this meeting are to be recorded by the Contractor and published via email within 48 hours to all attendees. The minutes must be re-published within 48 hours via email pending any subsequent comments from the attendees.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

2.1.1 Structural Fill

Materials classified as GW, GP, GM, GW-GM, or GP-GM in accordance with [ASTM D2487](#). Select material type appropriate for the intended purpose. Only GW or GP may be used beneath airfield pavements.

2.1.2 Embankment Fill

Materials classified as GW, GP, GM, GC, GW-GM, GW-GC, GP-GM, GP-GC, GC-GM, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, SP-SC, ML, MH, CL, or CH in accordance with [ASTM D2487](#). Select material type appropriate for the intended purpose. Embankment fill beneath airfield pavements and proposed structures must not include cohesive material such as ML, MH, CL or CH. Only GW or GP may be used beneath airfield pavements. Other fill material utilized outside airfield pavement embankment must have a plasticity index not more than 12 percent and a liquid limit not greater than 35 percent, and containing no more than 25 percent passing a number 200 sieve, but with adequate sand content for dense compaction. Only cohesionless fill may be incorporated into embankments beneath structures.

2.1.3 Porous Fill

Materials containing less than 5 percent passing the No. 200 sieve. Provide the gradation as appropriate for the intended purpose.

2.1.4 Topsoil

Material suitable for topsoil obtained from excavations is defined as: Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than [one inch](#) diameter, brush, weeds, toxic substances, and other material detrimental to plant growth.

2.1.5 Utility Bedding Material

Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with [ASTM D2321](#). Install bedding for plastic piping to spring line of pipe. Utility bedding material may include the following:

Pipe bedding material for exterior coated steel pipe must be clean, sand conforming to [ASTM C144](#) (masonry aggregate) or [ASTM C33/C33M](#) (fine concrete aggregate) with not more than 5 percent by weight passing the No. 200 sieve. Resistivity tests for sand backfill must verify the sand has an average wet resistivity greater than 10,000 ohm-cm as determined by [ASTM G57](#).

Sieve	ASTM C33 Percent Passing	ASTM C144 Percent Passing
3/8 inch	100	---
No. 4	95 to 100	100
No. 8	80 to 100	95 to 100
No. 16	50 to 85	70 to 100
No. 30	25 to 60	40 to 75
No. 50	10 to 30	10 to 35
No. 100	2 to 10	2 to 15
No. 200	---	0 to 5

2.1.5.1 Class I

Angular, [0.25 to 1.5 inch](#), graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells.

2.1.5.2 Class II

Coarse sands and gravels with maximum particle size of [1.5 inch](#), including various graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class as specified in [ASTM D2487](#).

2.1.5.3 Gravel and Crushed Stone

Clean, coarsely graded natural gravel, crushed stone or a combination thereof or having a classification of GW, GP in accordance with [ASTM D2487](#) for bedding. Do not exceed maximum particle size of [3 inches](#).

2.1.6 Durable Stone

Hard, durable, angular rock that is resistant to weathering and water action and free of organic or other unsuitable materials. Do not use shale, rock with shale seams, or other fissile or fissured rock that may break into smaller pieces in the process of handling and placing. Durable stone must conform to the following:

- Apparent Specific Gravity, [AASHTO T 85](#): 2.5 min.
- Absorption, [AASHTO T 85](#): 4.2percent max.
- Coarse Durability Index, [AASHTO T 210](#): 50 min.

2.1.7 2.1.7 Sand Filter Fill

Sand having particle sizes that range from fine sand to coarse sand, with less than 2 percent fines, and having a classification of SP or SW in accordance with [ASTM D2487](#).

2.2 BURIED WARNING AND IDENTIFICATION MARKERS

Provide polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inches minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Provide permanent color and printing, unaffected by moisture or soil.

Warning Tape Color Codes	
Red	Electric
Yellow	Gas, Oil; Dangerous Materials
Orange	Telephone and Other Communications
Blue	Water Systems
Green	Sewer Systems
White	Steam Systems
Gray	Compressed Air

2.2.1 Warning Tape for Metallic Piping

Provide acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above, with a minimum thickness of 0.003 inch and a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.

2.2.2 Detectable Warning Tape for Non-Metallic Piping

Provide polyethylene plastic tape conforming to the width, color, and printing requirements specified above, with a minimum thickness of 0.004 inch, and a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Manufacture tape with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.2.3 Detection Wire for Non-Metallic Piping

Insulate a single strand, solid copper detection wire with a minimum of 12 AWG.

2.3 MATERIAL FOR RIP-RAP

Provide bedding material filter fabric and rock conforming to these requirements for construction indicated.

2.3.1 Bedding Material

Provide bedding material consisting of sand, gravel, or crushed rock, well graded, or poorly graded with a maximum particle size of 2 inches. Compose material of tough, durable particles. Allow fines passing the No. 200 standard sieve with a plasticity index less than 6.

2.3.2 Rock

Provide rock fragments which ensure permanence in the structure and the environment in which it is to be used. Use rock fragments free from cracks, seams, and other defects that would increase the risk of deterioration from natural causes. Provide fragments sized such that no individual fragment exceeds a weight of 150 pounds and that no more than 10 percent of the mixture, by weight, consists of fragments weighing 2 pounds or less each. Provide rock with a minimum specific gravity of 2.50. Do not permit the inclusion of more than trace 1 percent quantities of dirt, sand, clay and rock fines.

2.4 BORROW

Provide borrow materials from sources located within and/or outside of Government property meeting the requirements of paragraph STRUCTURAL FILL, EMBANKMENT, FILL TOPSOIL. Borrow materials must be free of organic content, according to ASTM D2974.

PART 3 EXECUTION

3.1 PROTECTION

Perform all work specified in accordance with applicable requirements of the Corps of Engineers publication EM 385-1-1 Safety and Health Requirements Manual. Provide a Geotechnical Engineer to monitor construction activities and to prepare necessary work plans and reports; see paragraph QUALITY CONTROL.

Use equipment of type and size appropriate for the site conditions (soil character and moisture content). Maintenance of exposed subgrades and fills is the responsibility of the Contractor. The Contractor is required to prevent damage by ineffective drainage, dewatering, and heavy loads and equipment by implementing precautionary measures. Repair or replace any defects or damage.

3.1.1 Underground Utilities

Location of the existing utilities indicated is approximate. Physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor is responsible for protecting utilities from damage during construction.

3.1.2 Drainage and Dewatering

Provide for the collection and disposal of surface and subsurface water encountered during construction.

3.1.2.1 Drainage

Provide for the collection and disposal of surface and subsurface water encountered during construction. Construct storm drainage features

(ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and/or provide temporary ditches, swales, and other drainage features and equipment as required to keep soils from becoming unstable, prevent erosion, or undermining of foundations. Remove unstable material from working platforms for equipment operation and soil support for subsequent construction features and provide new material as specified herein. It is the responsibility of the Contractor to assess the site conditions to employ necessary measures to permit construction to proceed.

3.1.2.2 Dewatering

Control groundwater flowing toward or into excavations to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches are not allowed within **3 feet** of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Perform control measures by the time the excavation reaches the water level in order to maintain the integrity of the in-situ material. While the excavation is open, maintain the water level continuously, at least **3 feet** below the working level. Submit a **Dewatering Work Plan** outlining procedures for accomplishing dewatering work.

3.1.3 Shoring and Sheet piling

Submit an **Excavation and Trenching Plan** to stabilize features, prevent undermining or unintended horizontal and vertical movement of adjacent structures, and prevent slippage or movement in banks or slopes adjacent to the excavation. Submit drawings and calculations, certified by a registered professional engineer, describing the methods for shoring and sheet piling of excavations. Drawings to include material sizes and types, arrangement of members, and the sequence and method of installation and removal. Calculations are to include data and references used.

3.1.4 Protection of Graded Surfaces

Protect newly backfilled, graded, and topsoiled areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes.

3.2 BORROW

Select borrow material to meet the requirements and conditions of the fill or embankment for which it is to be used. Obtain borrow material selected by the Contractor from approved private sources. Submit a **Borrow Plan** that includes materials to be excavated, stockpile locations, proposed slopes, drainage, and closure. Unless otherwise provided in the contract, the Contractor is responsible for obtaining the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling from the owners.

3.2.1 Government Furnished Borrow Area(s)

3.2.1.1 Drainage of Borrow Excavations

Provide adequate drainage of borrow area. Ensure that borrow operations result in minimum detrimental effects on natural environmental conditions.

3.2.2 Contractor Furnished Borrow Area(s)

Obtain approved borrow materials from approved offsite sources. If a borrow source is selected that is not a commercial entity from which soil material is directly purchased, submit a Borrow Plan that includes the borrow source location, geotechnical test results showing the fill material meets the Contract requirements, environmental test results in accordance with paragraph ENVIRONMENTAL REQUIREMENTS FOR OFF-SITE SOIL, and any Federal, State, and local permits required for excavation and reclamation of the borrow area.

3.2.3 Environmental Requirements for Off-Site Soil

Test offsite soils brought in for use as backfill for Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and full Toxicity Characteristic Leaching Procedure (TCLP) including ignitability, corrosivity and reactivity. Backfill may not contain concentrations above appropriate State and EPA criteria, and for hazardous waste characteristics. Determine TPH concentrations by using EPA 600/4-79/020 Method 418.1. Determine BTEX concentrations by using EPA SW-846.3-3 Method 5030/8020/8260B. Perform TCLP in accordance with EPA SW-846.3-3 Method 1311. Perform hazardous waste characteristic tests for ignitability, corrosivity, and reactivity in accordance with accepted standard methods. Perform PCB testing in accordance with accepted standard methods for sampling and analysis of bulk solid samples. Provide borrow site testing for petroleum hydrocarbons and BTEX from a grab sample of material from the area most likely to be contaminated at the borrow site (as indicated by visual or olfactory evidence), with at least one test from each borrow site. Provide borrow site testing for hazardous waste characteristics (TPH, BTEX and TCLP) from a composite sample of material, collected in accordance with standard soil sampling techniques. Do not bring borrow material to project site until Borrow Plan containing environmental test results has been received and approved by the Contracting Officer. Supplier certified or representative testing by the contractor must be supplemented by production sampling prior to delivery to the site for every 150,000 cubic yards delivered.

3.3 SURFACE PREPARATION

3.3.1 Clearing and Grubbing

Clear and grub as specified in Section 31 11 00 CLEARING AND GRUBBING.

Remove trees, stumps, logs, shrubs, brush and vegetation and other items that would interfere with construction operations. Remove stumps entirely. Grub out matted roots and roots over 3 inches in diameter to at least 18 inches below existing surface.

3.3.2 Stripping

Strip site where indicated on the plans. Strip existing surface materials to a depth of 4 inches below the existing ground surface in areas

designated as Clear and Grub on the plans. Strip existing surficial soils to a depth of 4 inches in all other areas. Strip in all areas within the planned limits of disturbance. All stripped materials not suitable for reuse as topsoil will be wasted in specified disposal area. Screen all stripped soils to remove roots and organic materials prior disposal.

3.3.3 Electrical Resistivity Tomography (ERT)

The Contractor must engage a geophysicist or geotechnical engineering firm meeting the requirements of ASTM D3740 that is familiar with ERT testing methods in accordance with ASTM D6431. The firm must provide a project geophysicist, QC geophysicist, and geophysical survey team leader for the project. The QC geophysicist and geophysical team leader must be present during all ERT work. The QC geophysicist must review the ERT tests results produced by the geophysical team leader. The project geophysicist must be present at the beginning of the ERT work as defined in Section 01 45 00 QUALITY CONTROL to coordinate the areas where ERT work will be done with the Contracting Officer, and hydrogeologist team, to provide general supervision of the ERT work at the start of the project, and to perform daily remote review of the work done by the on-site geophysical team. ~~The project geophysicist must be present on-site as needed and as requested by the Contracting Officer, and must otherwise be available for remote work related to the ERT testing and review of the ERT testing.~~ ERT testing must be performed where shown on the drawings, and in additional areas approved by the Contracting Officer. After site stripping is completed, the exposed area must be evaluated using ASTM D6431 with probe spacing sufficient to evaluate the potential karst features from the ground surface up to 60 feet below the existing subgrade. Perform ERT testing using a 100-ft grid-based pattern. To evaluate the area, individual parallel arrays must have a horizontal spacing no greater than 100 feet, with arrays positioned perpendicular to these and at the same spacing. ERT testing must extend 100-feet beyond the perimeter of the testing areas identified on the drawings, and in additional areas approved by the Contracting Officer. ERT testing in additional areas that are approved by the Contracting Officer must be done for sinkhole throat widths of greater than 6 feet. The remaining means and methods for performing ERT testing that are not presently part of the specifications are the responsibility of the Contractor's geophysicist team.

The Contractor's hydrogeologist team will be comprised of a Quality Control Hydrogeologist Specialist (QCHS) and a Hydrogeologist (See Section 01 45 00 QUALITY CONTROL for qualifications, experience, and frequency required of each role), where these individuals must not have other roles/responsibilities assigned to them from other areas of the project. The hydrogeologist will be under the direct supervision of the QCHS. The QCHS will work side-by-side with the hydrogeologist while on-site, provide technical assistance for the hydrogeologist and permitting agencies via in-person and remote meetings, where required by the Contract Documents. The QCHS is also responsible for the reviewing, signing and sealing of professional hydrogeological reports for the project. During site clearing and grading, the hydrogeologist team will be responsible for identifying karst features, determining which karst features require hydrogeologic assessment, and coordinating ERT testing areas that will support their hydrogeologic assessment with the geophysicist team in accordance with the Contract Documents. The hydrogeologist team will be responsible for reviewing "Subsurface Extents of Karst Features Reports" prepared by the geophysicist team, and in the application of this information and other project information in their preparation of the "Karst Feature Repair Methodology and Hydrogeologic Assessment Report".

The Contractor's hydrogeologist team must initially identify the potential presence of sinkholes based on their experience with combinations of sinkholes characteristics including but not limited to their size and shape, presence of ground surface depressions with or without indications of ponding, presence of exposed cavities, vegetation, or the results of probing or excavations, etc. Once these features are located, the sinkhole throat width must be measured, which will require excavation down to the throat of the sinkhole where the sinkhole throat is not presently exposed. The cost of excavation of sinkholes above their throat must be included within general earthwork and grading. After the sinkhole location and throat width are confirmed, coordinates must be obtained and ERT testing must be performed where required by the specifications.

GPS coordinates must be provided by the ERT testing firm for all ERT test arrays, with coordinates being provided for the ends of each straight line segment along each individual ERT test array. The locations of each ERT test must be shown on a map of the site plan. The Contractor's hydrogeologist/geotechnical engineer must provide GPS coordinates for the approximate center point of the throat of all encountered sinkholes requiring repair. The Contractor's hydrogeologist/geotechnical engineer must provide GPS coordinates of the perimeter of the sinkhole throat for sinkholes with throat widths greater than 6-feet in width. The QC geophysicist must review the raw data to check for anomalies and errors due to poor electrode contact or environmental noise. For each array, two-dimensional plots of the resistivity with depth along the array must be provided with suspect karst features noted. A report of these ERT test results entitled "[Subsurface Extents of Karst Features Report](#)" ~~must~~ must be prepared and submitted to the Contractor's hydrogeologist/geotechnical engineer, and must include the locations, depths, and extents of the karst features and supporting data. A draft report of the ERT data must be provided within 2 days of each day of completed field testing summarizing the results for a single day of testing. A final report of ERT testing must be provided within 7 days of the completion of all testing. For karst features with throat widths greater than 6 feet, the Contractor's hydrogeologist/geotechnical engineer will prepare a [Karst Feature Repair Methodology and Hydrogeologic Assessment Report](#) based on the Karst Features Report, and will submit these reports to the Contracting Officer, DOR, and GEPA for review. The Karst Feature Repair Methodology and Hydrogeologic Assessment Report must include the Zone type as shown on the Karst Features project drawings at the location of the sinkhole, in addition to the locations, depths, extents of the karst features, photographs and measurements of the encountered sinkhole, means and methods for the repair's construction, and must include a hydrogeologic assessment(s) and report in accordance with GEPA Regulation 22, Div 2, Ch 10, Section 10107, para F. The Contractor is responsible for obtaining ERT test results that are conclusive and support the Hydrogeologic Assessment. Upon review of the Karst Feature Repair Methodology and Hydrogeologic Assessment Report, a repair method will be issued to the Contractor by the Contracting Officer indicating the backfill requirements. Contractor must not backfill suspect areas without permission of the Contracting Officer. The approximate locations of potential karst features are provided on drawing BB126. Existing ERT data is provided on drawings BB121 to BB125. The data provided on the identified sheets is for informational purposes only.

3.3.4 Proof Rolling

Perform proof rolling on exposed subgrade that is unfrozen and free of

surface water (wet conditions resulting from rainfall). Perform proof rolling under the full time observation of the Geotechnical Field Representative. Notify the Contracting Officer a minimum of three days prior to proof rolling. Perform proof rolling in the presence of the Contracting Officer.

After stripping, excavating, and rough grading to the planned elevation, proof roll the existing subgrade of all building, pavement and embankment locations with six passes of a loaded tandem axle dump truck. Operate the truck in a systematic manner to ensure the number of passes over all areas, and at speeds between 2.5 to 3.5 miles per hour. Subgrade materials that exhibit excessive deflection and/or rutting during proof rolling need to be scarified, aerated, and re-compacted to specified density at plus or minus 3 percent of optimum moisture content prior to being considered for remedial action by the Contracting Officer. When proof rolling under buildings, the building subgrade is considered to extend 5 feet beyond the building lines, and make one-half of the passes with the roller in a direction perpendicular to the other passes. A 15 ton pneumatic-tired or smooth drum roller may be used instead of a loaded tandem axle dump truck for proof rolling.

3.3.5 Stockpiling Operations

Place and grade stockpiles of satisfactory as specified. Keep stockpiles in a neat and well drained condition, giving due consideration to drainage at all times. Clear, grub, and seal by rubber-tired equipment, the ground surface at stockpile locations; separately stockpile excavated satisfactory and unsatisfactory materials. Protect stockpiles of satisfactory materials from contamination which may destroy the quality and fitness of the stockpiled material. Do not create stockpiles that could obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, remove and replace such material with satisfactory material from approved sources.

3.4 EXCAVATION

Excavate to contours, elevation, and dimensions indicated. Excavate soil disturbed or weakened by Contractor's operations, and soils softened or made unstable for subsequent construction due to exposure to weather. Use material removed from excavations meeting the specified requirements in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes to minimize surplus material and to minimize additional material to brought on site. Do not excavate below indicated depths except to remove unstable material as determined by the Geotechnical Field Representative and confirmed by the Contracting Officer. Remove and replace excavations below the grades shown with appropriate materials as specified.

3.4.1 Ditches, Gutters, and Channel Changes

Finish excavation of ditches, gutters, and channel changes by cutting accurately to the cross sections, grades, and elevations shown. Do not excavate below grades shown. Backfill excessive excavation as directed by the Contracting Officer, with satisfactory, compacted, material or with suitable stone or cobble to grades shown. Dispose excavated material as shown or as directed. Do not allow material to be deposited within 4 feet from edge of a ditch. Maintain excavations free from detrimental

quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.4.2 Trench Excavation Requirements

Excavate the trench as recommended by the manufacturer of the pipe to be installed. Slope trench walls below the top of the pipe, or make vertical, and of such width as recommended by the manufacturer. Provide vertical trench walls where no manufacturer installation instructions are available. Do not exceed the trench width of 24 inches below the top pipe plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter, and do not exceed 36 inches plus pipe outside diameter for pipe sizes larger than 24 inches inside diameter. Where recommended trench widths are exceeded, provide redesign, stronger pipe, or special installation procedures. The Contractor is responsible for the cost of redesign, stronger pipe, or special installation procedures without any additional cost to the Government.

3.4.2.1 Bottom Preparation

Grade the bottoms of trenches accurately to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Excavate bell holes to the necessary size at each joint or coupling to eliminate point bearing. Remove stones of 3 inch or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, to avoid point bearing.

3.4.2.2 Removal of Unyielding Material

Where unyielding material is encountered in the bottom of the trench, remove such material 4 inch below the required grade and replaced with suitable materials as provided in paragraph FILLING AND COMPACTION.

3.4.2.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, remove such material to the depth directed and replace it to the proper grade with suitable material as provided in paragraph FILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the Contractor is responsible for excavating the resulting material and replacing it without additional cost to the Government.

3.4.2.4 Excavation for Appurtenances

Provide excavation for manholes, catch-basins, inlets, or similar structures sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members and of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown.

3.4.2.5 Gas Distribution

Excavate trenches to a depth that will provide a minimum 18 inches of cover in rock excavation and a minimum 24 inches of cover in other excavation.

3.4.2.6 Water Lines

Excavate trenches to a depth that provides a minimum cover of 3 feet from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe.

3.4.3 Underground Utilities

Perform work adjacent to utilities as indicated. Excavation made with power-driven equipment is not permitted within 2 feet of known utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the Contracting Officer. Report damage to utility lines or subsurface construction immediately to the Contracting Officer.

3.4.4 Structural Excavation

Following general excavation and rough grading activities, excavate the entire building footprint area and at least 5 feet beyond, to the deeper of 4 feet below existing grade or 3 feet below bottom of footings. Scarify the exposed surface to a depth of 4 to 6 inches, moisture-condition, and compact to at least 100 percent of laboratory maximum density. For new pavement areas including exterior concrete pads, over-excavate granular soils including GW and GP to a minimum of 12 inches below bottom of new pavement/pad base course, scarify, moisture-condition, and compact to at least 100 percent. For all other soils, excavate a minimum of 36 inches below bottom of new pavement/pad base course, and replace with structural fill, moisture-condition, and compact to at least 100 percent of the laboratory maximum density. Cohesive soils must not be placed beneath structures or pavements.

Make excavations to the lines, grades, and elevations shown, or as directed. Provide trenches and foundation pits of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Clean rock or other hard foundation material of loose debris and cut to a firm, level, stepped, or serrated surface. Remove loose disintegrated rock and thin strata.

Footing subgrades must be inspected by the Geotechnical Field Representative prior to placing reinforcement and concrete. Following inspection by the Geotechnical Field Representative, the Contracting Officer must be notified prior to proceeding with Concrete placement.

When intact hard rock is encountered, terminate excavation at the bottom of footing elevation shown on the plans. If the subgrade can be scarified, scarify as described above. Level the excavated rock subgrade with a minimum 1 inch thick lean concrete or sand-cement grout with a minimum 28 day unconfined compressive strength of 1,500 psi. Determine if a mixed soil-rock subgrade condition exists. Pothole a maximum spacing of 50 feet and where a mixed soil and rock subgrade is observed. Excavate soil or weak, broken rock to a depth of 3 feet below subgrade. Replace these areas with structural fill.

3.4.5 Rock Excavation and Blasting

Excavate rock encountered in the cut section to a depth of 6 inches below finished grade and replace with satisfactory material. Blasting will not be permitted.

3.5 SUBGRADE PREPARATION

3.5.1 General Requirements

Shape subgrade to line, grade, and cross section as indicated. Remove unsatisfactory and unstable material in surfaces to receive fill or in excavated areas, as determined by proof rolling, and replaced with satisfactory materials. Do not place material on surfaces that are muddy, or otherwise containing unstable material. Scarify the surface to a depth of 4 inches prior to placing fill. Step or bench sloped surfaces steeper than 1 vertical to 4 horizontal prior to scarifying. Place 4 inches of loose fill and blend with scarified material. When subgrade is part fill and part excavation or natural ground, scarify to a depth of 8 inches. Perform probing and grouting beneath structures as shown on the plans prior to the placement of structural fill. Perform probing and grouting according to Section 31 33 10 FOUNDATION DRILLING AND GROUTING IN ROCK.

3.5.2 Subgrade for Structures, Spread Footings, and Concrete Slabs

Do not excavate below depth shown for structures, spread footings, and concrete slabs. If over excavation occurs, compact disturbed material to at least 100 percent of ASTM D1557. After final rolling, the surface of the subgrade for buildings and pavements must not show deviations greater than 0.05 foot when tested with a 12-foot straightedge applied both parallel and at right angles to the centerline of the area.

3.5.3 Subgrade for Pavements

Compact top 12 inches of subgrade for pavements to at least 100 percent of ASTM D1557. After final rolling, the surface of the subgrade for buildings and pavements must not show deviations greater than 0.05 foot when tested with a 12-foot straightedge applied both parallel and at right angles to the centerline of the area.

3.5.4 Subgrade for Shoulders

Compact the upper 16 inches of subgrade for shoulders to at least 100 percent of ASTM D1557 for the depth below the surface of shoulder shown.

3.5.5 Subgrade for Airfield Pavements

Compact top 12 inches of subgrade, to at least 100 percent of ASTM D1557. After final rolling, the surface of the subgrade for buildings and pavements must not show deviations greater than 0.05 foot when tested with a 12-foot straightedge applied both parallel and at right angles to the centerline of the area.

3.6 FILLING AND COMPACTION

Prepare ground surface on which backfill is to be placed and provide compaction requirements for backfill materials in conformance with the applicable portions of paragraphs for SUBGRADE PREPARATION. Do not place material on surfaces that are muddy. Finish compaction by sheep's foot

rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Moisten material as necessary to plus or minus 3 percent of optimum moisture. Fill and backfill to contours, elevations, and dimensions indicated. Compact and test each lift before placing overlaying lift.

3.6.1 Trench Backfill

Backfill trenches to the grade shown. Do not backfill the trench until all specified tests are performed.

3.6.1.1 Replacement of Unyielding Material

Replace unyielding material removed from the bottom of the trench with satisfactory material or initial backfill material.

3.6.1.2 Replacement of Unstable Material

Replace unstable material removed from the bottom of the trench or excavation with satisfactory material placed in layers not exceeding 6 inches loose thickness.

3.6.1.3 Bedding and Initial Backfill

Provide bedding of the type and thickness shown. Place initial backfill material and compact it with approved tampers to a height of at least one foot above the utility pipe or conduit. Bring up the backfill evenly on both sides of the pipe for the full length of the pipe. Take care to ensure thorough compaction of the fill under the haunches of the pipe. Except where shown or when specified otherwise in the individual piping section, provide bedding for buried piping in accordance with PART 2 paragraph UTILITY BEDDING MATERIAL. Compact backfill to top of pipe to 95 percent of ASTM D1557 maximum density. Provide plastic piping with bedding to spring line of pipe.

3.6.1.4 Final Backfill

Do not begin backfill until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Bring backfill to indicated finish grade. Where pipe is coated or wrapped for protection against corrosion, the backfill material up to an elevation 2 feet above sewer lines and one foot above other utility lines need to be free from stones larger than one inch in any dimension. Heavy equipment for spreading and compacting backfill are not to be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; compact remaining area in layers not more than 4 inches in compacted thickness with power-driven hand tampers suitable for the material being compacted. Place backfill carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks. Do not place backfill against foundation walls prior to 7 days after completion of the walls. As far as practicable, bring backfill up evenly on each side of the wall and sloped to drain away from the wall. Cohesive soils must not be placed beneath structures or pavements.

Fill the remainder of the trench, except for special materials for buildings, airfields and pavements with satisfactory material. Place backfill material and compact as follows:

3.6.1.4.1 Buildings, Airfields and Pavements

Place backfill up to the required elevation as specified. Do not permit water flooding or jetting methods of compaction. Compact as specified for Structural Fill. Subgrade materials placed within 3 feet of the final subgrade elevation below pavements must be tested to confirm that a minimum CBR value of 20 has been achieved in accordance with [ASTM D1883](#).

3.6.1.4.2 Turfed or Seeded Areas and Miscellaneous Areas

Deposit backfill in layers of a maximum of [8 inches](#) loose thickness, and compact it to 90 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. Do not permit compaction by water flooding or jetting. Apply this requirement to all other areas not specifically designated above.

3.6.1.5 Electrical Distribution System

Provide a minimum cover of [24 inches](#) from the finished grade to direct burial cable and conduit or duct line, unless otherwise indicated.

3.6.1.6 Displacement of Features

After other required tests have been performed and the trench backfill compacted to the finished grade surface, inspect the pipe to determine whether unexpected or damaging displacement has occurred. Conduct walk-through inspection of pipe sizes larger than [48 inches](#). Inspect pipes smaller than [48 inches](#) using remote methods using closed circuit television, sonar, or hybrid that can provide a 360-degree inspection of the pipe. Prepare and submit a [pipe inspection report](#) consisting of digital video or photos. If, in the judgment of the Contracting Officer, the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, replace or repair the defects as directed at no additional cost to the Government.

3.6.1.7 Buried Tape And Detection Wire

3.6.1.7.1 Buried Warning and Identification Tape

Provide buried utility lines with utility identification tape. Bury tape [12 inches](#) below finished grade; under pavements and slabs, bury tape [6 inches](#) below top of subgrade.

3.6.1.7.2 Buried Detection Wire

Bury detection wire directly above non-metallic piping at a distance not to exceed [12 inches](#) above the top of pipe. Extend the wire continuously and unbroken, from manhole to manhole. Terminate the ends of the wire inside the manholes at each end of the pipe, with a minimum of [3 feet](#) of wire, coiled, remaining accessible in each manhole. Furnish insulated wire over its entire length. Install wires at manholes between the top of the corbel and the frame, and extend up through the chimney seal between the frame and the chimney seal. For force mains, terminate the wire in the valve pit at the pump station end of the pipe.

3.6.2 Structural Fill Placement

Place fill and backfill beneath and adjacent to structures in successive horizontal layers of loose material not more than [8 inches](#) in depth, or in

loose layers not more than 4 inches in depth when using hand-operated compaction equipment. Do not place over wet materials. Compact to at least 100 percent of laboratory maximum density for cohesionless materials, except as otherwise specified. Perform compaction in such a manner as to prevent wedging action or eccentric loading upon or other damage to the structure. Moisture condition fill and backfill material to within range of plus 2 or minus 2 percent of optimum moisture content at the time of compaction.

3.6.3 Backfill for Appurtenances

After the manhole, catchbasin, inlet, or similar structure has been constructed, place backfill in such a manner that the structure is not be damaged by the shock of falling earth. Deposit the backfill material, compact it as specified for final backfill, and bring up the backfill evenly on all sides of the structure to prevent eccentric loading and excessive stress.

3.6.4 Compaction

3.6.4.1 General Site

Compact underneath areas designated for vegetation and areas outside the 5 foot line of the paved area or structure to at least 85 percent of ASTM D1557.

3.6.4.2 Adjacent Areas

Compact areas within 5 feet of structures to at least 95 percent of ASTM D1557.

3.6.5 Backfill for Karst Repairs

Perform karst mitigation where shown on Karst Features Plan and perform as shown on Karst Features Detail. Zone 2 repairs requiring geotextile placement must meet the following requirements for a Class A Filter Geotextile:

Geotextile Strength Requirements for Drains		
Strength Type	Test Method	Class A
Grab Tensile	ASTM D4632/D4632M	180
Seam	ASTM D4632/D4632M	160
Puncture	ASTM D4833/D4833M	80
Burst	ASTM D3786/D3786M	290
Trapezoid Tear	ASTM D4533	50

3.7 EMBANKMENTS

3.7.1 Earth Embankments

Construct earth embankments from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. Place the material in successive horizontal layers of loose material not more than 8 inches in depth. Spread each layer uniformly on a soil surface that has been moistened or aerated as necessary and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, plow, disk, or otherwise break up each layer; moisten or aerate as necessary; thoroughly mix; and compact to at least 100 percent laboratory maximum density for cohesionless materials beneath structures and 95 percent laboratory maximum density for cohesionless materials not beneath structures. Cohesive materials are not permitted under structures or pavements and must only be placed in turf/green and miscellaneous fill areas. The cohesive materials in these areas must be compacted to a minimum of 90 percent of the laboratory Proctor. Backfill and fill material are to be within the range of minus 3 to plus 3 percent of optimum moisture.

Compaction requirements for the upper portion of earth embankments forming subgrade for pavements are identical with those requirements specified in paragraph SUBGRADE PREPARATION. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.8 RIP-RAP CONSTRUCTION

Construct rip-rap on bedding material in the areas indicated. Trim and dress indicated areas to conform to cross sections, lines and grades shown within a tolerance of 0.1 foot.

3.8.1 Bedding Placement

Spread bedding material uniformly to a thickness of at least 3 inches on prepared subgrade as indicated.

3.8.2 Stone Placement

Place rock for rip-rap on prepared bedding material to produce a well graded mass with the minimum practicable percentage of voids in conformance with lines and grades indicated. Distribute larger rock fragments, with dimensions extending the full depth of the rip-rap throughout the entire mass and eliminate "pockets" of small rock fragments. Rearrange individual pieces by mechanical equipment or by hand as necessary to obtain the distribution of fragment sizes specified above.

3.9 FINISHING/FINISH OPERATIONS

During construction, keep embankments and excavations shaped and drained. Maintain ditches and drains along subgrade to drain effectively at all times. Do not disturb the finished subgrade by traffic or other operation. Protect and maintain the finished subgrade in a satisfactory condition until ballast, subbase, base, or pavement is placed. Do not permit the storage or stockpiling of materials on finished subgrade. Do not lay subbase, base course, ballast, or pavement until the subgrade has been checked and approved, and in no case place subbase, base, surfacing, pavement, or ballast on a muddy, spongy, frozen or otherwise unstable

subgrade.

Finish the surface of excavations, embankments, and subgrades to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. Provide the degree of finish for graded areas within **0.1 foot** of the grades and elevations indicated except as indicated for subgrades specified in paragraph SUBGRADE PREPARATION. Finish gutters and ditches in a manner that will result in effective drainage. Finish the surface of areas to be turfed to a smoothness suitable for the application of turfing materials. Repair graded, topsoiled, or backfilled areas prior to acceptance of the work, and re-established grades to the required elevations and slopes.

3.9.1 Capillary Water Barrier

Place a capillary water barrier under concrete floor and area-way slabs grade directly on the subgrade and compact with a minimum of two passes of a hand-operated plate-type vibratory compactor.

3.9.2 Grading Around Structures

Construct areas within **5 feet** outside of each building and structure line true-to-grade, shape to drain, and maintain free of trash and debris until final inspection has been completed and the work has been accepted.

3.9.3 Grading

Finish grades as indicated within **one-tenth of one foot**. Grade areas to drain water away from structures. Maintain areas free of trash and debris. For existing grades that will remain but which were disturbed by Contractor's operations, grade as directed.

3.9.4 Topsoil and Seed

Provide as specified in Section **32 92 19 SEEDING**.

On areas to receive topsoil, prepare the compacted subgrade soil to a **2 inches** depth for bonding of topsoil with subsoil. Spread topsoil evenly to a thickness of **4 inch** and grade to the elevations and slopes shown. Do not spread topsoil when frozen or excessively wet or dry. Keep topsoil separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than **2 inches** in diameter, and other materials that would interfere with planting and maintenance operations. Remove from the site any surplus of topsoil from excavations and gradings. Obtain material required for topsoil in excess of that produced by excavation within the grading limits from offsite areas.

3.10 DISPOSITION OF SURPLUS MATERIAL

Remove from Government property all surplus or other soil material not required or not suitable for filling or backfilling, along with brush, refuse, stumps, roots, and timber. Properly disposed of in accordance with all applicable laws and regulations. Prepare plan for **Disposition of Surplus Materials** to include permissions document to dispose of nonsalable products.

3.11 TESTING

Perform testing as indicated in Table 1. Submit **Material Test Reports**

within 24 hours of tests being completed. The material test reports must include a plan showing test identification, elevation, location, coordinates, and a table of the results and action taken for non-conforming items. When test results indicate that compaction is not as specified, the material must be removed, replaced, and recompacted to meet specification requirements. Tests on recompacted areas must be performed to determine conformance with specification requirements.

MATERIAL TESTED	PROCTOR TYPE	MIN PERCENT DRY DENSITY	MOUISTURE CONTENT RANGE	FREQUENCY OF TESTING*
Structural Fill (Granular)	Modified (ASTM D1557)	100 percent	-2 to + 2 percent	1 per 1,000 cy of fill placed per ASTM D6938
			>95 percent saturated	
Random Fill (non-load bearing)	Modified (ASTM D1557)	90 percent	-3 to + 3 percent	1 per 3,000 cy of fill placed per ASTM D6938
Utility Trench Backfill/Wall Backfill	Modified (ASTM D1557)	90 percent	-2 to + 2 percent	1 per 200 cy of fill placed per ASTM D6938
*Minimum of 1 test per lift A minimum of one density test is required per footing or slab. Test per ASTM D2453 and ASTM D4254 for relative density for soils with less than 5 percent passing the No. 200 Sieve at the same frequency as shown above per ASTM D6938.				

Material	Test Type	Frequency of Test
Embankments beneath structures, fills, backfills, borrow, and subgrade	Modified Proctor (ASTM D1557)	1 per 5,000 CY or material change
	CBR - Field or Laboratory (ASTM D1883)	1 per 5,000 CY or material change
	Gradation (ASTM C136/C136M)	1 per 1,000 CY or material change
	Atterberg Limits (ASTM D4318)	1 per 1,000 CY or material change
	Organic Content (ASTM D2974)	1 representative test per 200 lineal feet of embankment

Material	Test Type	Frequency of Test
Native Soil Subgrades other than beneath structures or pavement	Modified Proctor (ASTM D1557)	1 per 10,000 CY or material change
	Gradation (ASTM C136/C136M)	1 per 3,000 CY or material change
	Atterberg Limits (ASTM D4318)	1 per 3,000 CY or material change
	Organic Content (ASTM D2974)	1 representative test per 200 lineal feet of embankment
Utility Trench Backfill	Modified Proctor (ASTM D1557)	1 per 1,000 CY or material change
	Gradation (ASTM C136/C136M)	1 per 500 CY or material change
	Atterberg Limits (ASTM D4318)	1 per 500 CY or material change
	Organic Content (ASTM D2974)	1 representative test per 200 lineal feet of embankment

-- End of Section --

SECTION 32 11 20

BASE COURSE FOR RIGID PAVING
05/22

PART 1 GENERAL

1.1 UNIT PRICES

1.1.1 Waybills and Delivery Tickets

Submit copies of [waybills and delivery tickets](#) during progress of the work. Before the final payment is allowed, file certified waybills and certified delivery tickets for all aggregates actually used.

1.2 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C29/C29M	(2023) Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C117	(2023) Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C131/C131M	(2020) Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136/C136M	(2019) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D75/D75M	(2019) Standard Practice for Sampling Aggregates
ASTM D1556/D1556M	(2015; E 2016) Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
ASTM D1557	(2012; E 2015) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³) (2700 kN-m/m ³)
ASTM D2487	(2017; E 2020) Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D3665	(2012; R 2017) Standard Practice for Random Sampling of Construction Materials

ASTM D4318	(2017; E 2018) Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4718/D4718M	(2015) Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
ASTM D6938	(2017a) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D7928	(2017) Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis
ASTM E11	(2024) Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves

1.3 DEGREE OF COMPACTION

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum laboratory dry density obtained by the test procedure presented in ASTM D1557 abbreviated as a percent of laboratory maximum dry density. Since ASTM D1557 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, express the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve as a percentage of the laboratory maximum dry density in accordance with ASTM D1557 Method C and corrected with ASTM D4718/D4718M.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Plant, Equipment, and Tools; G

Waybills and Delivery Tickets

SD-06 Test Reports

Initial Tests; G

In-Place Tests; G

Test Section Report; G

1.5 QUALITY ASSURANCE

Perform sampling and testing using a laboratory approved in accordance with Section 01 45 00 QUALITY CONTROL. Do not start work requiring

testing until the testing laboratory has been inspected and approved. All contractor quality control testing laboratories performing acceptance testing require USACE validation by the Material Testing Center (MTC) for both parent laboratory and on-site laboratory. Validation on all laboratories is required to remain current throughout the duration of the paving project. Contact the MTC manager listed at <https://mtc.erdc.dren.mil/requestvalidation.aspx#> for costs and scheduling. Test the materials to establish compliance with the specified requirements and perform testing at the specified frequency. Furnish copies of test results within 24 hours of completion of the tests.

1.5.1 Sampling

Take samples for laboratory testing in conformance with [ASTM D75/D75M](#).

1.5.2 Tests

1.5.2.1 Gradation

Perform gradation in conformance with [ASTM C117](#) and [ASTM C136/C136M](#) using sieves conforming to [ASTM E11](#). Perform particle-size analysis of the soils in conformance with [ASTM D7928](#).

1.5.2.2 Liquid Limit and Plasticity Index

Determine liquid limit and plasticity index in accordance with [ASTM D4318](#).

1.5.2.3 Moisture-Density Determinations

Determine the laboratory maximum dry density and optimum moisture in accordance with paragraph DEGREE OF COMPACTION.

1.5.2.4 Field Density Tests

Measure field density in accordance with [ASTM D1556/D1556M](#), or [ASTM D6938](#). For the method presented in [ASTM D1556/D1556M](#), use the base plate, as shown in the drawing. For the method presented in [ASTM D6938](#), check the calibration curves and adjust them, if necessary, using only the sand cone method as described in Annex A2, of the ASTM publication. Use [ASTM D6938](#) to determine the moisture content of the soil. Check the calibration curves furnished with the moisture gauges along with density calibration checks as described in [ASTM D6938](#). Make the calibration checks of both the density and moisture gauges using the prepared containers of material method, as described in Annex A2, in [ASTM D6938](#), on each different type of material to be tested at the beginning of a job and at intervals as directed. Submit calibration curves and related test results prior to using the device or equipment being calibrated.

1.5.2.5 Wear Test

Perform wear tests on subbase course and rigid pavement base course material in conformance with [ASTM C131/C131M](#).

1.5.2.6 Weight of Slag

Determine weight per cubic [foot](#) of slag in accordance with [ASTM C29/C29M](#).

1.6 ENVIRONMENTAL REQUIREMENTS

Perform construction when the atmospheric temperature is above 35 degrees F. When the temperature falls below 35 degrees F, protect all completed areas by approved methods against detrimental effects of freezing. Correct completed areas damaged by freezing, rainfall, or other weather conditions to meet specified requirements.

1.7 ACCEPTANCE

1.7.1 Tolerances

Acceptance of separation layer is based on compliance with the tolerances presented in Table 1. Remove and replace any course identified by the failing tests.

TABLE 1	
Measurement	Tolerance
Grade	Plus 0, Minus 1/2 inch
Smoothness	Plus/Minus 1/2 inch
Total Thickness	Plus/Minus 1/2 inch
Average Job Thickness	Plus/Minus 1/4 inch
Compaction	
Subbase	Minimum 100 percent
Rigid Pavement Base Course	Minimum 100 percent

1.7.2 Test Section

Construct a test section consisting of 1000 square yards of separation layer to demonstrate the materials, equipment, and construction processes meet the requirements of this specification. Acceptance of the test section is based on compliance with the tolerances listed in Table 1. Rework, re-compact, or remove and replace test sections that do not meet specification requirements. Do not commence full operations until the test section report has been approved. Use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments are approved in advance.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Separation Layer

Provide aggregates consisting of crushed stone or gravel, shell, sand, or other sound, durable, approved materials processed and blended or naturally combined. Provide aggregates which are durable and sound, free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material. Limit the percentage of loss to a maximum of 50

percent after 500 revolutions when tested in accordance with **ASTM C131/C131M**. Provide aggregates with at least 75 percent by weight retained on each sieve having one freshly fractured face with the area at least equal to 75 percent of the smallest midsectional area of the piece. Provide aggregate that is reasonably uniform in density and quality. Provide aggregates having a maximum size of **2 inches**, a minimum of 70 percent passing the **3/4 inch** sieve, and within the limits specified as follows:

Maximum Aggregate Size	Lesser of 2 inches or mor 1/4 of layer thickness
~~Maximum~~ - ~~Minimum~~ CBR	50
Maximum Percent Passing No. 10	50
Maximum Percent Passing No. 200	8
Maximum Liquid Limit	25
Maximum Plasticity Index	5
d ₁₅ of Seperation Layer to d ₈₅ of Subgrade	Less than or equal to 5

Limit the portion of any blended component and of the completed course passing the **No. 40 sieve** to be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5. Provide any additional stability required to maintain a working platform for construction equipment. If a test section can demonstrate that a material has adequate stability to support construction equipment, the fractured face requirement can be deleted, subject to approval by the Government.

2.2 TESTS, INSPECTIONS, AND VERIFICATIONS

2.2.1 Initial Tests

Perform one of each of the following **Initial Tests** on the proposed material prior to commencing construction to demonstrate that the proposed material meets all specified requirements prior to installation. Complete this testing for each source if materials from more than one source are proposed.

- Gradation.
- Liquid limit and plasticity index.
- Moisture-density relationship.
- Wear.

Submit certified copies of test results for approval not less than 30 days before material is required for the work.

2.2.2 Approval of Material

Tentative approval of material will be based on initial test results.

2.3 EQUIPMENT, TOOLS, AND MACHINES

All plant, equipment, and tools used in the performance of the work are subject to approval by the Government before the work is started. Maintain all plant, equipment, and tools in satisfactory working condition at all times. Submit a list of proposed equipment, including descriptive data. Use equipment capable of minimizing segregation, producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Provide adequate drainage during the entire period of construction to prevent water from collecting or standing on the working area.

3.2 OPERATION OF AGGREGATE SOURCES

Condition aggregate sources on private lands in accordance with local laws and authorities.

3.3 STOCKPILING MATERIAL

Clear and level storage sites prior to stockpiling of material. Stockpile all materials, including approved material available from excavation and grading, in the manner and at the locations designated. Stockpile aggregates on the cleared and leveled areas designated to prevent segregation. Stockpile materials obtained from different sources separately.

3.4 PREPARATION OF UNDERLYING COURSE OR SUBGRADE

Clean the underlying course or subgrade of all foreign substances prior to constructing the separation layer. Construct the surface of the underlying course or subgrade to meet specified compaction and surface tolerances. Correct ruts or soft yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the specified requirements set forth herein by loosening and removing soft or unsatisfactory material and adding approved material, reshaping to line and grade, and recompact to specified density requirements. For cohesionless underlying courses or subgrades containing sands or gravels, as defined in [ASTM D2487](#), stabilize the surface prior to placement of the overlying course. Stabilize by mixing the overlying course material into the underlying course and compacting by approved methods. Consider the stabilized material as part of the underlying course and meet all requirements of the underlying course. Do not allow traffic or other operations to disturb the finished underlying course and maintain in a satisfactory condition until the overlying course is placed.

3.5 GRADE CONTROL

Provide a finished and completed subbase and rigid pavement base courses conforming to the lines, grades, and cross sections shown. Place line and grade stakes as necessary for control.

3.6 MIXING AND PLACING MATERIALS

Mix and place the materials to obtain uniformity of the material at the

water content specified. Make such adjustments in mixing or placing procedures or in equipment as directed to obtain the true grades, to minimize segregation and degradation, to reduce or accelerate loss or increase of water, and to provide a satisfactory course.

3.7 LAYER THICKNESS

Compact the completed course to the thickness indicated. Limit individual compacted lifts to a maximum thickness of 6 inches and a minimum thickness of 3 inches. Compact the course(s) to a total thickness that is within the tolerances of paragraph ACCEPTANCE. Where the measured thickness is more than 1/2 inch deficient, correct such areas by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 1/2 inch thicker than indicated, the course will be considered as conforming to the specified thickness requirements. However, the requirements for the overlying course thickness and plan grade are still applicable. The average job thickness will be the average of all thickness measurements taken for the job and within the tolerances of paragraph ACCEPTANCE.

3.8 COMPACTION

Compact each lift of the material, as specified, with approved compaction equipment. For cohesive soils, maintain water content during the compaction procedure to within plus or minus 2 percent of optimum water content determined from laboratory tests as specified in this Section and for cohesionless soils, maintain a water content to facilitate compaction without bulking. Begin rolling at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Slightly vary the length of alternate trips of the roller. Adjust speed of the roller as needed so that displacement of the aggregate does not occur. Compact mixture with hand-operated power tampers in all places not accessible to the rollers. Continue compaction of the separation layer until each lift is compacted through the full depth to meet the compaction requirements of Table 1. Make such adjustments in compacting or finishing procedures to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a compliant separation layer r course. Remove any materials that are found to be non-compliant and replace with compliant material or rework, as directed, to meet the requirements of this specification.

3.9 PROOF ROLLING

In addition to the compaction specified, proof roll subbase course in areas designated on the drawings by application of 6 coverages of a heavy pneumatic-tired roller having four or more tires abreast, each tire loaded to a minimum of 30,000 pounds and inflated to a minimum of 125 psi. A coverage is defined as the application of one tire print over the designated area. In the areas designated, apply proof rolling to the top lift of the completed subbase course. Maintain water content of the top lift of the subbase course as specified in paragraph COMPACTION from start of compaction to completion of proof rolling. Remove any subbase course materials that produce permanent deformation exceeding 1/2 inch and replace with satisfactory materials. Then recompact and proof roll to meet specifications.

3.10 EDGES OF SEPARATION LAYER

Place approved material along the outer edges of the separation layer in sufficient quantity to compact to the thickness of the course being constructed. When the course is being constructed in two or more lifts, simultaneously roll and compact at least a 2 foot width of this shoulder material with the rolling and compacting of each lift of the separation layer, as directed.

3.11 FINISHING

Finish the surface of the top lift of rigid pavement base course after final compaction and proof rolling by cutting any overbuild to grade and rolling with a steel-wheeled roller. Do not add thin lifts of material to the top lift to meet grade. If the elevation of the top lift exceeds the tolerances of paragraph ACCEPTANCE, scarify the top lift to a depth of at least 3 inches and blend new material in and compact to bring to grade. Make adjustments to rolling and finishing procedures to minimize segregation and degradation, obtain grades, maintain moisture content, and insure an acceptable rigid pavement base course. If the surface becomes rough, corrugated, uneven in texture, or traffic marked prior to completion, scarify the non-compliant portion and rework and recompact it or replace as directed.

3.12 SMOOTHNESS TEST

Construct the top lift so that the surface shows no deviations exceeding the tolerances of paragraph ACCEPTANCE when tested with a 12 foot straightedge. Test the entire area in both a longitudinal and a transverse direction on parallel lines. Perform the transverse lines 15 feet or less apart, as directed. Perform the longitudinal lines at the centerline of each placement lane and at the 1/8th point in from each side of the lane. 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 freestanding (unleveled) straightedge on the surface and measuring the maximum gap between the straightedge and the surface. Determine measurements along the entire length of the straight edge. Correct deviations exceeding the tolerances of Table 1 by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

3.13 FIELD QUALITY CONTROL

3.13.1 In-Place Tests

Perform one of each of the following In-Place Tests on samples taken from the placed and compacted separation layer course. Determine sample locations using random sampling in accordance with ASTM D3665. Take samples and test at the rates indicated.

- a. Perform density tests on every lift of material placed and at a frequency of one set of tests for every 2,000 square feet, or portion thereof, of completed area.
- b. Perform gradation including 0.02 mm size material on every lift of material placed and at a frequency of one gradation for every 1,000 square yards, or portion thereof, of material placed.

- c. Perform liquid limit and plasticity index tests at the same frequency as the gradation.
- d. Measure the thickness of each course at intervals providing at least one measurement for each 2,000 square feet or part thereof. Measure the thickness using test holes, at least 3 inches in diameter through the course.

3.13.2 Approval of Material

No paving shall occur without final approval of materials in prior lifts or strata and no paving over materials out of specifications will be permitted.

Final approval of the materials will be based on tests for density, thickness measurements, gradation, liquid limit, and plasticity index performed on samples taken from the completed and fully compacted course(s).

3.14 TRAFFIC

Completed portions of the separation layer can be opened to limited traffic, provided there is no marring or distorting of the surface by the traffic. Do not allow heavy equipment on the completed separation layer except when necessary for construction. When it is necessary for heavy equipment to travel on the completed separation layer, protect the area against marring or damage to the completed work. Repair damage to meet these specifications.

3.15 MAINTENANCE

Maintain the completed course in a satisfactory condition until the full pavement section is completed and accepted. Immediately repair any defects and repeat repairs as often as necessary to keep the area intact. Retest any course that was not paved over prior to the onset of winter to verify that it still complies with the requirements of this specification. Rework or replace any area that is damaged as necessary to comply with this specification.

3.16 DISPOSAL OF UNSATISFACTORY MATERIALS

Dispose of any unsuitable materials that have been removed outside the limits of Government-controlled land. No additional payments will be made for materials that have to be replaced.

-- End of Section --

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SECTION 32 12 15.13

ASPHALT PAVING FOR AIRFIELDS
11/20, CHG 1: 05/22

PART 1 GENERAL

1.1 FULL PAYMENT

1.1.1 Method of Measurement

Utilize the quantity of hot-mix warm-mix asphalt pavement, per ton placed and accepted, for the purposes of assessing the pay factors stipulated below.

1.1.2 Basis of Payment

The measured quantity of hot-mix warm-mix asphalt pavement will be paid for and included in the lump sum contract price. If less than 100 percent payment is due based on the pay factors stipulated in paragraph PERCENT PAYMENT and ACCEPTANCE, a unit price of \$937.00 per ton will be used for purposes of calculating the payment reduction.

1.2 PERCENT PAYMENT

When a pavement lot of material fails to meet the specification requirements for 100 percent pay as outlined in the following paragraphs, remove and replace the lot, or accept at a reduced price which will be computed by multiplying the unit price per ton by the lot's pay factor. The lot pay factor is determined by taking the lowest computed pay factor based on either laboratory air voids, in-place density, grade or smoothness (each discussed below). At the end of the project, an average of all lot pay factors will be calculated. If this average lot pay factor exceeds 95.0 percent and no individual lot has a pay factor less than 75.0 percent, then the percent payment for the entire project will be 100 percent of the unit bid price. If the average lot pay factor is less than 95.0 percent, then each lot will be paid for at the unit price multiplied by the lot's pay factor. For any lots which are less than 2000 tons, a weighted lot pay factor will be used to calculate the average lot pay factor. When work on a lot is required to be terminated before all sublots are completed, the results from the completed sublots will be analyzed to determine the percent payment for the lot following the same procedures and requirements for full lots but with fewer test results.

1.2.1 Mat and Joint Densities

The average in-place mat and joint densities are expressed as a percentage of the average theoretical maximum density (TMD) for the lot. The average TMD for each lot will be determined as the average TMD of the four random samples per lot. The average in-place mat density and joint density for a lot are determined and compared with Table 1 to calculate a single pay factor per lot based on in-place density, as described below. All density results for a lot will be completed and reported within 24 hours after the construction of that lot. Use the following process to determine the single pay factor for in-place density:

- a. Step 1: Determine the pay factors for mat density and joint density using Table 1.

- b. Step 2: Determine ratio of joint area to mat area. The area associated with the joint is considered to be 10 feet wide times the length of completed longitudinal construction joint in the lot. This joint area will not exceed the total lot size. The length of joint to be considered will be that length where a new lane has been placed against an adjacent lane of asphalt pavement, either any cold joint against another lot or any other existing asphalt paved previously. The area associated with the joint is expressed as a percentage of the total lot.
- c. Step 3: Compute the weighted pay factor for the joint using the formula in the example shown in paragraph PAY FACTOR BASED ON IN-PLACE DENSITY.
- d. Step 4: Where freshly placed asphalt pavement abuts old (not in contract) asphalt pavement, determine density at the tie-in longitudinal joint by taking one core per subplot at a random location for each lot of material placed adjacent to the joint. If Step 4 is not applicable, move to Step 5. The size of joint area is 10 feet wide by the length of the joint being paved. Locate the center of each of the four cores 6 inches from the edge of the existing pavement. Take each core at a random location along the length of the joint. The requirements for joint density for this lot, adjacent to the existing asphalt joint, are the same as that for the mat density specified in Table 1. For the interface of new asphalt pavement abutting existing asphalt (not in contract) joints at taxiways abutting runways, aprons, or other taxiways, take two additional randomly located cores along each taxiway intersection.
- e. Step 5: Compare weighted pay factor for joint density to pay factor for mat density and select the lowest. This selected pay factor is the pay factor based on density for the lot. When the TMD on both sides of a longitudinal joint is different, the average of these two TMD values will be used as the TMD needed to calculate the percent joint density.

When 0 percent payment is determined for mat density, remove and replace the rejected lot at least 4 inches into the cold lane adjacent to the longitudinal joint. Evaluate this as a new lot per paragraph MAT AND JOINT DENSITIES.

When 0 percent payment is determined for joint density, remove and replace the rejected longitudinal joint with a 10 feet wide paving lane that is centered over the joint. This 10 feet wide placement will be evaluated as a new lot. When removing and replacing a joint that fails to meet the project requirements, the result will be two additional longitudinal joints. Determine a pay factor for these longitudinal joints by randomly selecting two cores per lot centered on the joint each side of the lot. This will result in four total cores for joint density evaluation. Take the average of the joint density of the four cores to develop a pay factor for joint density determination. Average the new lot TMD values with the adjacent lot TMD values to determine a final average for joint density evaluation. In this case do not use a weighted pay factor. Evaluate the mat density for this lot per paragraph MAT AND JOINT DENSITIES.

<u>Table 1</u>		
<u>Pay Factor Based on In-place Density</u>		
<u>Average Mat Density (4 cores) (Percent of TMD)</u>	<u>Pay Factor, percent</u>	<u>Average Joint Density (4 cores)(Percent of TMD)</u>
<u>94.0 - 96.0</u>	<u>100.0</u>	<u>Above 92.5</u>
<u>93.9</u>	<u>100.0</u>	<u>92.4</u>
<u>93.8 or 96.1</u>	<u>99.9</u>	<u>92.3</u>
<u>93.7</u>	<u>99.8</u>	<u>92.2</u>
<u>93.6 or 96.2</u>	<u>99.6</u>	<u>92.1</u>
<u>93.5</u>	<u>99.4</u>	<u>92.0</u>
<u>93.4 or 96.3</u>	<u>99.1</u>	<u>91.9</u>
<u>93.3</u>	<u>98.7</u>	<u>91.8</u>
<u>93.2 or 96.4</u>	<u>98.3</u>	<u>91.7</u>
<u>93.1</u>	<u>97.8</u>	<u>91.6</u>
<u>93.0 or 96.5</u>	<u>97.3</u>	<u>91.5</u>
<u>92.9</u>	<u>96.3</u>	<u>91.4</u>
<u>92.8 or 96.6</u>	<u>94.1</u>	<u>91.3</u>
<u>92.7</u>	<u>92.2</u>	<u>91.2</u>
<u>92.6 or 96.7</u>	<u>90.3</u>	<u>91.1</u>
<u>92.5</u>	<u>87.9</u>	<u>91.0</u>
<u>92.4 or 96.8</u>	<u>85.7</u>	<u>90.9</u>
<u>92.3</u>	<u>83.3</u>	<u>90.8</u>
<u>92.2 or 96.9</u>	<u>80.6</u>	<u>90.7</u>
<u>92.1</u>	<u>78.0</u>	<u>90.6</u>
<u>92.0 or 97.0</u>	<u>75.0</u>	<u>90.5</u>
<u>below 92.0, above 97.0</u>	<u>0.0 (reject)</u>	<u>below 90.5</u>

1.2.2 Pay Factor Based on In-place Density

An example of the computation of a pay factor (in I-P units only) based on in-place density, is as follows: Assume the following test results for field density made on the lot: (1) Average mat density = 93.2 percent (of lab TMD). (2) Average joint density = 91.5 percent (of lab TMD). (3) Total area of lot = 30,000 square feet. (4) Length of completed longitudinal construction joint = 2,000 feet.

a. Step 1: Determine pay factor based on mat density and on joint density, using Table 1:

(1) Mat density of 93.2 percent = 98.3 pay factor.

(2) Joint density of 91.5 percent = 97.3 pay factor.

b. Step 2: Determine ratio of joint area (length of longitudinal joint x 10 feet) to mat area (total paved area in the lot): Multiply the length of completed longitudinal construction joint by the specified 10 feet width and divide by the mat area (total paved area in the lot).

(1) ,000 feet x 10 feet)/30000 square feet = 0.6667 ratio of joint area to mat area (ratio).

c. Step 3: Weighted pay factor (wpf) for joint is determined as indicated below:

$$(1) \text{ wpf} = \text{joint pay factor} + (100 - \text{joint pay factor}) (1 - \text{ratio}) \text{ wpf} \\ = 97.3 + (100 - 97.3) (1 - 0.6667) = 98.2 \text{ percent}$$

d. Step 4: Compare weighted pay factor for joint density to pay factor for mat density and select the smaller:

(1) Pay factor for mat density: 98.3 percent. Weighted pay factor for joint density: 98.2 percent

(2) Select the smaller of the two values as pay factor based on density: 98.2 percent

1.2.3 Payment Adjustment for Smoothness (Final Wearing Surface Only)

1.2.3.1 Longitudinal Smoothness

Evaluate smoothness per paragraph PROFILOGRAPH TESTING. Determine the pay factor for longitudinal smoothness by entering Table 2.

<u>Table 2</u>	
<u>Pay Factor for Smoothness</u>	
<u>Profile Index of a 0.1 mile segment of a lot exceeds the tolerance specified in paragraph SURFACE SMOOTHNESS by:</u>	<u>Pay Factor, Percent</u>
<u>0.0 inch per mile</u>	<u>100.0</u>
<u>greater than 0.0 inch per mile but less than 1.0 inches per mile</u>	<u>95.0</u>
<u>1.0 inches per mile but less than 2.0 inches per mile</u>	<u>90.0</u>
<u>2.0 inches per mile but less than 3.0 inches per mile</u>	<u>75.0</u>
<u>3.0 inches per mile or greater</u>	<u>Remove and Replace</u>

1.2.4 Laboratory Air Voids and Theoretical Maximum Density

Laboratory air voids will be calculated in accordance with ASTM D3203/D3203M by determining the density of each lab compacted specimen using the laboratory-prepared, thoroughly dry method in ASTM D2726/D2726M and determining the theoretical maximum density (TMD) of four of the sublots using ASTM D2041/D2041M. Laboratory air void calculations for each lot will use the average TMD values obtained for the

lot. The mean absolute deviation of the four laboratory air void contents (one from each subplot) from the JMF air void content will be evaluated and a pay factor determined from Table 3. All laboratory air void tests will be completed and reported within 24 hours after completion of construction of each lot. The TMD is also used for computation of in-place density, as required in paragraph MAT AND JOINT DENSITIES above.

1.2.4.1 Mean Absolute Deviation

An example of the computation of mean absolute deviation for laboratory air voids is as follows: Assume that the laboratory air voids are determined from 4 random samples of a lot (where 3 specimens were compacted from each sample). The average laboratory air voids for each subplot sample are determined to be 3.5, 3.0, 4.0, and 3.7. Assume that the target air voids from the JMF is 4.0. The mean absolute deviation is then:

$$\text{Mean Absolute Deviation} = (|3.5 - 4.0| + |3.0 - 4.0| + |4.0 - 4.0| + |3.7 - 4.0|)/4$$

$$= (0.5 + 1.0 + 0.0 + 0.3)/4 = (1.8)/4 = 0.45$$

The mean absolute deviation for laboratory air voids is determined to be 0.45. It can be seen from Table 3 that the lot's pay factor based on laboratory air voids, is 100 percent.

Table 3	
Pay Factor Based on Laboratory Air Voids	
Mean Absolute Deviation of Lab Air Voids from JMF	Pay Factor, Percent
0.60 or less	100
0.61 - 0.80	98
0.81 - 1.00	95
1.01 - 1.20	90
Above 1.20	reject (0)

1.2.5 Pay Factor Based on Plan Grade

Evaluate plan grade per paragraph PLAN GRADE. Use Table 4 for determining Pay Factor for Plan Grade. Evaluate plan grade on a lot basis.

Table 4	
Pay Factor for Plan Grade	
Percent of All Measurements Outside Tolerance	Pay Factor, percent
Less than 5	100
Greater than or equal to 5 but less than 10	90

<u>Table 4</u>	
<u>Pay Factor for Plan Grade</u>	
<u>Percent of All Measurements Outside Tolerance</u>	<u>Pay Factor, percent</u>
<u>Greater than or equal to 10 but less than 15</u>	<u>75</u>
<u>Greater than or equal to 15</u>	<u>Remove and replace the surface lift</u>

1.3 REFERENCES

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO M 156 (2013; R 2017) Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures

AASHTO T 329 (2015) Standard Test Method for Moisture Content of Hot Mix Asphalt (HMA) by Oven Method

ASPHALT INSTITUTE (AI)

AI MS-2 (2015) Asphalt Mix Design Methods

ASTM INTERNATIONAL (ASTM)

ASTM C29/C29M (2023) Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate

ASTM C88 (2018) Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

ASTM C117 (2023) Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing

ASTM C127 (2015) Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate

ASTM C128 (2022) Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate

ASTM C131/C131M (2020) Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

ASTM C136/C136M	(2019) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C142/C142M	(2017; R 2023) Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C566	(2013) Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
ASTM C1252	(2017) Standard Test Methods for Uncompacted Void Content of Fine Aggregate (as Influenced by Particle Shape, Surface Texture, and Grading)
ASTM D75/D75M	(2019) Standard Practice for Sampling Aggregates
ASTM D242/D242M	(2009; R 2014) Mineral Filler for Bituminous Paving Mixtures
ASTM D979/D979M	(2015) Sampling Bituminous Paving Mixtures
ASTM D2041/D2041M	(2011) Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D2172/D2172M	(2017; E 2018) Standard Test Methods for Quantitative Extraction of Asphalt Binder from Asphalt Mixtures
ASTM D2419	(2014) Sand Equivalent Value of Soils and Fine Aggregate
ASTM D2489/D2489M	(2016) Standard Test Method for Estimating Degree of Particle Coating of Asphalt Mixtures
ASTM D2726/D2726M	(2019) Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D3203/D3203M	(2017) Standard Test Method for Percent Air Voids in Compacted Asphalt Mixtures
ASTM D3665	(2012; R 2017) Standard Practice for Random Sampling of Construction Materials
ASTM D3666	(2016) Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D4125/D4125M	(2010) Asphalt Content of Bituminous Mixtures by the Nuclear Method
ASTM D4791	(2019) Flat Particles, Elongated

	Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D4867/D4867M	(2009; R 2014) Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D5361/D5361M	(2016) Standard Practice for Sampling Compacted Asphalt Mixtures for Laboratory Testing
ASTM D5444	(2015) Mechanical Size Analysis of Extracted Aggregate
ASTM D5821	(2013; R 2017) Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
ASTM D6084/D6084M	(2018) Standard Test Method for Elastic Recovery of Asphalt Materials by Ductilometer
ASTM D6307	(2019) Standard Test Method for Asphalt Content of Asphalt Mixture by Ignition Method
ASTM D6373	(2023) Standard Specification for Performance Graded Asphalt Binder
ASTM D6925	(2014) Standard Test Method for Preparation and Determination of the Relative Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyrotory Compactor
ASTM D6926	(2020) Standard Practice for Preparation of Asphalt Mixture Specimens Using Marshall Apparatus
ASTM D6927	(2015) Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures

1.4 AIRFIELD ASPHALT PAVING WORKSHOP

Attend a one day paving workshop held in advance of asphalt paving. Acquire a facility for the workshop in the vicinity of the installation, or other appropriate location, as approved by the Government. Provide a facility that includes at a minimum, parking and seating for forty attendees, audio/visual with standard connections, including TV, projector, screen and any other items as required for display of digital presentations, and access to Wi-Fi. Coordinate schedule with the Government. Attendance requirements apply to each paving crew anticipated to be on the project. At a minimum, the following attendees are required.

- a. Project Superintendent
- b. Paving Superintendent or Foreman(s)
- c. Paving Machine Operator(s)

- d. Asphalt Plant Operator(s)
- e. Airfield Asphalt Pavement Quality Control Manager
- f. Airfield Asphalt Pavement Inspector
- g. Airfield Asphalt Pavement Laboratory Technicians
- h. Roller Operators
- i. Aggregate Supplier(s)
- j. MTV Operator(s)

1.5 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Equipment; G

SD-02 Shop Drawings

Placement Plan; G

SD-03 Product Data

Diamond Grinding Plan; G

Mix Design; G

Contractor Quality Control; G

SD-04 Samples

Aggregates

Asphalt Binder

Warm-mix Additive

SD-06 Test Reports

Aggregates; G

QC Monitoring

Pavement Lots; G

SD-07 Certificates

Asphalt Binder; G

Testing Laboratory

Warm-mix Additive

Airfield Asphalt Pavement QC Manager

Airfield Asphalt Pavement Inspector

Airfield Asphalt Pavement Laboratory Technician

1.6 CONTRACTOR QUALITY CONTROL STAFF

Reference Section 01 45 00 QUALITY CONTROL for Contractor personnel qualification requirements along with the information included below. The Airfield Asphalt Pavement QC Manager is a separate person and is in addition to the CQC System Manager identified in Section 01 45 00 QC Manager identified in Section 01 45 00 QUALITY CONTROL. The Airfield Asphalt Pavement QC Manager will report to and assist the project CQC System Manager. Submit certifications for Contractor Quality Control Staff in the following areas:

- a. **Airfield Asphalt Pavement QC Manager⁽¹⁾**: The QC manager will oversee all QC testing and inspection, review asphalt pavement transmittals prior to submission to the Government, be responsible for making mix design adjustments, and in charge of all other activities related to performance. The QC manager will also ensure that daily reports and necessary transmittals arrive for Government review as specified.
- b. **Airfield Asphalt Pavement Inspector⁽¹⁾**: The Inspector will be available on the project during all paving operations. The Inspector is responsible for identifying observed paving issues and ensuring these issues are addressed by the Contractor Quality Control staff.
- c. **Airfield Asphalt Pavement Laboratory Technician⁽¹⁾**: The Technician will be responsible for conducting laboratory tests. The Airfield Asphalt Pavement Technician will be present in the laboratory anytime laboratory testing is underway.

⁽¹⁾: Registration for the Airfield Asphalt Pavement Certification Program can be found at www.airfieldasphaltpcert.com.

1.7 ACCEPTANCE

1.7.1 Acceptability of Work

Acquire the services of an independent commercial laboratory to perform acceptance testing. Acceptance of the plant produced mix and in-place requirements will be on a lot to lot basis. The materials and the pavement itself will be accepted on the basis of production testing. The Government may make check tests from split samples to validate the results of the production testing. Testing performed by the Government does not reduce the required testing of the independent commercial laboratory. Split samples will be taken for Government testing to reduce the variability between the independent commercial laboratory and the Government's test results. When the difference between the independent commercial laboratory and the Government's test results for split samples exceed the acceptable range of two results for multi-laboratory precision for the appropriate test method (i.e. ASTM) then at least one of the laboratories is determined to be in error. An evaluation of procedures and equipment in both laboratories will be made to determine the cause(s)

for the differences. Develop steps to correct procedures and equipment to bring multi-laboratory precision to within acceptable limits.

1.7.2 Acceptance Requirements

Provide all sampling and testing required for acceptance and payment adjustment. Where appropriate, adjustments in payment for individual lots of asphalt pavement will be made based on laboratory air voids, in-place density, smoothness, and grade in accordance with the following paragraphs. Surface smoothness and grade determinations will be made on the lot as a whole. Exceptions or adjustments to this will be made in situations where the mix within one lot is placed as part of both the intermediate and surface courses, thus smoothness and grade measurements for the entire lot cannot be made.

1.7.3 Pavement Lots

A standard lot for all requirements is equal to one day's production or 2,000 tons, whichever is smaller. Divide each lot into four equal sublots in order to evaluate laboratory air voids and in-place density. When operational conditions cause a lot to be terminated before the specified four sublots have been completed, use the following procedure to adjust the lot size and number of tests for the lot. Where three sublots have been completed, they constitute a lot. Where one or two sublots have been completed, incorporate them into the next lot and the total number of sublots (i.e. 5 or 6 sublots) is used for acceptance criteria. Maintain 4 sublots when possible. Include partial lots at the end of asphalt production into the previous lot. When more than one plant is simultaneously producing asphalt for the project, apply the lot size separately for each plant. Complete and report all asphalt testing including but not limited to aggregate gradation, asphalt content, theoretical maximum density, laboratory air voids, and in-place density testing within 24 hours, unless otherwise stated, after construction of each lot.

1.7.4 Sublot Sampling

Obtain one random mixture sample from each sublot in accordance with ASTM D979/D979M from a loaded truck or another approved location for determining laboratory air voids, theoretical maximum density, Contractor Quality Control, and for any additional testing as directed the Government. Representative samples will be selected from random trucks, using commonly recognized methods of assuring randomness conforming to ASTM D3665 and employing tables of random numbers or computer programs. Laboratory air voids will be determined from three laboratory compacted specimens of each sublot sample in accordance with ASTM D3203/D3203M. The specimens will be compacted within 2 hours of the time the mixture was loaded into trucks at the asphalt plant. Samples will not be reheated prior to compaction and insulated containers will be used as necessary to maintain the temperature.

1.7.5 Additional Sampling and Testing

The Government reserves the right to direct additional samples and tests for any area which appears to deviate from the specification requirements. The cost of any additional testing will be paid for by the Contractor. Testing in these areas will be treated as a separate lot. Payment will be made for the quantity of asphalt pavement represented by these tests in accordance with the provisions of this section.

1.7.6 Theoretical Maximum Density (TMD)

Measure theoretical maximum density one time for each subplot in accordance with [ASTM D2041/D2041M](#) for purposes of calculating laboratory air voids and determining in-place density. The average TMD for each lot will be determined as the average TMD of the random subplot samples. When the TMD on both sides of a longitudinal joint is different, the average of these two TMD values will be used as the TMD needed to calculate the percent joint density.

1.7.7 Laboratory Air Voids

Prepare one set of laboratory compacted specimens for each subplot in accordance with [ASTM D6926](#) using the hand-held hammer for the Marshall Method. Prepare one set of laboratory compacted specimens for each subplot in accordance with [ASTM D6925](#) using the Superpave gyratory compactor. Provide three test specimens prepared from the same sample for each set of laboratory compacted specimens. Compact the specimens within 2 hours of the time the mixture was loaded into trucks at the asphalt plant. Do not reheat samples prior to compaction. Provide insulated containers as necessary to maintain the sample temperature. Measure the bulk density of laboratory compacted specimens in accordance with [ASTM D2726/D2726M](#). Determine laboratory air voids from one set (three laboratory compacted specimens) for each subplot sample in accordance with [ASTM D3203/D3203M](#).

1.7.8 In-place Density

Obtain one random [6 inch](#) diameter core from the mat and joint of each subplot in accordance with [ASTM D5361/D5361M](#) for determining in-place density. Where different job mix formulas are required as part of the same project, and are adjacent to one another, follow the same joint density sampling and joint density testing instructions of this specification. Cut samples neatly with a diamond core drill bit. Obtain random cores that are the full thickness of the layer being placed. Select core locations randomly using the procedures contained in [ASTM D3665](#). Locate cores for mat density no closer than [12 inches](#) from a transverse or longitudinal joint. Center all cores for joint density on the joint. Discard samples that are clearly defective as a result of sampling and take an additional random core. When the random core is less than [1 inch](#) thick, it will not be included in the analysis. In this case, obtain another random core sample. Clean and tack coat dry core holes before filling with asphalt mixture. Fill all core holes with asphalt mixture and compact using a manual (hand-held) Marshall hammer to the density specified. Provide all tools, labor, and materials for cutting samples, cleaning, and filling the cored pavement. Measure in-place density in accordance with [ASTM D2726/D2726M](#) using each core obtained from the mat and joint.

1.7.9 Surface Smoothness

After the final rolling, but not later than 24 hours after placement, test the surface of the pavement in each entire lot by use of a straightedge and/or profilograph to reveal surface irregularities exceeding the tolerances specified. Straightedge is used for all lifts. Use the profilograph method for testing longitudinal smoothness on surface lifts only, except for paving lanes less than [0.10 miles](#), and at the ends of the paving limits for the project. Use straightedge method for all other measurements. If any pavement areas are diamond ground, retest these areas immediately after diamond grinding and submit results to the Government

for evaluation. At a minimum, provide enough information to determine exact location of grinding (station and offset from centerline), smoothness results, and the associated lot(s) pay factor for smoothness. Follow requirements of paragraph DIAMOND GRINDING if diamond grinding is required to correct smoothness. Where drawings show required deviations from a plane surface (for instance crowns, drainage inlets), finish the surface to meet the approval of the Government.

1.7.9.1 Straightedge Testing

Provide finished surfaces of the pavements within the tolerances specified in Table 5 when checked with an approved 12 foot straightedge. Start longitudinal and transverse straightedge testing with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurements. Perform continuous tests across all joints. Determine the amount of surface irregularity by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Use the straightedge to also measure abrupt changes in surface smoothness. Abrupt changes in the surface can be visually observed where the surface exhibits irregularities or discontinuities. Surface areas with obvious smoothness defects will be tested with the straightedge to determine the limits of the surface not meeting the tolerance requirements in Table 5. Do not perform straightedge measurements across grade changes or cross slope transitions.

After two full lots have been placed with an average of less than five percent of measurements out, a request can be made to reduce the testing frequency at a rate approved by the Government. Report all individual straightedge measurements coinciding with project stationing in each paving lot report.

Table 5		
Straightedge Surface Smoothness		
Pavement Category	Direction of Testing	Tolerance, inch
Shoulders (outside edge stripe)	Longitudinal	1/4
	Transverse	1/4

1.7.10 Plan Grade

Within 5 working days after completion of a particular lot incorporating the final wearing course, test the lot for conformance with specified plan grade requirements. Provide a final wearing surface of pavement conforming to the elevations and cross sections and not vary more than 0.03 foot for runways and landing zones or 0.05 foot for taxiways, aprons and shoulders. Deviation from the plan elevations will not be permitted in areas of pavements where closer conformance with planned elevation is required for the proper functioning of drainage and other appurtenant structures involved. The grade will be determined by running lines of levels at intervals of 50 feet, or less, longitudinally that coincides with the project spot elevations and lateral spacing to match the paving lane width (after cut back). In areas where the grade exceeds the tolerance by more than 50 percent, remove the surface lift full depth and

replace the lift with asphalt pavement to meet specification requirements, at no additional cost to the Government. Match finished surfaces at juncture with other pavements with finished surfaces of abutting pavements except for where paragraph ASPHALT PAVEMENT-PORTLAND CEMENT CONCRETE JOINTS apply. Diamond grinding can be used to remove high spots to meet grade requirements. Skin patching for correcting low areas or planing or milling for correcting high areas is not permitted. Provide finished surface grades in record drawing format showing design and constructed elevations which are stamped and signed by a licensed surveyor. Provide a comparison of the as-built grades to the design grades and determine a percentage of individual measurements exceeding the tolerances specified and determine pay factor per paragraph PAY FACTOR BASED ON PLAN GRADE. Submit the survey CAD files to the Government for record purposes. Submit all files including the calculation for percent measurements in each paving lot report.

1.8 LABORATORY ACCREDITATION AND VALIDATION

Provide laboratories used to develop the Job Mix Formula (JMF), perform acceptance testing, and Contractor Quality Control testing that meet the requirements of [ASTM D3666](#). Perform all required test methods by an accredited and validated laboratory including field standards. Schedule and provide payment for laboratory inspections. Additional payment or a time extension due to failure to acquire the required laboratory accreditation is not allowed. The Government will inspect the laboratory equipment and test procedures prior to the start of asphalt pavement operations for conformance with [ASTM D3666](#). In addition, all testing laboratories performing JMF, acceptance testing and Contractor Quality Control requires USACE validation by the Material Testing Center (MTC) for both parent laboratory and plant testing laboratory. Validation on all laboratories is required to remain current throughout the duration of the paving project. Contact the MTC manager listed at <https://mtc.erdcdren.mil/> for costs and scheduling. Submit a certificate of compliance signed by the manager of the laboratory stating that it meets these requirements to the Government prior to the start of construction. At a minimum, include the following certifications:

- a. Qualification(s) and certification(s) of personnel; laboratory manager, supervising technician, and testing technicians.
- b. A listing of equipment, with calibration dates, to be used in developing the job mix.
- c. A copy of the laboratory's quality control system.

1.9 ENVIRONMENTAL REQUIREMENTS

Do not place asphalt pavement upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 6. The temperature requirements may be waived by the Government, if requested; provided all other requirements, including in-place density, are met.

Table 6	
Surface Temperature Limitations of Underlying Course	
Mat Thickness, inches	Degrees F
3 or greater	40
Less than 3	45

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

This section is intended to stand alone for construction of asphalt pavement. However, where the construction covered herein interfaces with other sections, construct each interface to conform to the requirements of both this section and the other section, including tolerance for both.

Perform the work consisting of pavement courses composed of mineral aggregate and asphalt material heated and mixed in a central mixing plant and placed on a prepared course. Provide hot-mix asphalt (HMA) warm-mix asphalt (WMA) pavement designed and constructed in accordance with this section conforming to the lines, grades, thicknesses, and typical cross sections shown on the drawings. Construct each course to the depth, section, or elevation required by the drawings and rolled, finished, and approved before the placement of the next course (adjacent to or above). Submit proposed Placement Plan, indicating lane widths, longitudinal joints, and transverse joints for each course or lift.

2.2 EQUIPMENT

Provide product data for all components below.

2.2.1 Asphalt Mixing Plant

Provide plants used for the preparation of asphalt mixture conforming to the requirements of AASHTO M 156, including calibration data.

2.2.1.1 Truck Scales

Weigh the asphalt mixture on approved scales, or on certified public scales at no additional expense to the Government. Inspect and seal scales at least annually by an approved calibration laboratory.

2.2.1.2 Inspection of Plant

Provide access to the Government at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant; verifying weights, proportions, and material properties; checking the temperatures maintained in the preparation of the mixtures and for taking samples. Provide assistance as requested, for the Government to procure any desired samples.

2.2.1.3 Storage Silos

The asphalt mixture may be stored in non-insulated storage silos for a period of time not exceeding 3 hours. The asphalt mixture may be stored in insulated storage silos for a period of time not exceeding 8 hours. No

differences in the mix removed from silos and the mix loaded into trucks are allowed.

2.2.2 Hauling Equipment

Provide trucks used for hauling asphalt mixture that have tight, clean, and smooth metal beds. To prevent the mixture from adhering to them, lightly coat the truck beds with a minimum amount of paraffin oil, lime solution, or other approved material. Do not use petroleum based products as a release agent. Cover the bed of each truck with a tarp or other suitable cover at all times during transport. When necessary to ensure that the mixture is delivered to the site at the specified temperature, provide insulated or heated truck beds with covers (tarps) that are securely fastened.

2.2.3 Material Transfer Vehicle (MTV)

Provide a self-propelled MTV with a swing conveyor that delivers material to the paver from outside the paving lane and without making contact with the paver. Provide MTV capable to move back and forth between the hauling equipment and the paver providing material transfer to the paver, while allowing the paver to operate at a constant speed. Provide Material Transfer Vehicle with remixing and a minimum onboard storage capability of 13 tons.

2.2.4 Asphalt Pavers

Provide mechanical spreading and finishing equipment consisting of a self-powered paver, capable of spreading and finishing the mixture to the specified line, grade, and cross section. Provide paver with a vibrating screed capable of placing a uniform mixture to meet the specified thickness, smoothness, and grade without physical or temperature segregation, the full width of the material being placed. Provide a screed that effectively produces a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture. Provide information on the tractor(s) and screed(s) proposed for use.

2.2.4.1 Receiving Hopper

Provide paver with a receiving hopper of sufficient capacity to permit a uniform spreading operation and a distribution system to place the mixture uniformly in front of the screed without segregation.

2.2.4.2 Automatic Grade Controls

If an automatic grade control device is used, provide a paver equipped with a control system capable of automatically maintaining the specified screed elevation that is automatically actuated from either a reference line or through a system of mechanical sensors or sensor-directed mechanisms or devices which maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. Provide transverse slope controller capable of maintaining the screed at the desired slope within plus or minus 0.1 percent. Do not use the transverse slope controller to control grade. Provide controls capable of working in conjunction with any of the following attachments:

- a. Ski-type device of not less than 30 feet in length.
- b. Taut stringline set to grade.

- c. Short ski or shoe for joint matching.
- d. Laser control.
- e. GPS control.

2.2.5 Rollers

Provide rollers in good condition and operated at slow speeds to avoid displacement of the asphalt mixture. Provide sufficient number, type, and weight of rollers to compact the mixture to the required density while it is still in a workable condition. Do not use equipment which causes excessive crushing of the aggregate.

2.2.6 Diamond Grinding

Those performing diamond grinding are required to have a minimum of three years experience in diamond grinding of airfield 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 asphalt pavement with approved equipment after the asphalt pavement is at a minimum age of 14 days. Perform diamond grinding by sawing with saw blades impregnated with an industrial diamond abrasive. 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 asphalt pavement. 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 feet](#) wide. Diamond grinding equipment that causes raveling, fracturing of aggregate, or disturbance to the underlying material will not be allowed. The maximum area corrected by diamond grinding the surface of the asphalt pavement is 10 percent of the total area of any subplot. The maximum depth of diamond grinding is [1/2 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.

Prior to production diamond grinding operations, perform a test section at the approved location, consisting of a minimum of two adjacent passes with a minimum length of [40 feet](#) to allow evaluation of the finish and transition between adjacent passes. Production diamond grinding operations cannot be performed prior to approval.

2.3 [AGGREGATES](#)

Sample aggregates in the presence of a Government Representative. Obtain samples in accordance with [ASTM D75/D75M](#) and be representative of the materials to be used for the project. Provide aggregates consisting of crushed stone, crushed gravel, crushed slag, screenings, natural sand and mineral filler, as required. The portion of material retained on the [No. 4](#) sieve is coarse aggregate. The portion of material passing the [No. 4](#) sieve and retained on the [No. 200](#) sieve is fine aggregate. The portion passing the [No. 200](#) sieve is defined as mineral filler. Submit sufficient

materials to produce ~~200 pounds~~ 400 pounds of blended mixture for mix design verification. Submit all aggregate test results and samples to the Government at least 14 days prior to start of construction. Aggregate tests can be no older than 6 months prior to contract award.

2.3.1 Coarse Aggregate

Provide coarse aggregate consisting of sound, tough, durable particles, free from films of material that would prevent thorough coating and bonding with the asphalt material and free from organic matter and other deleterious substances. Provide coarse aggregate particles meeting the following requirements:

- a. The percentage of loss not greater than 40 percent after 500 revolutions when tested in accordance with [ASTM C131/C131M](#).
- b. The sodium sulfate soundness loss not exceeding 12 percent, or the magnesium sulfate soundness loss not exceeding 18 percent after five cycles when tested in accordance with [ASTM C88](#).
- c. At least 75 percent by weight of coarse aggregate contain at least two or more fractured faces when tested in accordance with [ASTM D5821](#) with fractured faces produced by crushing.
- d. The particle shape essentially cubical and the aggregate containing not more than 5 percent, by weight, of flat particles, elongated particles, or flat and elongated particles (5:1 ratio of maximum to minimum) when tested in accordance with [ASTM D4791](#) Method A.
- e. Slag consisting of air-cooled, blast furnace slag, with a compacted weight of not less than 75 pounds per cubic foot when tested in accordance with [ASTM C29/C29M](#).
- f. Clay lumps and friable particles not exceeding 0.3 percent, by weight, when tested in accordance with [ASTM C142/C142M](#).

2.3.2 Fine Aggregate

Provide fine aggregate consisting of clean, sound, tough, durable particles. Provide aggregate particles that are free from coatings of clay, silt, or any objectionable material, contain no clay balls, and meet the following requirements:

- a. Quantity of natural sand (noncrushed material) added to the aggregate blend not exceeding 15 percent by weight of total aggregate.
- b. Individual fine aggregate sources with a sand equivalent value greater than 45 when tested in accordance with [ASTM D2419](#).
- c. Fine aggregate portion of the blended aggregate with an uncompacted void content greater than 45.0 percent when tested in accordance with [ASTM C1252](#) Method A.
- d. Clay lumps and friable particles not exceeding 0.3 percent, by weight, when tested in accordance with [ASTM C142/C142M](#).

2.3.3 Mineral Filler

Provide mineral filler consisting of a nonplastic material meeting the

requirements of [ASTM D242/D242M](#).

2.3.4 Aggregate Gradation

Provide a combined aggregate gradation that conforms to gradations specified in Table 7, when tested in accordance with [ASTM C136/C136M](#) and [ASTM C117](#), and does not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa, but grades uniformly from coarse to fine. Provide a JMF within the specification limits; however, the gradation can exceed the limits when the allowable deviation from the JMF shown in Tables 10 and 11 are applied.

Table 7	
Aggregate Gradations	
	Gradation 2
Sieve Size, inch	Percent Passing by Mass
1	---
3/4	100
1/2	90-100
3/8	69-89
No. 4	53-73
No. 8	38-60
No. 16	26-48
No. 30	18-38
No. 50	11-27
No. 100	6-18
No. 200	3-6

2.4 ASPHALT BINDER

Provide asphalt binder that conforms to [ASTM D6373](#) for Performance Grade (PG) 76-22. Provide test data indicating grade certification by the supplier at the time of delivery of each load to the mix plant. For modified binders, perform PG Plus test requirements in [ASTM D6084/D6084M](#) Procedure B on RTFO aged binder, with a minimum elastic recovery of 75 percent. Submit copies of these certifications to the Government. The supplier is defined as the last source of any modification to the binder. The Government may sample and test the binder at the mix plant at any time before or during mix production.

2.5 MIX DESIGN

The mix design must be designed to meet the specs before it is processed

through the plant. The baghouse must not be used to remove fines to meet specified gradations. The baghouses are intended to keep the plant from generating a large cloud of dust when under production, not to modify the gradation. Develop the mix design and provide results of the Job Mix formula (JMF) and aggregates testing performed no earlier than 6 months prior to contract award. Provide asphalt mixture composed of well-graded aggregate, mineral filler if required, and asphalt material. Provide aggregate fractions sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of Table 7. Do not produce asphalt pavement for payment until a JMF has been approved. Design the asphalt mixture using hand-held (manual) Marshall hammer procedures contained in AI MS-2 and the criteria shown in Table 8. Mechanical hammers are not permitted during JMF development. Design the asphalt mixture using the Superpave gyratory compactor set at 50 gyrations using the procedures contained in AI MS-2 and the criteria shown in Table 8. Prepare samples at various asphalt contents and compacted in accordance with ASTM D6925/ASTM D6926. Use laboratory compaction temperatures for Polymer Modified Asphalts as recommended by the asphalt binder supplier. For tensile strength ratio (TSR) testing, adjust the compactive effort, as required, to provide specimens with an air void content of 7 plus or minus 1 percent. If the Tensile Strength Ratio (TSR) of the composite mixture, as determined by ASTM D4867/D4867M is less than 75, reject the aggregates or treat the asphalt mixture with an anti-stripping agent. Add a sufficient amount of anti-stripping agent to produce a TSR of not less than 75. If an antistrip agent is required, provide it at no additional cost to the Government. Provide sufficient materials to produce 200 pounds 400 pounds of blended mixture to the Government for verification of mix design at least 14 days prior to construction of test section.

2.5.1 JMF Requirements

Submit the proposed JMF in writing, for approval, at least 14 days prior to the start of the test section, including as a minimum:

- a. Percent passing each sieve size.
- b. Optimum asphalt content.
- c. Percent of each aggregate and mineral filler to be used.
- d. Asphalt viscosity grade, penetration grade, or performance grade and additional test requirements as specified in paragraph ASPHALT BINDER.
- e. Number of blows of hammer per side of molded specimen.
- f. Laboratory mixing and compaction temperatures.
- g. Supplier-recommended field mixing and compaction temperatures.
- h. Percentage and properties (asphalt content aggregate gradation, and aggregate properties) of RAP in accordance with paragraph RECYCLED ASPHALT PAVEMENT, if RAP is used.
- i. Temperature-viscosity relationship of the asphalt binder.
- j. Plot of the combined gradation on the 0.45 power gradation chart, stating the nominal maximum size.

- k. Graphical plots and summary tabulation of **stability, flow**, air voids, voids in the mineral aggregate, and unit weight versus asphalt content as shown in **AI MS-2**. Include summary tabulation that includes individual specimen data for each specimen tested.
- l. Specific gravity and absorption of each aggregate.
- m. Percent natural sand.
- n. Percent particles with two or more fractured faces (in coarse aggregate).
- o. Fine aggregate angularity.
- p. Percent flat or elongated particles (in coarse aggregate).
- q. Tensile Strength Ratio and wet/dry specimen test results.
- r. Type and amount of antistrip agent (if required).
- s. List of all modifiers.
- t. Percentage and properties (asphalt content aggregate gradation, and aggregate properties) of RAP in accordance with paragraph RECLAIMED ASPHALT PAVEMENT, if RAP is used.
- u. Date the JMF was developed. Mix designs that are not dated or which are from a prior construction season may not be accepted.
- v. **Warm-mix additive**.

Table 8	
Marshall Design Criteria	
Test Property	50 Blow Mix
Stability, pounds minimum	1350 ⁽¹⁾
Flow, 0.01 inch	8-18 ⁽²⁾
Air voids, percent	4 ⁽⁴⁾
Percent Voids in mineral aggregate (minimum)	See Table 9
Dust Proportion ⁽³⁾	0.8-1.2
TSR, minimum percent	75
TSR Conditioned Strength (minimum psi)	60

Table 8	
Marshall Design Criteria	
Test Property	50 Blow Mix
(1) This is a minimum requirement. Provide significantly higher average during construction to ensure compliance with the specifications.	
(2) The flow requirement is not applicable for Polymer Modified Asphalts	
(3) Dust Proportion is calculated as the aggregate content, expressed as a percent of mass, passing the No. 200 sieve, divided by the effective asphalt content, in percent of total mass of the mixture.	
(4) Select the JMF asphalt content corresponding to an air void content of 4 percent. Verify the other properties of Table 8 meet the specification requirements at this asphalt content.	

Table 8	
Superpave Gyratory Compaction Criteria	
Test Property	Value
Air voids, percent	4 ⁽¹⁾
Percent Voids in mineral aggregate (minimum)	See Table 9
Dust Proportion ⁽²⁾	0.8-1.2
TSR, minimum percent	75
TSR Conditioned Strength (minimum psi)	60
(1) Select the JMF asphalt content corresponding to an air void content of 4 percent. Verify the other properties of Table 8 meet the specification requirements at this asphalt content.	
(2) Dust Proportion is calculated as the aggregate content, expressed as a percent of mass, passing the No. 200 sieve, divided by the effective asphalt content, in percent of total mass of the mixture.	

Table 9	
Minimum Percent Voids in Mineral Aggregate (VMA) ⁽¹⁾	
Aggregate (See Table 7)	Minimum VMA, percent
Gradation 2	14.0

Table 9	
Minimum Percent Voids in Mineral Aggregate (VMA) ⁽¹⁾	
Aggregate (See Table 7)	Minimum VMA, percent
(1) Calculate VMA in accordance with AI MS-2, based on ASTM C127 and ASTM C128 bulk specific gravity for the aggregate.	

2.5.2 Adjustments to JMF

The JMF for each mixture is in effect until a new formula is approved in writing by the Government. Should a change in sources of any materials be made, perform a new mix design and a new JMF approved before the new material is used. Make minor adjustments within the specification limits to the JMF to optimize mix volumetric properties. Adjustments to the original JMF are limited to plus or minus 4 percent on the No. 4 and coarser sieves; plus or minus 3 percent on the No. 8 to No. 50 sieves; and plus or minus 1 percent on the No. 100 sieve. Adjustments to the JMF are limited to plus or minus 1.0 percent on the No. 200 sieve. Asphalt content adjustments are limited to plus or minus 0.40 from the original JMF. If adjustments are needed that exceed these limits, develop a new mix design.

2.6 RECLAIMED ASPHALT PAVEMENT

Reclaimed asphalt is not allowed for the project.

2.7 RECYCLED ASPHALT SHINGLES

Recycled asphalt shingles (RAS) is not allowed for the project.

PART 3 EXECUTION

3.1 CONTRACTOR QUALITY CONTROL

3.1.1 General Quality Control Requirements

Submit the Pavement Quality Control Plan. The Quality Control Plan is specific to this specification and supplements the overall Quality Control Plan required by Section 01 45 00. Do not produce hot-mix warm-mix asphalt pavement for payment until the quality control plan has been approved. In the quality control plan, address all elements which affect the quality of the pavement including, but not limited to:

- Mix Design and unique JMF identification code
- Aggregate Grading
- Quality of Materials
- Stockpile Management and procedures to prevent contamination
- Proportioning including percent of warm-mix additive
- Mixing and Transportation

- g. Mixture Volumetrics
- h. Moisture Content of Mixtures
- i. Placing and Finishing
- j. Joints
- k. Compaction, including Asphalt Pavement-Portland Cement Concrete joints
- l. Surface Smoothness
- m. Truck bed release agent
- n. Correlation of mechanical hammer to hand-held (manual) hammer. Determine the number of blows of the mechanical hammer required to provide the same density of the JMF as provided by the hand-held (manual) hammer. Use the average of three specimens per trial blow application.

3.1.2 Testing Laboratory

Provide a fully equipped asphalt laboratory located at the plant or job site that is equipped with heating and air conditioning units to maintain a temperature of 75 plus or minus 5 degrees F. Provide laboratory facilities that are kept clean and all equipment maintained in proper working condition. Provide the Government with unrestricted access to inspect the laboratory facility, to witness quality control activities, and to perform any check testing desired. The Government will advise in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to adversely affect test results, immediately suspend the incorporation of the materials into the work. Incorporation of the materials into the work will not be permitted to resume until the deficiencies are corrected.

3.1.3 Quality Control Testing

Perform all quality control tests applicable to these specifications and as set forth in the Quality Control Program. The quality control (QC) testing is separate and distinct from the acceptance testing in paragraph ACCEPTANCE. Use in-house capabilities or the independent commercial laboratory for quality control testing. Required elements of the testing program include, but are not limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, moisture in the asphalt mixture, laboratory air voids, stability, flow, in-place density, grade and smoothness. Develop a Quality Control Testing Plan as part of the Quality Control Program.

3.1.3.1 Asphalt Content

Determine asphalt content a minimum of twice per lot (a lot is defined in paragraph PAVEMENT LOTS) by one of the following methods: extraction method in accordance with ASTM D2172/D2172M, Method A or B, the ignition method in accordance with ASTM D6307, or the nuclear method in accordance with ASTM D4125/D4125M, provided each method is calibrated for the specific mix being used. For the extraction method, determine the weight of ash, as described in ASTM D2172/D2172M, as part of the first extraction test performed at the beginning of plant production; and as part of every

tenth extraction test performed thereafter, for the duration of plant production. Use the last weight of ash value in the calculation of the asphalt content for the mixture. The asphalt content for the lot will be determined by averaging the test results.

3.1.3.2 Aggregate Properties

Determine aggregate gradations a minimum of twice per lot (a lot is defined in paragraph PAVEMENT LOTS) from mechanical analysis of recovered aggregate in accordance with [ASTM D5444](#), [ASTM C136/C136M](#), and [ASTM C117](#). Determine the specific gravity of each aggregate size grouping for each [20,000 tons](#) in accordance with [ASTM C127](#) or [ASTM C128](#). Determine fractured faces for gravel sources for each [20,000 tons](#) in accordance with [ASTM D5821](#). Determine the uncompacted void content of fine aggregate (including manufactured sand and blending aggregate) for each [20,000 tons](#) in accordance with [ASTM C1252](#) Method A.

3.1.3.3 Temperatures

Check temperatures at least four times per lot, at necessary locations, to determine the temperature at the dryer, the asphalt binder in the storage tank, the asphalt mixture at the plant, and the asphalt mixture at the job site.

3.1.3.4 Moisture Content of Aggregate

Determine the moisture content of aggregate used for production a minimum of once per lot in accordance with [ASTM C566](#).

3.1.3.5 Moisture Content of Mixture

Determine the moisture content of the mixture at least once per lot in accordance with [AASHTO T 329](#).

3.1.3.6 Laboratory Air Voids, TMD, and VMA VMA, Marshall Stability and Flow

Obtain mixture samples at least four times per lot and compacted into specimens, [using 50 blows per side with the Marshall hand-held \(manual\) hammer as described in ASTM D6926](#). The mechanical Marshall hammer can be used only after JMF development and after correlation from hand-held (manual) Marshall hammer to mechanical Marshall hammer per guidance in [AI MS-2](#). After compaction, measure the bulk density of laboratory compacted specimens in accordance with [ASTM D2726/D2726M](#). Determine the laboratory air voids from the set (three laboratory compacted specimens) for each sample in accordance with [ASTM D3203/D3203M](#). Also calculate the VMA of each specimen in accordance with AI MS-2 based on ASTM C127 and ASTM C128 bulk specific gravity for the aggregate, [as well as the Marshall stability and flow, as described in ASTM D6927](#). Provide VMA within the limits of Table 9.

3.1.3.7 In-Place Density

Conduct any necessary testing to ensure the specified density is achieved. A nuclear gauge or other non-destructive testing device may be used to monitor pavement density for Contractor Quality Control purposes only.

3.1.3.8 Grade and Smoothness

Conduct the necessary checks to ensure the grade and smoothness requirements are met in accordance with paragraph ACCEPTANCE.

3.1.3.9 Additional Testing

Perform any additional testing, deemed necessary to control the process.

3.1.3.10 QC Monitoring

Submit all QC test results to the Government on a daily basis as the tests are performed. The Government reserves the right to monitor any of the Contractor's quality control testing and to perform duplicate testing as a check to the Contractor's quality control testing.

3.1.4 Sampling

When directed by the Government, sample and test any material which appears inconsistent with similar material being produced, unless such material is voluntarily removed and replaced or deficiencies corrected. Perform all sampling in accordance with standard procedures specified.

3.1.5 Control Charts

For process control, establish and maintain linear control charts on both individual samples and the running average of last four samples for the parameters listed in Table 10, as a minimum. Post the control charts as directed by the Government and maintain current at all times. Identify the following on the control charts, the project number, the test parameter being plotted, the individual sample numbers, the Action and Suspension Limits listed in Table 10 applicable to the test parameter being plotted, and the test results. Also show target values (JMF) on the control charts as indicators of central tendency for the cumulative percent passing, asphalt content, and laboratory air voids parameters. When the test results exceed either applicable Action Limit, take immediate steps to bring the process back in control. When the test results exceed either applicable Suspension Limit, halt production until the problem is solved. When the Suspension Limit is exceeded for individual values or running average values, the Government has the option to require removal and replacement of the material represented by the samples or to leave in place and base acceptance on mixture volumetric properties and in place density. Use the control charts as part of the process control system for identifying trends so that potential problems can be corrected before they occur. Make decisions concerning mix modifications based on analysis of the results provided in the control charts. In the Quality Control Plan, indicate the appropriate action to be taken to bring the process into control when certain parameters exceed their Action Limits.

Table 10				
Action and Suspension Limits for the Parameters to be Plotted on Individual and Running Average Control Charts				
	Individual Samples		Running Average of Last Four Samples	
Parameter to be Plotted	Action Limit	Suspension Limit	Action Limit	Suspension Limit
No. 4 sieve, Cumulative Percent Passing, deviation from JMF target; plus or minus values	6	8	4	5
No. 30 sieve, Cumulative Percent Passing, deviation from JMF target; plus or minus values	4	6	3	4
No. 200 sieve, Cumulative Percent Passing, deviation from JMF target; plus or minus values	1.4	2.0	1.1	1.5
Asphalt content, percent deviation from JMF target; plus or minus value	0.4	0.5	0.2	0.3
Laboratory Air Voids, percent deviation from JMF target value	No specific action and suspension limits set since this parameter is used to determine percent payment			
In-place Mat Density, percent of TMD	No specific action and suspension limits set since this parameter is used to determine percent payment			
In-place Joint Density, percent of TMD	No specific action and suspension limits set since this parameter is used to determine percent payment			
VMA, percent deviation from JMF target				
Gradation 1, 2 & 3	-0.5	-1.0	-0.25	-0.5
P _{0.075} /P _{be} Ratio, deviation from 1.0; plus or minus values	0.7	0.8	0.3	0.4
Table 10 cont'd				
Action and Suspension Limits for the Parameters to be Plotted on Individual and Running Average Control Charts - Marshall Compaction				
Stability, pounds (minimum)				
50 blow JMF	950	830	1350	1230
Flow, 0.01 inch				
50 blow JMF	8 min.	7 min.	9 min.	8 min.
	18 max.	19 max.	17 max.	18 max.

3.2 PREPARATION OF ASPHALT BINDER MATERIAL

Heat the asphalt binder material while avoiding local overheating and

providing a continuous supply of the asphalt material to the mixer at a uniform temperature. Maintain the temperature of unmodified asphalts to no more than 325 degrees F when added to the aggregates. The temperature of modified asphalts is not to exceed 350 degrees F.

3.3 PREPARATION OF MINERAL AGGREGATE

Heat and dry the aggregate for the mixture prior to mixing. No damage to the aggregates due to the maximum temperature and rate of heating used is allowed. Maintain the temperature no lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

3.4 PREPARATION OF ASPHALT MIXTURE

Weigh or meter the aggregates and the asphalt binder and introduce into the mixer in the amount specified by the JMF. Limit the temperature of the asphalt mixture to 350 degrees F 270 degrees F when the asphalt binder is added. Mix the combined materials until the aggregate obtains a thorough and uniform coating of asphalt binder (testing in accordance with ASTM D2489/D2489M may be required by the Contracting Officer) and is thoroughly distributed throughout the mixture. The moisture content of all asphalt mixture upon discharge from the plant is not to exceed 0.5 percent by total weight of mixture as measured by AASHTO T 329.

3.5 PREPARATION OF THE UNDERLYING SURFACE

Immediately before placing asphalt pavement, clean the underlying course of dust and debris. Apply a prime coat or tack coat in accordance with Section 32 12 13 BITUMINOUS TACK AND PRIME COATS.

3.6 TEST SECTION

Prior to full production, place a test section for each JMF used. Construct a test section 500 feet long and two paver passes wide with a longitudinal cold joint. Do not place the second lane of test section until the temperature of pavement edge is less than 175 degrees F. Construct the test section with the same depth as the course which it represents. Ensure the underlying grade or pavement structure upon which the test section is to be constructed is the same or very similar to the underlying layer for the project. Use the same equipment in construction of the test section as on the remainder of the course represented by the test section. Construct the test section as part of the project pavement as approved by the Government.

3.6.1 Sampling and Testing for Test Section

Obtain one representative sample from random trucks at the plant, compact triplicate specimens, and test for stability, flow, and laboratory air voids. Test a portion of the same sample for theoretical maximum density (TMD), aggregate gradation and asphalt content. Test an additional portion of the sample to determine the TSR. Adjust the compactive effort as required to provide TSR specimens with an air void content of 7 plus or minus 1 percent. Obtain four randomly selected cores from the finished pavement mat, and four from the longitudinal joint, and test for density. Perform random sampling in accordance with procedures contained in ASTM D3665. Construction may continue provided the test results are within the tolerances or exceed the minimum values shown in Table 11. If all test results meet the specified requirements, the test section may

remain as part of the project pavement. If test results exceed the tolerances shown, remove and replace the test section and construct another test section at no additional cost to the Government.

Table 11	
Test Section Requirements for Material and Mixture Properties	
Property	Specification Limit
Aggregate Gradation-Percent Passing (Individual Test Result)	
No. 4 and larger	JMF plus or minus 8
No. 8, No. 16, No. 30, and No. 50	JMF plus or minus 6
No. 100 and No. 200	JMF plus or minus 2.0
Asphalt Content, Percent (Individual Test Result)	JMF plus or minus 0.5
Laboratory Air Voids, Percent (Average of 3 specimens)	JMF plus or minus 1.0
VMA, Percent (Average of 3 specimens)	See Table 9
Tensile Strength Ratio (TSR) (At 7 percent plus/minus 1 percent air void content)	75 percent minimum
Conditioned Strength	60 psi minimum
Mat Density, Percent of TMD (Average of 4 Random Cores)	92.0 - 96.0
Joint Density, Percent of TMD (Average of 4 Random Cores)	90.5 minimum

Table 11 cont'd	
Test Section Requirements for Material and Mixture Properties Marshall Compaction	
Stability, (Average of 3 specimens)	1350 pounds minimum for 50-blow
Flow, 0.01 inch (Average of 3 specimens)	8 - 18 for 50-blow

3.6.2 Additional Test Sections

If the initial test section proves to be unacceptable, make the necessary adjustments to the JMF, plant operation, placing procedures, and rolling procedures before beginning construction of a second test section.

Construct and evaluate additional test sections, as required, for conformance to the specifications. Full production paving is not allowed to begin until an acceptable test section has been constructed and accepted.

3.7 TRANSPORTING AND PLACING

3.7.1 Transporting

Transport asphalt mixture from the mixing plant to the site in clean, tight vehicles. Schedule deliveries so that placing and compacting of mixture is uniform with minimum stopping and starting of the paver. Provide adequate artificial lighting for night placements. Hauling over freshly placed material is not permitted until the material has been compacted as specified, and allowed to cool to 140 degrees F.

3.7.2 Placing

Place the mix in lifts of adequate thickness and compacted at a temperature suitable for obtaining density, surface smoothness, and other specified requirements. Place the mixture to the full width by an asphalt paver; strike off in a uniform layer of such depth that, when the work is complete, the required thickness conforms to the grade and contour indicated. Do not broadcast waste mixture onto the mat or recycle it into the paver hopper. Collect waste mixture and dispose off site. Regulate the speed of the paver to eliminate pulling and tearing of the asphalt mat. Begin placement of the mixture along the centerline of a crowned section or on the high side of areas with a one-way slope. Place the mixture in consecutive adjacent strips having a minimum width of 10 feet. Offset the longitudinal joint in one course from the longitudinal joint in the course immediately below by at least 1 foot; however, locate the joint in the surface course at the centerline of the pavement. Offset transverse joints in one course by at least 10 feet from transverse joints in the previous course. Offset transverse joints in adjacent lanes a minimum of 10 feet. On isolated areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture may be spread and luted by hand tools. Construct the free edge of shoulder pavements following a guide (e.g. plumb-bob, stringline, etc.) to prevent various widths of the asphalt shoulder. Contractor may elect to cut-back the asphalt edge to maintain consistent shoulder dimensions shown on the plans.

3.8 COMPACTION OF MIXTURE

3.8.1 General

- a. After placing, thoroughly and uniformly compact the mixture by rolling. Compact the surface as soon as possible without causing displacement, cracking or shoving. Determine the sequence of rolling operations and the type of rollers used, except as specified in paragraph ASPHALT PAVEMENT-PORTLAND CEMENT CONCRETE JOINTS. Maintain the speed of the roller, at all times, sufficiently slow to avoid displacement of the asphalt mixture and be effective in compaction. Correct at once any displacement occurring as a result of reversing the direction of the roller, or from any other cause.
- b. Furnish sufficient rollers to handle the output of the plant. Continue rolling until the surface is of uniform texture, true to grade and cross section, and the required field density is obtained.

To prevent adhesion of the mixture to the roller, keep the drums properly moistened, but excessive water is not permitted. In areas not accessible to the roller, thoroughly compact the mixture with hand tampers. Remove the full depth of any mixture that becomes loose and broken, mixed with dirt, contains check-cracking, or is in any way defective, replace with fresh asphalt mixture and immediately compact to conform to the surrounding area. Perform this work at no expense to the Government. Skin patching is not allowed.

3.8.2 Segregation

The Government can sample and test any material that looks deficient. When the in-place material appears to be segregated, the Government has the option to sample the material and have it tested and compared to the aggregate gradation, asphalt content, and in-place density requirements in Table 11. If the material fails to meet these specification requirements, remove and replace the extent of the segregated material the full depth of the layer of asphalt mixture at no additional cost to the Government. When segregation occurs in the mat, take appropriate action to correct the process so that additional segregation does not occur.

3.9 JOINTS

Construct joints to ensure a continuous bond between the courses and to obtain the required density. Provide all joints with the same texture as other sections of the course and meet the requirements for smoothness and grade.

3.9.1 Transverse Joints

Do not pass the roller over the unprotected end of the freshly laid mixture, except when necessary to form a transverse joint. When necessary to form a transverse joint, construct by means of placing a bulkhead or by tapering the course. Utilize a dry saw cut on the transverse joint full depth and width on a straight line to expose a vertical face prior to placing the adjacent lane. Neither cutting equipment that uses water as a cooling or cutting agent nor milling equipment is permitted. Remove the cutback material and cutting debris from the project. Provide a tack coat in accordance with Section 32 12 13 BITUMINOUS TACK AND PRIME COATS to all contact surfaces before placing any fresh mixture against the joint.

3.9.2 Longitudinal Joints

Cut back longitudinal joints which are irregular, damaged, uncompacted, cold (less than 175 degrees F at the time of placing the adjacent lane), or otherwise defective, a minimum of 3 inches and a maximum of 6 inches from the top edge of the lift with a cutting wheel to expose a clean, sound, near vertical surface for the full depth of the course. Remove all cutback material from the project. Neither cutting equipment that uses water as a cooling or cutting agent nor milling equipment is permitted. Remove the cutback material and cutting debris from the project. Provide tack coat in accordance with Section 32 12 13 BITUMINOUS TACK AND PRIME COATS to all contact surfaces prior to placing any fresh mixture against the joint.

3.9.3 Asphalt Pavement-Portland Cement Concrete Joints

Joints between asphalt pavement and Portland Cement Concrete (PCC) require specific construction procedures for the asphalt pavement. The following

criteria are applicable to the first 10 feet or paver width of asphalt pavement adjacent to the PCC.

- a. For all lifts, place the asphalt pavement side of the joint in a direction parallel to the joint.
- b. For non-surface lifts (e.g. base or intermediate lifts), compact the mixture per paragraph MAT AND JOINT DENSITIES.
- b. For the surface lift place the asphalt pavement side sufficiently high so that when fully compacted the asphalt pavement is greater than 1/8 inch but less than 1/4 inch higher than the PCC side of the joint.
- c. For the surface lift, compact with steel wheel rollers and at least one rubber tire roller. Compact with a rubber tire roller that weights at least 20 tons with tires inflated to at least 90 psi. Avoid spalling the PCC during placement and compaction of the asphalt pavement. Operate steel wheel rollers in a way that prevents spalling the PCC. Repair any damage to PCC edges or joints as directed by the Government. If damage to the PCC joint or panel edge exceeds a total of 3 feet, remove and replace the PCC panel at no additional expense to the Government.
- d. For the surface lift, after compaction is finished, diamond grind a minimum width of 3 feet of the asphalt pavement so that the asphalt pavement side is less than 1/8 inch higher than the PCC side. Perform diamond grinding in accordance with subparagraph DIAMOND GRINDING above. The asphalt pavement immediately adjacent to the joint is not allowed to be lower than the PCC after the grinding operation. Transition the grinding into the asphalt pavement in a way that ensures good smoothness and provides drainage of water. The joint and adjacent materials when completed is required to meet all of the requirements for grade and smoothness. Measure smoothness across the asphalt pavement-PCC joint using a 12 feet straightedge. The acceptable tolerance is 1/8 inch.
- e. For all lifts, consider the asphalt pavement next to the PCC as a separate weighted pay factor associated with the lot being placed for evaluation. Lots are based on individual lifts. Do not commingle cores from different lifts for density evaluation purposes. Take four cores for each lot of material placed adjacent to the asphalt pavement-PCC joint. The size of lot is 10 feet wide by the length of the joint being paved. Perform the same computation as displayed in paragraph PAY FACTOR BASED ON IN-PLACE DENSITY above to determine the weighted pay factor. Select the lowest computed pay factor for the lot. Locate the center of each of the four cores 6 inches from the edge of the concrete. Take each core at a random location along the length of the joint. The requirements for joint density, adjacent to the PCC joint, are the same as that for the mat density specified in Table 1. For asphalt pavement-PCC joints at taxiways abutting runways, aprons, or other taxiways, take two additional randomly located cores along each taxiway intersection.
- f. All procedures, including repair of damaged PCC, are required to be in accordance with the approved Quality Control Plan.

-- End of Section --

SECTION 33 52 43.13

AVIATION FUEL PIPING
08/18, CHG 1: 02/21

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 basic designation only.

AMERICAN PETROLEUM INSTITUTE (API)

API RP 1110	(2013; R 2018) Recommended Practice for the Pressure Testing of Steel Pipelines for the Transportation of Gas, Petroleum Gas, Hazardous Liquids, Highly Volatile Liquids, or Carbon Dioxide
API STD 608	(2012) Metal Ball Valves - Flanged, Threaded, And Welding End
<u>API Spec 5L</u>	<u>(2018; 46th Ed; ERTA 2018) Line Pipe</u>
API Spec 6D	(June 2018, 4th Ed; Errata 1 July 2018; Errata 2 August 2018) Specification for Pipeline and Piping Valves
API Std 607	(2016) Fire Test for Quarter-turn Valves and Valves Equipped with Non-metallic Seats

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B1.1	(2024) Unified Inch Screw Threads (UN, UNR, and UNJ Thread Form)
ASME B16.5	(2020) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B16.9	(2018) Factory-Made Wrought Buttwelding Fittings
ASME B16.11	(2022) Forged Fittings, Socket-Welding and Threaded
ASME B16.21	(2021) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B18.2.1	(2012; R 2021) Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)
ASME B18.2.2	(2022) Nuts for General Applications:

Machine Screw Nuts, and Hex, Square, Hex
Flange, and Coupling Nuts (Inch Series)

ASME B31.3

(2024) Process Piping

ASME BPVC SEC VIII D1

(2023) BPVC Section VIII-Rules for
Construction of Pressure Vessels Division 1

AMERICAN WELDING SOCIETY (AWS)

AWS A5.1/A5.1M

(2025) Specification for Carbon Steel
Electrodes for Shielded Metal Arc Welding

AWS A5.5/A5.5M

(2022) Specification for Low-Alloy Steel
Electrodes for Shielded Metal Arc Welding

AWS A5.9/A5.9M

(2022) Welding Consumables-Wire
Electrodes, Strip Electrodes, Wires, and
Rods for Arc Welding of Stainless and Heat
Resisting Steels- Classification

ASTM INTERNATIONAL (ASTM)

ASTM A53/A53M

(2024) Standard Specification for Pipe,
Steel, Black and Hot-Dipped, Zinc-Coated,
Welded and Seamless

ASTM A105/A105M

(2023) Standard Specification for Carbon
Steel Forgings for Piping Applications

ASTM A182/A182M

(2024) Standard Specification for Forged
or Rolled Alloy and Stainless Steel Pipe
Flanges, Forged Fittings, and Valves and
Parts for High-Temperature Service

ASTM A193/A193M

(2024a) Standard Specification for
Alloy-Steel and Stainless Steel Bolting
Materials for High-Temperature Service and
Other Special Purpose Applications

ASTM A194/A194M

(2024) Standard Specification for Carbon
Steel, Alloy Steel, and Stainless Steel
Nuts for Bolts for High-Pressure or
High-Temperature Service, or Both

ASTM A234/A234M

(2025) Standard Specification for Piping
Fittings of Wrought Carbon Steel and Alloy
Steel for Moderate and High Temperature
Service

ASTM A269/A269M

(2024) Standard Specification for Seamless
and Welded Austenitic Stainless Steel
Tubing for General Service

ASTM A312/A312M

(2022a) Standard Specification for
Seamless, Welded, and Heavily Cold Worked
Austenitic Stainless Steel Pipes

ASTM A358/A358M

(2024) Standard Specification for

Electric-Fusion-Welded Austenitic
Chromium-Nickel Stainless Steel Pipe for
High-Temperature Service and General
Applications

ASTM A403/A403M

(2022b) Standard Specification for Wrought
Austenitic Stainless Steel Piping Fittings

ASTM A960/A960M

(2018a) Standard Specification for Common
Requirements for Wrought Steel Pipe
Fittings

ASTM A961/A961M

(2024) Standard Specification for Common
Requirements for Steel Flanges, Forged
Fittings, Valves, and Parts for Piping
Applications

ASTM D229

(2019) Standard Test Methods for Rigid
Sheet and Plate Materials Used for
Electrical Insulation

ASTM D1655

(2018a) Standard Specification for
Aviation Turbine Fuels

ASTM F436

(2011) Hardened Steel Washers

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41

(1991; R 1995) Recommended Practice on
Surge Voltages in Low-Voltage AC Power
Circuits

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)

MSS SP-58

(2018) Pipe Hangers and Supports -
Materials, Design and Manufacture,
Selection, Application, and Installation

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30

(2024) Flammable and Combustible Liquids
Code

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE J514

(2012) Hydraulic Tube Fittings

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-101

(2014; Rev C) Color Code for Pipelines and
for Compressed Gas Cylinders

MIL-STD-161

(2025; Rev J) Identification Methods for
Bulk Petroleum Products Systems Including
Hydrocarbon Missile Fuels

1.2 ADMINISTRATIVE REQUIREMENTS

Design conditions must be as specified in Section 33 52 43.11 AVIATION FUEL MECHANICAL EQUIPMENT. Submit [Operation and Maintenance Manuals](#) for the equipment items or systems listed below. Refer to Section 01 78 23.33 OPERATION AND MAINTENANCE MANUALS FOR AVIATION FUEL SYSTEMS for the information to be submitted for various type of equipment and systems.

- Manual Valves
- [Strainers](#)
- Protective Coatings
- Isolating Gasket Kits
- Gaskets

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

[SD-01 Preconstruction Submittals](#)

- [Contractor Qualifications; G](#)

[SD-03 Product Data](#)

- [Carbon Steel Piping; G](#)

- [Stainless Steel Piping; G](#)

- [Protective Coatings for Buried Stainless Steel Piping; G](#)

- [Fittings; G](#)

- [Isolating Gasket Kits; G](#)

- [Flange Protectors; G](#)

- [Lightning Surge Arrester; G](#)

- [Nuts and Bolts; G](#)

- [Gaskets; G.](#)

- [Ball Valves; G.](#)

- [Plug \(Double Block and Bleed\) Valves; G](#)

- [Thermal Relief Valves; G](#)

- [Strainers; G](#)

- [Pigging Accessories; G](#)

[SD-05 Design Data](#)

- [Pipeline Inventory; G](#)

SD-06 Test Reports

Pneumatic Test

Hydrostatic Test

SD-07 Certificates

Carbon Steel Piping

Stainless Steel Piping

Protective Coatings for Buried Stainless Steel Piping

Fittings

Isolating Gasket Kits

Lightning Surge Arrester

Nuts and Bolts

Gaskets

Ball Valves

Plug (Double Block and Bleed) Valves

Thermal Relief Valves

Strainers

Pigging Accessories

Survey Final Elevations

Pipeline Pigging Verification; G

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G

Ball Valves; G

Plug (Double Block and Bleed) Valves; G

Strainers; G

Isolating Gasket Kits; G

Refer to Section 01 78 23.33 OPERATION AND MAINTENANCE MANUALS FOR AVIATION FUEL SYSTEMS for the information to be submitted for various types of aviation fueling equipment and systems.

1.4 QUALITY ASSURANCE

1.4.1 Design Data

1.4.1.1 Pipeline Inventory

Fuel system volume must be calculated using as constructed pipe lengths, internal diameters, fittings, and components.

1.4.2 Contractor Qualifications

Each installation Contractor must have successfully completed at least 3 projects of the similar scope and the same size or larger within the last 6 years. Each installation Contractor must demonstrate specific installation experience in regard to the specific system installation to be performed. Each installation Contractor must have taken, if applicable, manufacturer's training courses on the installation of piping and must meet the licensing requirements in the state. Submit a letter listing prior projects, the date of construction, a point of contact for each prior project, the scope of work of each prior project, and a detailed list of work performed. Provide in the letter evidence of prior manufacturer's training and state licensing.

PART 2 PRODUCTS

2.1 TYPES OF FUEL HANDLED

2.1.1 Properties of F-24 Turbine Fuel

Jet Fuel system components must be suitable for use with F-24 turbine fuel (Jet A with additives FSII, CI/LI, and SDA); specific gravity of 0.81 at 60 degrees F; Reid vapor pressure less than 0.05 psi; flash point of 100 degrees F; viscosity 1.62 cSt at 60 degrees F; ASTM D1655.

2.2 MATERIALS AND EQUIPMENT

Pipe and fittings in contact with fuel must be stainless steel, interior epoxy coated carbon steel, or carbon steel as indicated on the drawings. No zinc coated metals, brass, bronze or other copper bearing alloys must be used in contact with the fuel. Identification of piping must be in accordance with MIL-STD-161 and as detailed on the drawings, unless specified otherwise. Flow arrows, at a minimum, must be provided adjacent each product labeling location. Flow arrows must be sized based on the requirements of MIL-STD-101. Material for manual valves must be as specified hereinafter.

2.2.1 Carbon Steel Piping

Subject each length of pipe to factory hydrostatic testing and ultrasonic testing in accordance with their respective pipe specification.

- a. Piping 12-Inches and Larger: Seamless or electric resistance welded, Schedule 80, ASTM A53/A53M Grade B.
- b. Piping 2-Inches and Smaller: Seamless, Schedule 80 API Spec 5L Grade B or ASTM A53/A53M Grade B.
- c. Welding Electrodes (Factory Fabrication): E70XX low hydrogen electrodes conforming to AWS A5.1/A5.1M or AWS A5.5/A5.5M.

- d. Internal Pipe Coating (Epoxy Lining) for piping 3.5 inches and larger must be fusion bonded epoxy coated in accordance with Section 33 52 80 LIQUID FUELS PIPELINE COATING SYSTEM. The ends of the pipe must be masked or wiped back a minimum of one inch but not more than 1-1/2 inches.

2.2.2 Stainless Steel Piping

a. Piping 2-1/2-Inches and Larger:

- (1) **ASTM A358/A358M**, Grade 304L, Class 1 or Class 3 with supplementary requirements of S1, S2 and S3, or **ASTM A312/A312M** Type 304L, seamless (only). Any agreements between the purchaser and the manufacturer or supplier as referenced in the applicable ASTM must include the Contracting Officer as a party to the agreement. All piping welds will receive 100 percent radiographic inspection, 100 percent liquid penetrant inspection, 100 percent visual inspection and all tests as required by the applicable ASTM Standard. Piping must be provided with a nominal wall thickness as shown in Table A for **ASTM A358/A358M** with the deviation from the nominal wall thickness less than 0.01-inch. **ASTM A312/A312M** seamless piping must be provided with a minimum schedule 10S wall thickness.

TABLE A		
Nominal Pipe Size	Nominal (Average) Pipe O.D.	Wall Thickness(tn)
16 inches	16.000 inches	0.312 inch
14 inches	14.000 inches	0.312 inch
12 inches	12.750 inches	0.250 inch
10 inches	10.750 inches	0.250 inch
8 inches	8.625 inches	0.250 inch
6 inches	6.625 inches	0.219 inch
4 inches	4.500 inches	0.219 inch
2.5 inches	2.875 inches	0.156 inch

- (2) Pipe Ends: All Piping must be provided with beveled ends per Chapter V, **ASME B31.3**, and must be shipped with the ends capped.
- (3) Factory Testing and Inspection Records: Per Table K341.3.2 of Chapter IX of **ASME B31.3**, visual, radiographic and liquid penetrant tests must be performed for each section of piping provided as all sections are subjected to cyclic conditions. All testing and inspections records must be submitted to the Contracting Officer and must indicate the pipe mark and installed location of each piping section on the project site. Observation by the Contracting Officer of the manufacturers and the fields testing and inspection procedures must be allowed under this

contract. Pipe certification along with pipe markings must be submitted before the pipe arrives on the job site.

(4) Provide a qualified inspector in accordance with Chapter VI of [ASME B31.3](#) to act as the owner's inspector (for the Government) at the pipe manufacturer's facility in addition to the manufacturer's inspector.

(5) Submit Quality Assurance Plan for the welding, inspecting and testing of the welded seam pipe.

- b. Piping [2-inches](#) and Smaller: Schedule 80 [ASTM A312/A312M](#) seamless Type 304L for threaded piping and schedule 40 (unless otherwise indicated) [ASTM A312/A312M](#) seamless Type 304L for welded piping.
- c. Stainless Steel Control Tubing: Seamless, fully annealed tubing conforming to [ASTM A269/A269M](#), Grade TP316, Rockwell hardness B80 or less. Wall thickness for [1/2-inch](#) tubing to be [0.049-inch](#).
- d. Welding Electrodes (Factory Fabrication): E308L conforming to [AWS A5.9/A5.9M](#).

2.2.3 External Protective Coatings for Buried Steel Piping

2.2.3.1 Protective Coatings for Buried Carbon Steel Piping

- a. New pipe and fittings must be factory coated fusion bonded epoxy (FBE) in accordance with Section 33 52 80 LIQUID FUELS PIPELINE COATING SYSTEM.
- b. Field joints and repairs must be fusion bonded epoxy (FBE) in accordance with Section 33 52 80 LIQUID FUELS PIPELINE COATING SYSTEM.

2.2.3.2 Protective Coatings for Buried Stainless Steel Piping

- a. New pipe and fittings must be factory coated fusion bonded epoxy (FBE) in accordance with Section [33 52 80](#) LIQUID FUELS PIPELINE COATING SYSTEM.
- b. Field joints and repairs must be fusion bonded epoxy (FBE) in accordance with Section [33 52 80](#) LIQUID FUELS PIPELINE COATING SYSTEM.
- c. Field joints and repairs in tight spots (valve pits, etc. when heaters are too big) must be liquid epoxy in accordance with Section [33 52 80](#) LIQUID FUELS PIPELINE COATING SYSTEM.
- d. Existing systems must match existing coating system and must be in accordance with Section [33 52 80](#) LIQUID FUELS PIPELINE COATING SYSTEM.

2.2.4 Fittings

2.2.4.1 General

Welding ells, caps, tees, reducers, etc., must be of materials compatible for welding to the pipe line in which they are installed, and wall thickness, pressure and temperature ratings of the fittings must be not less than the adjoining pipe line. Unless otherwise required by the conditions of installation, all elbows must be the long radius type.

Miter joints are not acceptable. Make odd angle offsets with pipe bends or elbows cut to the proper angle. Butt weld fittings must be factory-made wrought fittings manufactured by forging or shaping. Fabricated fittings will not be permitted. Welding branch fittings must be insert type suitable for radiographic inspections specified herein, unless indicated otherwise on the drawings.

2.2.4.2 Carbon Steel Fittings

- a. Fittings 2.5 Inches and Larger: Butt weld, conforming to ASTM A234/A234M, grade WPB and ASME B16.9 of the same wall thickness as the adjoining pipe. All welds must be radiographically examined throughout the entire length of each weld. Each fitting must be subjected to the Supplementary Requirements S52 and S53, Liquid Penetration examination and Magnetic-Particle Examination per ASTM A960/A960M. Detectable flaws will not be accepted in the supplementary examinations. Fittings must be identified to relate them to their respective radiograph.
- b. Fittings 2 Inches and Smaller. Forged (socket welded or if indicated on drawings, threaded), 2,000-pound W.O.G., conforming to ASTM A105/A105M, Grade 2 and ASME B16.11. Threaded fittings must only be used for above grade applications. Underground and in pits low point drain pipe and high point vent pipe must be butt welded.
- c. Interior Epoxy Coating System must be applied to the fittings as specified in paragraph "Carbon Steel Piping."

2.2.4.3 Stainless Steel Fittings

- a. Fittings 2.5 Inches and Larger: Butt weld stainless steel conforming to ASTM A403/A403M, Class WP, Type 304L, seamless or welded, and ASME B16.9 of the same minimum wall thickness as the adjoining pipe. Welded fittings must be tested and inspected the same as the welded seam pipe and meet the same requirements as for the pipe. Elbows located between the pig launcher and the receiver, must have a radius 3 times the pipe diameter (3D bends). Tees with branches 6-inches and larger, must have guide bars as detailed on the drawings.
- b. Fittings 2-Inches and Smaller: Forged Type 304 or 304L (socket welded or if indicated on drawings, threaded), 3,000-pound W.O.G. conforming to ASTM A182/A182M and ASME B16.11. Threaded fittings must only be used for above grade applications. Underground and in pits low point drain pipe and high point vent pipe must be butt welded.
- c. Unions. Conforming to ASTM A312/A312M, Grade 304 or 316.
- d. Flanges. 150 pound weld neck, forged Type 304 stainless steel flanges conforming to ASTM A182/A182M and ASME B16.5, except flanges that are to be connected to the fueling/defueling pumps must be 300-pound. For flanges 2" and smaller located in contained pumphouses, contained truck offloads, contained truck fill stands, and other visibly contained areas the fitting may be forged (socket welded), 900 kg 3,000-pound W.O.G., conforming to ASTM A182/A182M and ASME B16.11. In pits, vaults, on PRV piping for pipeline routes, and other uncontained locations the connection must be butt welded. Flanges to be 1/16-inch raised-face with phonographic finish, except where required otherwise to match equipment furnished. Match flange face to valves or equipment furnished. Flanges must be subjected to the Supplementary

Requirements S56, Liquid Penetrant Examination as outlined in
[ASTM A961/A961M](#). Detectable flaws will not be acceptable.

- e. Stainless Steel Tube Fittings. Flareless, 316 stainless steel fittings conforming to [SAE J514](#).
- f. Fabricated Bends. Where indicated, provide fabricated bends with a centerline radius equal to 3 times the nominal pipe diameter (3D bends). 3D bends must have a 1 foot long straight section on each side of the bend (from tangent points), to prevent ovality at the weld joints. Field bending of pipe is not permitted. 3D bends must be fabricated of stainless steel pipe that complies with paragraph STAINLESS STEEL PIPING of this section.

2.2.4.4 Isolating Gasket Kits (Insulating) for Flanges

Provide [ASTM D229](#) electrical insulating material of 1,000 ohms minimum resistance or 500 Volts per Mil (VPM) minimum dielectric strength; material must be resistant to the effects of aviation hydrocarbon fuels. Provide full face insulating gaskets between flanges with fluoroelastomer (FKM), commonly referred to as Viton, O-ring sealing surfaces. Provide full surface [0.03-inch](#) thick wall thickness, spiral-wound mylar insulating sleeves between the bolts and the holes in flanges; bolts may have reduced shanks of a diameter not less than the diameter at the root of threads. Provide [0.125-inch](#) thick high-strength phenolic insulating washers next to flanges and provide flat circular stainless steel washers over insulating washers and under bolt heads and nuts. Provide bolts [0.5-inch](#) longer than standard length to compensate for the thicker insulating gaskets and the washers under bolt heads and nuts. Above grade flanges separated by electrically isolating gasket kits must be provided with weatherproof [lightning surge arrester](#) devices. The surge arrester must bolt across flanges separated by insulating gasket kits per detail on contract drawings. The arrestor must have the following features:

- a. Weatherproof NEMA 6P enclosure.
- b. Bidirectional and bipolar protection.
- c. Constructed of solid state components, no lights, fuses or relays and used without required maintenance or replacement.
- d. Withstand unlimited number of surges at 50,000 Amperes.
- e. Maximum clamping voltage of 700 Volts based on a [IEEE C62.41](#) 8x20 microsecond wave form at 50,000 Amperes peak measured at the device terminals (zero lead length).
- f. A UL listed arrester for installation in Class 1, Division 1 or Class 1, Division 2, Group D, hazardous areas.

Install the mounting bracket and leads on the flange side of the bolt insulating sleeve and washer, and size in accordance with this schedule:

Line Size	Bolt Size
2 inch	5/8 inch
2.5 inch	5/8 inch
3 inch	5/8 inch
4 inch	5/8 inch
6 inch	3/4 inch
8 inch	3/4 inch

Line Size	Bolt Size
10 inch	7/8 inch
12 inch	7/8 inch
14 inch	1 inch
16 inch	1 inch
Note: Make allowance for the 1/32-inch thickness of the insulating sleeve around the bolts when sizing the mounting lugs.	

2.2.4.5 Flange Protectors

Protectors shall protect the bolts, studs, nuts, and gaskets of a flanged end connection from corrosion or damage due to exposure to the environment. Protectors must be weather and ultraviolet (UP) resistant. Protectors must allow for quick and easy removal and re-installation by maintenance personnel. Provide grease filled bolt caps. Corrosion prevention grease shall be non-expansive and designed for the service. Provide protectors that allow for visual inspection of the flange gasket without requiring removal. Provide protectors with grease fittings which allow the injection of grease into the flange cavity. Only provide in low point drain pits, high point vent pits, and isolation valve vaults.

2.2.5 Nuts and Bolts

Bolts and nuts for pipe flanges, flanged fittings, valves and accessories must conform to ASME B18.2.1 and ASME B18.2.2, except as otherwise specified. Bolts must be of sufficient length to obtain full bearing on the nuts and must project no more than three full threads beyond the nuts with the bolts tightened to the required torque. Bolts must be regular hexagonal bolts conforming to ASME B18.2.1 with material conforming to ASTM A193/A193M, Class 2, Grade B8, stainless steel, when connections are made where a stainless steel flange is involved, and Grade B7, chromium molybdenum alloy, when only carbon steel flanges are involved. Bolts must be threaded in accordance with ASME B1.1, Class 2A fit, Coarse Thread Series, for sizes one inch and smaller and Eight-Pitch Thread Series for sizes larger than one inch. Nuts must conform to ASME B18.2.2, hexagonal, heavy series with material conforming to ASTM A194/A194M, Grade 8, stainless steel for stainless steel bolts, and Grade 7, chromium molybdenum alloy for chromium molybdenum alloy bolts. Nuts must be threaded in accordance with ASME B1.1, Class 2B fit, Coarse Thread Series for sizes one inch and smaller and Eight-Pitch Thread Series for sizes larger than one inch. Provide washers under bolt heads and nuts. Use chromium molybdenum alloy washers dimensioned to ASTM F436 flat circular for chromium molybdenum bolts. Stainless steel washer dimensioned in accordance with ASTM F436 flat circular, use material the same as the bolt. Use torque wrenches to tighten all flange bolts to the torque recommended by the gasket manufacturer. Tight in the pattern recommended by the gasket manufacturer. Use anti-seize compound on stainless steel bolts.

2.2.6 Gaskets

ASME B16.21, composition ring, using a Buna-N, polytetrafluoroethylene (PTFE), or a protein and glycerin binder, 0.1250-inch thick. Gaskets must be resistant to the effects of aviation hydrocarbon fuels and manufactured of fire-resistant materials. Full-face gaskets must be used for flat-face flanged joints. Ring gaskets must be used for raised-face flanged joints. Gaskets must be of one piece factory cut.

2.2.7 Relief and Drain System Piping

Pressure relief valve discharge lines and drain lines to the product recovery tank must be Schedule 40 ASTM A312/A312M seamless Type 304L Stainless Steel. See Gaskets specified herein before.

2.2.8 Relief and Drain System Protective Coating

Pipe must be factory coated as specified herein before for steel piping.

2.2.9 Stainless Steel Field Applied Protective Coatings

The field joints and fittings of all underground piping must be coated in accordance with Section 33 52 80 LIQUID FUELS PIPELINE COATING SYSTEMS, Para 2.2 (Field Applied External Pipe Coating).

2.2.10 Threaded Joints

Threaded joints, if indicated on the drawings, must be made tight with manufacturer recommended PTFE tape or a mixture of graphite and oil, inert filler and oil, or with a graphite compound, applied with a brush to the male threads. Not more than three threads must show on made up joints. Threaded joints, mechanical couplings and flanges will not be permitted in buried piping. Threaded joints must not get welded.

2.2.11 Welded Joints

Welded joints in steel pipe must be as specified in Part 3.

2.3 MANUAL VALVES

All portions of a valve coming in contact with fuel in stainless steel pipe lines or epoxy lined carbon steel pipe lines must be of noncorrosive material. Valves in stainless steel pipe lines or epoxy lined carbon steel pipe lines must be Type 304 or Type 316 stainless steel or carbon steel internally plated with chromium or nickel or internally electroless nickel plated. Valves in unlined carbon steel pipelines must have carbon steel body. Stem and trim must be stainless steel for all valves. Manually operated valves 6 inches and larger must be worm-gear operated and valves smaller than 6 inches must be lever operated or handwheel operated. Valves smaller than 2 inches must have lever-type handles. Handles installed more than 6 feet above finished floor must have chain operators. Valve indicators installed higher than 5 feet must have a position indicator visible from ground level. Sprocket wheel for chain operator must be aluminum. Valves in the isolation pits in fuel piping between the pig launchers and the pig receivers must be full bore, piggable, double block and bleed type. The full bore piggable valves at the launcher and the receiver must be ball type.

2.3.1 Ball Valves

Ball valves must be fire tested and qualified in accordance with the requirements of **API Std 607** and **API STD 608**. Seal material for the fire test must be graphite, seal material for the project must be as indicated below. Ball valves must be nonlubricated valves that operate from fully open to fully closed with 90 degree rotation of the ball. Valves **2 inches** and larger must conform to applicable construction and dimension requirements of **API Spec 6D**, ANSI Class 150 and must have flanged ends. Valves smaller than **2 inches** must be ANSI class 150 valves with flanged ends, unless noted otherwise. The balls in valves **10 inches** full port and **12 inch** regular port and larger must have trunnion type support bearings. Except as otherwise specified, reduced port or full port valves may be provided at the Contractor's option. All **1-inch** ball valves associated with thermal relief assemblies shall be full port. Balls must be solid, not hollow cavity.

2.3.1.1 Materials

Ball must be stainless steel. Ball valves must have polytetrafluoroethylene (TFM) or fluoroelastomer (FKM), commonly referred to as Viton seats, body seals and stem seals. Valves **4 inches** and smaller must have a locking mechanism.

2.3.2 Plug (Double Block and Bleed) Valves

API Spec 6D, ANSI Class 150, non-lubricated, resilient, double seated, trunnion mounted, tapered lift plug capable of two-way shutoff. Valve must have tapered plug of steel or ductile iron with chrome or nickel plating and plug supported on upper and lower trunnions. Sealing slips must be steel or ductile iron, with Viton seals which are held in place by dovetail connections. Valve design must permit sealing slips to be replaced from the bottom with the valve mounted in the piping. Valves must operate from fully open to fully closed by rotation of the handwheel to lift and turn the plug. Valves must have weatherproof operators with mechanical position indicators. Indicator shaft must be stainless steel. Minimum bore size must be not less than 65 percent of the internal cross sectional area of a pipe of the same nominal diameter unless bore height of plug equals the nominal pipe diameter and manufacturer can show equal or better flow characteristics of the reduced bore size design. Full port plug valves in distribution piping must be provided with a **1/2-inch** threaded body drain. Provide full port (piggable) double block and bleed plug valves where indicated on the mechanical drawings.

2.3.2.1 Valve Operation

Rotation of the handwheel toward open must lift the plug without wiping the seals and retract the sealing slips so that during rotation of the plug clearance is maintained between the sealing slips and the valve body. Rotation of the handwheel toward closed must lower the plug after the sealing slips are aligned with the valve body and force the sealing slips against the valve body for positive closure. When valve is closed, the slips must form a secondary fire-safe metal-to-metal seat on both sides of the resilient seal. Plug valves located in Isolation Valve Pits or vaults must be provided with handwheel extensions.

2.3.2.2 Relief Valves

ANSI Class 150. Provide plug valves with automatic thermal relief valves

to relieve the pressure build up in the internal body cavity when the plug valve is closed. Relief valves must open at 25 psi differential pressure and must discharge to the throat of, and to the upstream side, of the plug valve.

2.3.2.3 Bleed Valves

ANSI Class 150, stainless steel body valve. Provide manually operated bleed valves that can be opened to verify that the plug valves are not leaking when in the closed position.

2.4 THERMAL RELIEF VALVES

Relief valves must be the fully enclosed, spring loaded, angle pattern, single port, hydraulically operated type with plain caps, and must be labeled in accordance with ASME BPVC SEC VIII D1 (GPM). Valve stems must be fully guided between the closed and fully opened positions. The valves must be factory-set to open at 225 psi unless otherwise indicated on the drawings. Operating pressure must be adjustable by means of an enclosed adjusting screw. The valves must have a minimum capacity of 20 GPM at 10 percent overpressure. Valves must have a replaceable seat. Relief valves that do not relieve to a zone of atmospheric pressure or tank must be a balanced (non-ASME) type relief or regulator valve.

2.4.1 Valve Materials

Valves must have carbon steel bodies (stainless steel on SS pipelines) and bonnets with stainless steel springs and trim. Valves must be Class 150 flanged end connections.

2.5 PIPING ACCESSORIES

2.5.1 Pipe Sleeves

Pipe sleeves must be installed where indicated and at all points where the piping passes through concrete construction. Such sleeves must be of sufficient inside diameter to provide a minimum clear distance between the pipe and the sleeve of 1/2-inch. Sleeves through concrete pits or slabs must be GR TP316L Schedule 40S stainless steel pipe, unless indicated otherwise. Each sleeve must extend through the respective pit wall or slab and must be provided with a Buna-N casing seal (Viton when exposed to sunlight). Sleeves where piping passes under roads or piping indicated to be double walled must be standard weight carbon steel pipe with a protective coating as previously specified. Alignment of the sleeve and piping must be such that the pipe is accurately centered within the sleeve by a nonconductive centering element. The sleeve must be securely anchored to prevent dislocation. Closure of space between the pipe and the pipe sleeve must be by means of a mechanically adjustable segmented elastomeric seal. The seal must be installed so as to be flush.

2.5.2 Strainers

2.5.2.1 Cone Type

Strainer must be stainless steel type 304 or 316, 100 mesh screen with the ratio of net open area of strainer to the area of the connecting pipe must be not less than three to one at the pump suction, and 5/32-inch perforations and suitable for bi-directional flow at the inlet to the hydrant pit control valves. Pump suction strainer must have a 100 mesh

screen with not less than 300 percent open area (ratio of the strainer open area to the cross section of pipe). Hydrant pit control valve strainer must be the basket type, have 5/32 inch perforations, suitable for bidirectional flow, and have a minimum 200 percent open area.

2.5.3 Pipe Supports

2.5.3.1 General

Pipe supports must conform to **MSS SP-58**. Supports must be provided at the indicated locations. Steel support structures shall be hot-dipped galvanized unless otherwise noted on the Structural drawings. A PTFE pad must be installed between the pipe and any steel structure to prevent metal to metal contact.

2.5.3.2 Adjustable Pipe Supports

Adjustable pipe supports must consist of a cast iron saddle and a threaded nipple connected to a carbon steel pipe by means of a special reducer conforming to **MSS SP-58**. The supports must be provided with PTFE insulation strips.

2.5.3.3 Low Friction Supports

Low friction supports must be self-lubricating antifriction element composed of reinforced PTFE. Units must be factory designed and manufactured.

2.5.3.4 Concrete and Grout

Concrete and grout for anchors and supports must comply with SECTION **03 30 00** CAST-IN-PLACE CONCRETE.

2.5.4 Pigging Accessories

2.5.4.1 Closure Door

The closure must be hinged, swing bolted closure of the same material as the pipe and for a Class 150 system. Gasket must be nitrile. Eye bolts must be pinned to lugs on the hub.

2.5.4.2 Signaler

The pig signaler must be mechanical flag type with manual reset, and be located on the pig launcher and the pig receiver. Material in contact with the fuel must be stainless steel. Units must be suitable for removal and installation under line pressure of 275 psig. Signaler must be capable of withstanding line pressure of a Class 150 system.

PART 3 EXECUTION

3.1 VERIFICATION OF DIMENSIONS

After becoming familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

3.2 CLEANING OF PIPING

Keep the interior and ends of all new piping, affected by construction operations, thoroughly cleaned of foreign matter and water before and after being installed. Piping systems must be kept clean during installation by means of plugs or other approved methods. When work is not in progress, open ends of piping and fittings must be closed so that no water or other foreign substance will enter the pipes or fittings. Piping must be inspected before placing into position. The interior of each length of pipe must be cleaned after welding insuring that the interior of the piping is free of foreign matter when it is connected into the system.

3.3 TRENCHING AND BACKFILLING

Trenching and backfilling must conform to , and the following bedding and backfill requirements. The pipe must be laid in a bed of sand 6 inches deep, compacted in accordance with Section 31 00 00 EARTHWORK, paragraph "Backfilling and Compaction". Sand must meet the requirements of Section 31 00 00 EARTHWORK, paragraph "Select Granular Material". The full length of each section of pipe without any protective covering must be excavated to permit installation of the protective covering. Pipe that has the grade or joint disturbed after laying, must be taken up and relaid. Pipe must not be laid in water or when the trench or weather conditions are unsuitable for such work. After testing and application of protective covering to joints, sand backfill must be placed and compacted around the pipe or protective coating to a depth of 1 foot above top of pipe. The remainder of the backfill must be the same as for other types of pipe.

3.4 PIPING LAYOUT REQUIREMENTS

3.4.1 Pipe Fabrication

Fabricate piping to measurements established on the project site and position into place without springing or forcing. Make provisions for absorbing expansion and contraction without undue stress in any part of the system. The use of flexible hoses in permanently mounted pump suction and discharge lines as a method of compensating for piping misalignment is not acceptable.

3.4.2 Interferences and Measurements

Provide offsets, fittings, and accessories required to eliminate interferences and to match actual equipment connection locations and arrangements. Verify measurements before commencing work. Submit discrepancies for clarification before proceeding with the installations to the Contracting Officer.

3.4.3 Space and Access

Keep piping, control tubing, which is not detailed close to structures and columns so as to take up a minimum amount of space. Ensure that access is provided for maintenance of equipment, valves and gauges.

3.4.4 Location

Do not place unions in locations that will be inaccessible after the completion of the work. Place unions on each side of equipment.

3.4.5 Piping and Equipment

Provide anchors where required to absorb or transmit thrust or eliminate vibration or pulsation. Provide hangers and supports near each change of direction. Select support components which do not restrict the movement of the pipe due to thermal expansion. Space hangers uniformly and arrange symmetrically.

3.4.6 Structural Support

Provide supplementary or intermediate steel or other structural members as required for transmission of loads to members forming part of the supporting structure. Piping must not be supported from other piping.

3.4.7 Grade

Where profiles of piping lines are shown on the drawings, grade the line uniformly between changes in slope or direction. Maintain gradient to within + 1/4-inch over the entire length of pipe. When backfilling has been completed to the top of the pipe, the pipe must be surveyed at each joint, and logged by station number. Submit to the Contracting Officer for approval the survey final elevations before backfilling can continue.

3.4.8 Size Changes

Make changes in pipe size with reducing fittings. Do not use bushings. In lieu of welding reducing outlet tees for piping 2 inches and larger, welding branches suitable for 100 percent radiographic inspection may be used. Do not use weldolets unless specifically called out (labeled) on the drawings.

3.4.9 Direction Changes

Make changes in direction of pipes with long radius fittings. Provide special fittings when required. Do not make miter welds. Make odd-angle offsets with pipe bends or elbows cut to the proper angle.

3.5 WELDING

3.5.1 General

All joints, unless indicated otherwise, in carbon steel and stainless steel piping systems must be welded. Welding of fuel pipe joints must comply with Section 33 52 23.15 SERVICE PIPING WELDING.

3.6 INSTALLATION

3.6.1 Precautions

Take special care to ensure that the protective coating on buried pipe is not damaged during installation and that the completed system is free of rocks, sand, dirt, water, weld slag, and foreign objects including construction debris. Take the following steps to ensure these conditions.

- a. Coated pipe must be handled only with canvas or nylon slings or padded clamps. Any coating damaged by improper handling or storage must be repaired as specified.
- b. Pipe brought to the site must be stored on blocks or horses at least

18 inches above the ground and adequately supported to prevent sagging. Padded blocks or horses must be used for coated pipe. The method and height of storing coated pipe must be in accordance with the coating manufacturer's instructions. Pipe ends must be protected and capped against weather at all times, except to accommodate immediate installation.

- c. Visual inspection must be made of the inside of each length of pipe to ensure that it is clear and clean prior to installation.
- d. The open ends of the pipe system must be closed at the end of each day's work or when work is not in progress by use of expansion plugs and must not be opened until the work is resumed.
- e. A swab, with a leather or canvas belt disc to fit the inside diameter of pipe, must be pulled through each length of pipe after welding in place.
- f. Obstruction remaining in the pipe after completion of the system must be removed at the expense of the Contractor.
- g. Plasma cutters and torches are not to be used to make penetrations in the pipe or to cut pipe.
- h. After installation and backfill of the hydrant loop is complete and before fuel is put in the pipe, the pipe will be cleaned using foam swabs and poly coated wire brush pigs and compressed dry gas, residual humidity of not over 20 percent. Ten flights of a combination of swab and brush pigs must be run. During this, low point drains and high point vents must be blown clean.

3.6.2 Protective Coatings for Buried Stainless Steel Piping

Refer to Section 33 52 80 LIQUID FUELS PIPELINE COATING SYSTEM.

3.7 INSTALLATION OF UNDERGROUND PIPE

Underground fuel pipelines must be pitched as shown on the drawings. Where not indicated they must be pitched a minimum of 2 inches per 100 feet. Branch lines to the hydrant pits must slope up to the pit. Two-inch pipe size valved drain connections must be provided at all low points and 1-1/2-inch pipe size valved outlet vent connections must be provided at all high points. Vent and drain lines must terminate in male cam-type locking end connectors with matching female dust covers and installed in pits. The pipe must have cover as shown on the drawings. Drain lines must be installed at the slopes indicated.

3.7.1 Pipe Assembly

Pipe must be strung parallel and adjacent to or above a trench. The pipe must be supported on padded skids during welding and inspection of joints. Protective coating must be inspected and repaired prior to lowering the pipe into the trench. The pipe must be lowered using only canvas or nylon slings. The sling must be dug from underneath the pipe after placements and must not be pulled from underneath the pipe while in contact with it. Care must be taken to prevent damage to the pipe, welded joints or coating and any such damage must be repaired as directed by the Contracting Officer. Pressure testing of the pipe must be done after it has been placed in final position in the trench.

3.7.2 Warning Tapes in Earth Trenches

For the purpose of early warning and identification of buried pipes outside of building walls during future trenching or other excavation, continuous identification tapes must be provided in the trench. Provide metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured for the purpose of early warning and identification of utilities buried below the tape. Tape must be at least **3 inches** in width. Color of tape must be as standard with the manufacturer with respect to the type of utility buried below the tape. Tape must have lettering at least **1 inch** high with warning and identification imprinted in bold black letters continuously over the entire tape length with not less than the following identification on the tape: BURIED JET FUEL PIPING BELOW. Tape must be installed in accordance with the printed recommendations of the tape manufacturer, as modified herein. Tapes must be buried at a depth of **6 inches** from the top of the subgrade or **12 inches** below the top surface of earth. Provide permanent color and printing, unaffected by moisture or soil.

3.7.3 Clearances

Install pipe to be clear of contact with other pipes, pipe sleeves, casings, reinforcing steel, conduits, cables, or other metallic structures. Where pipes cross other pipes or structures with a separation of less than **6 inches**, install an insulating separator. Protect the pipe from contact with a **12-inch** square by **1 inch** thick bituminous-impregnated cane fiber board.

3.7.4 Protective Coating

When the protective coating on pipe is damaged, the Contracting Officer must be notified and must inspect the pipe before the coating is patched. If the damage to the pipe is deeper than **0.050-inch**, the damage must be repaired by welding in accordance with paragraph "WELDING". If the pipe is dented, out of round or damaged to the point that welding will not make it good as new, the length of pipe must be rejected.

3.8 TESTING

Piping must be tested by pneumatic and hydrostatic pressure. Testing must comply with applicable requirements of **ASME B31.3**, **NFPA 30** and the requirements specified herein. Hydrostatic testing must be performed using fuel as the liquid. Water must not be introduced into the system for testing. Pneumatic and hydrostatic testing must be performed only after welding inspection has been completed.

3.8.1 Pneumatic Test

Piping to be installed underground must not receive field applied protective covering at the joints or be covered by backfill until the piping has passed the pneumatic test described herein. To facilitate the tests, isolate various sections of the piping system and test each one separately. Where such sections terminate at flanged valve points, the line must be closed by means of blind flanges in lieu of relying on the valve. Furnish tapped flanges that can be attached to the end of the section of line being tested, and that will permit a direct connection between the piping and the air compressor and/or pressurizing pump. No taps in the permanent line will be permitted. Furnish all necessary

equipment for testing; all gauges must be subject to testing and approval of the Contracting Officer. The air used for pneumatic testing must have a dew point of no more than 41 degrees F. Provide dehumidifying equipment on the suction or discharge side of the air compressor used to provide air for testing. Pressurizing pump must not exceed 10 cfm.

3.8.1.1 Pneumatic Test Procedure

Special safety measures, including the wearing of face mask, must be taken during testing under pressure. Only authorized personnel must be permitted in the area during testing. The pneumatic test pressure must be applied in increments. A preliminary 25 psig test must be applied. Examine joints with soap solution. Leaks revealed by this test must be repaired. The full test pressure must then be applied. Unless otherwise directed by the Contracting Officer, all piping must be tested at a pressure of 50 psig for not less than 2 hours, during which time there must be no drop in pressure, only pressure rises with temperature. The pressure source must be disconnected during the final test period. Any leaks revealed by the test must be repaired and the test repeated.

3.8.1.2 Hydrostatic Test

Upon completion of pneumatic testing and after backfilling, hydrostatically test each piping system with fuel at 415 psig in accordance with ASME B31.3 and API RP 1110, with no leakage or reduction in gauge pressure for four hours. Furnish electricity, instruments, connecting devices, and personnel for test. Fuel must be furnished by the Government. Equipment which is not rated by the manufacturer for the test pressure must be removed prior to testing. Defects in work must be corrected at the Contractor's expense, and the test repeated until the work is proven to be in compliance with the Contract requirements.

3.8.2 Performance Testing

After the system is completed (including pneumatic and hydrostatic testing) the fuel system must be cleaned and performance tested as specified in Section 33 08 53 AVIATION FUEL DISTRIBUTION SYSTEM START UP. All control valves, both manual and automatic, must be checked for leaks (any area wetted with fuel) and proper operation and adjusted, repaired or replaced to correct any defects.

3.9 PIPELINE PIGGING VERIFICATION

3.9.1 Pipeline Internal Inspection Operations

3.9.1.1 General

The following pigs will be propelled through the pipeline with product in order to inspect the pipeline: 5 pound density foam swab, combination poly scraper-magnetic, stainless steel wire brush, and aluminum plate gauge. Tracking devices must be used on all pigs. At a minimum, the sequence of pig runs must be as follows: 1) foam swab for proving and cleaning, 2) wire brush for cleaning, 3) scraper-magnetic for cleaning, 4) aluminum plate gauge for gauging internal anomalies, 5) scraper-magnetic for cleaning, 6) wire brush for cleaning, 7) scraper-magnetic for cleaning, 8) foam swab for cleaning, (Note: the number of pig flights of each type of cleaning pigs must be determined by the amount and type of debris removed. The conclusion of the cleaning process must be when debris recovered is only that from the pigs themselves. This

determination will be determined by the project's system supplier and the Contracting Officer).

3.9.1.2 Preparatory Work

The Government will bring to the attention of the Contractor all statutes, rules and regulations relevant to the performance of the work on the site (on Government property) and will also provide the Contractor with a copy of its own site regulations (if any). Provide the pigging vendors with all-available pipeline records and drawings.

3.9.1.3 Pig Load And Launch

The pig must be loaded into the pig launcher by the Contractor. The method of loading and lodging the front pig cup into the launcher must not involve the use of uncontrolled mechanical force applied to the rear of the pig. A temporary pig launcher and receiver must be provided by the Contractor to pig the new hydrant loop.

3.9.1.4 Pipeline Operation During Pigging

All pig runs to the new hydrant loop must be made with the line packed with product. The temporary pumps will be used to propel the pig. The temporary pig traps will be used for pig launch and retrieval.

3.9.1.5 Brush and Gauging Survey

Run a brush pig at least as often as previously indicated. The brush pig must be designed and provided by the geometry/ultrasonic pig vendor. Additional runs may be required based upon the amount of debris found in the pipeline. The onsite geometry/ultrasonic pig vendor's personnel and COR must determine if additional runs are required. Immediately following the brush pig run and immediately prior to the geometry/ultrasonic survey, run, as a minimum, a single batching pig fitted with a gauge plate equal to 90 percent of the pipeline normal inside diameter. The plate is to be a segmented aluminum disk of 1/8 inch thickness. The plate gauge pig must also include a tracker and tracking equipment. Track the pig assembly above ground during the operation.

3.9.1.6 Lost Pig

The Contractor is responsible for a lost pig, finding the pig, retrieval of the pig, and all repairs, radiographs to the pipeline system and the pig.

-- End of Section --

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SECTION 33 52 80

LIQUID FUELS PIPELINE COATING SYSTEMS
08/22

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 WATER WORKS ASSOCIATION (AWWA)

<u>AWWA C203</u>	<u>(2025) Coal-Tar Protective Coatings and Linings for Steel Water Pipe and Fittings</u>
<u>AWWA C209</u>	<u>(2025) Hand-Applied Tape Coatings for Steel Water Pipe and Fittings</u>
AWWA C210	(2015) Standard for Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
AWWA C213	(2022) Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings
<u>AWWA C215</u>	<u>(2022) Extruded Polyolefin Coatings for Steel Water Pipe</u>
<u>AWWA C216</u>	<u>(2022) Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines</u>
<u>AWWA C217</u>	<u>(2023) Microcrystalline Wax and Petrolatum Tape Coating Systems for Steel Water Pipe and Fittings</u>

ASTM INTERNATIONAL (ASTM)

ASTM D3276	(2015; E 2016) Standard Guide for Painting Inspectors (Metal Substrates)
ASTM D3335	(1985a; R 2020) Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy
ASTM D3718	(1985a; R 2015) Low Concentrations of Chromium in Paint by Atomic Absorption Spectroscopy
ASTM D3925	(2002; R 2015) Sampling Liquid Paints and Related Pigmented Coatings
ASTM D4285	(1983; R 2018) Indicating Oil or Water in Compressed Air

ASTM D4417 (2021) Standard Test Methods for Field
Measurement of Surface Profile of Blast
Cleaned Steel

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 8502-3 (2017) Preparation of Steel Substrates
Before Application of Paints and Related
Products - Tests for the Assessment of
Surface Cleanliness - Part 3: Assessment
of Dust on Steel Surfaces Prepared for
Painting (Pressure-Sensitive Tape Method)

ISO 9001 (2015) Quality Management Systems-
Requirements

NACE INTERNATIONAL (NACE)

NACE RP0402 (2002) Field-Applied Fusion-Bonded Epoxy
(FBE) Pipe Coating Systems for Girth Weld
Joints: Application, Performance, and
Quality Control

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC AB 1 (2015; E 2017) Mineral and Slag Abrasives

SSPC AB 2 (2015; E 2016) Cleanliness of Recycled
Ferrous Metallic Abrasive

SSPC AB 3 (2023; R 2023) Ferrous Metallic Abrasive

SSPC Guide 6 (2021) Guide for Containing Surface
Preparation Debris Generated During Paint
Removal Operations

SSPC Guide 12 (2023) Guide for Illumination of
Industrial Painting Projects

SSPC PA 1 (2024) Shop, Field, and Maintenance
Coating of Metals

SSPC PA 2 (2015; E 2018) Procedure for Determining
Conformance to Dry Coating Thickness
Requirements

SSPC QP 1 (2019) Standard Procedure for Evaluating
the Qualifications of Industrial/Marine
Painting Contractors (Field Application to
Complex Industrial Steel Structures and
Other Metal Components)

SSPC QP 3 (2010) Standard Procedure for Evaluating
Qualifications of Shop Painting Applicators

SSPC QP 5 (2022) Standard Procedure for Evaluating
the Qualifications of Coating and Lining
Inspection Companies

SSPC QS 1	(2015) Standard Procedure for Evaluating a Contractor's Advanced Quality Management System
SSPC SP 1	(2015) Solvent Cleaning
<u>SSPC SP 10/NACE No. 2</u>	<u>(2015) Near-White Blast Cleaning</u>
SSPC SP 17	(2019) Thorough Abrasive Blast Cleaning of Non-Ferrous Metals
SSPC VIS 1	(2002; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910-SUBPART Z	Toxic and Hazardous Substances
29 CFR 1910.134	Respiratory Protection
29 CFR 1910.1000	Air Contaminants
29 CFR 1926.59	Hazard Communication

1.2 SYSTEM DESCRIPTION

This section specifies the requirements for interior and exterior coating of buried carbon steel casing pipe and exterior coating of below ground and buried ~~carbon steel and~~ stainless steel liquid fuel pipelines. The exterior coating system for buried pipelines is an extruded polyolefin system, a fusion bonded epoxy (FBE) system, or a liquid epoxy system. Fusion bonded epoxy coating is specified for the interior of carbon steel ~~aviation fuel pipe to protect fuel iron contamination~~ casing pipe.

1.3 DEFINITIONS

Definitions are generally provided throughout this Section in the paragraphs where used and denoted by capital letters. The following definition is used throughout this Section:

- a. INDEPENDENT THIRD-PARTY - Impartial third-party not a part or affiliated with Contractor or subcontractor principal or subsidiary businesses, and not a materials supplier.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contract Errors, Omissions, and Other Discrepancies

Corrective Action Procedures

Corrective Action Request (CAR) Form

Coatings Work Plan

Inspection Report Forms

SD-03 Product Data

External Pipe Coating

Internal Pipe Coating

Field-Applied External Pipe Coating

SD-05 Design Data

Containment System

SD-06 Test Reports

Inspection Report Forms

Daily Inspection Reports

Coatings Qualification Test Reports

Non-Metallic Abrasive Qualification Test Reports

Coating Field Test Reports

Abrasive Field Test Reports

SD-07 Certificates

Contract Errors, Omissions, And Other Discrepancies

Corrective Action Procedures

Coatings Work Plan

Qualifications of Certified Industrial Hygienist (CIH)

Qualifications of Pipe Coating Shop

Qualifications of Certified Protective Coatings Specialist (PCS)

Qualifications of Coatings Inspection Company

Qualifications of Quality Assurance Coatings Inspector

Qualifications of Coatings Contractors for Field Coating

Qualifications of Individuals Performing Abrasive Blasting for
Field Coating

Qualifications of Individuals Performing Coating Application for
Field Coating

Qualifications of Testing Laboratory for Coatings

Qualifications of Testing Laboratory for Abrasive

Coating Materials Certificate of Conformance

Non-Metallic Abrasive Certificate of Conformance

SD-08 Manufacturer's Instructions

Coating System Instructions

SD-11 Closeout Submittals

Disposal of Used Abrasive Shop Applied Coating

Disposal of Used Abrasive Field Applied Coating

Inspection Logbook

Corrective Action Log; G

1.5 QUALITY ASSURANCE

1.5.1 Contract Errors, Omissions, and Other Discrepancies

Submit all errors, omissions, and other discrepancies in contract documents to the Contracting Officer within 30 days of contract award for all work covered in this Section, other than the work that will not be uncovered until a later date. All such discrepancies must be addressed and resolved, and the Coatings Work Plan modified, prior to beginning the Initial and Follow-Up phases of work. Discrepancies that become apparent only after work is uncovered must be identified at the earliest discoverable time and submitted for resolution. Schedule time (float) must be built into the project schedule at those points where old work is to be uncovered or where access is not available during the first 30 days after award, to allow for resolution of contract discrepancies.

1.5.2 Corrective Action (CA)

CA must be included in the Contractor Quality Control Plan as outlined in Section 01 45 00 QUALITY CONTROL.

1.5.2.1 Corrective Action Procedures

Develop procedures for determining the root cause of each non-compliance, developing a plan to eliminate the root cause so that the non-compliance does not recur, and following up to ensure that the root cause was eliminated.

1.5.2.2 Corrective Action Request (CAR) Form

Develop Corrective Action Request (CAR) forms for initiating CA and for tracking and documenting each step. The CAR should be included with the Corrective Action Procedures. A CAR must be initiated by either the Contractor or the Contracting Officer. The Protective Coatings Specialist (PCS) must approve each CAR at the root cause identification stage, the plan for elimination stage, and the close out stage after verification that the root cause has been eliminated.

1.5.2.3 Corrective Action Log

When a CAR is initiated, Contractor must take action to identify and eliminate the root cause of each non-compliance so as to prevent recurrence. These actions must apply to non-compliance in the work, and to non-compliance in the Quality Control (QC) System. Corrective actions must be appropriate to the effects of the non-compliance encountered. The corrective action must be documented in a report that is serialized and tracked in the [Corrective Action Log](#) until project completion and its acceptance by the Contracting Officer. All corrective action reports must be retained in project records. The Corrective Action Log, showing status of each CAR, must be submitted to the Contracting Officer monthly.

1.5.3 Coatings Work Plan

This work plan must be considered as part of the Contractor Quality Control Plan as outlined in Section [01 45 00](#) QUALITY CONTROL.

The [Coatings Work Plan](#) must be submitted and approved by the PCS prior to mobilization. The Coatings Work Plan must explain in detail all procedures including, but not limited to, all sequential processes, quality control for each process, quality assurance for each process, and safety considerations. Subsections must include at least the following:

- a. Purpose;
- b. Introduction;
- c. Safety, fire, and health information;
- d. Contractor and worker qualifications with certifications;
- e. Project management organization and documents;
- f. Timeline in a Gantt chart;
- g. Project document references;
- h. Reference to all applicable standards (e.g., AMPP, NACE, SSPC, ISO, and ASTM);
- i. Coatings manufacturer's supporting documentation;
- j. Descriptions and explanations of any exceptions from the coating manufacturer (including those specific to stainless steel piping);
- k. Coating and blasting equipment, model names, and, if applicable, calibration dates;
- l. Containment design and/or details;
- m. Environmental testing;
- n. Material delivery, storage, and handling details;
- o. Surface preparation;
- p. Pre-application test panel validation for field-applied external coating as outlined in SURFACE STANDARD;

- q. Coating materials, mixing, application, recoat windows, and coating curing times, if applicable;
- r. Coating repairs and rework;
- s. Non-conformance;
- t. Spent material handling and effluent discharge containment and disposal;
- u. Inspection test plan (as outlined in FIELD INSPECTION, and including inspection hold points, both Quality Assurance and Coating Contractor QC Coatings Inspector's responsibilities, and daily documentation and delivery);
- v. Instruments and test kits;
- w. Warranty (in writing, signed by the Contractor and the coating manufacturer's representative);
- x. Demobilization;
- y. PCS and PM approval;

1.5.4 Design Data

1.5.4.1 Containment System for Field Coating

Submit complete design drawings and calculations for the scaffolding and containment system, including an analysis of the loads which will be added to the structure by the containment system and waste materials. A registered engineer must approve calculations and scaffold system design.

1.5.5 Test Reports

1.5.5.1 Coatings Qualification Test Reports

Submit test results from an INDEPENDENT THIRD-PARTY laboratory of representative samples of each coating material. U.S. Department of Defense laboratories are considered to be INDEPENDENT THIRD-PARTY laboratories. Samples must have been tested within the last three years. The purpose of qualification testing is to pre-qualify the coatings used on buried pipe. Provide qualification testing results for exterior coatings used for repairs or girth welds on buried pipe in conformance with AWWA C203, AWWA C209, AWWA C210, AWWA C216, AWWA C217, and NACE RP0402, as applicable. Provide qualification testing results for shop applied exterior coatings for buried pipe in conformance with AWWA C213 or AWWA C215, as applicable.

Provide qualification testing results for shop applied internal coatings for buried pipe in conformance with AWWA C213.

Qualification testing must be based on all required production verification testing required by AWWA C203, AWWA C209, AWWA C210, AWWA C216, AWWA C217, NACE RP0402, AWWA C213, and AWWA C215 as applicable. For AWWA C213, provide test reports for production verification testing described in paragraph OPTIONAL EPOXY PERFORMANCE TESTING OF COATED PIPE of AWWA C213, including cross-section porosity, interface porosity,

thermal analysis (DSC), permanent strain (bendability), and interfacial contamination. Perform production verification testing on a minimum of one pipe joint in the first half hour of production each day, and on a minimum of one pipe joint in the last half hour of production each day. Perform additional testing as required to segregate any non-compliant material.

1.5.5.2 Non-Metallic Abrasive Qualification Test Reports

Submit results for abrasive as required in paragraph 4 REQUIREMENTS of **SSPC AB 1**. Submit test results from an INDEPENDENT THIRD-PARTY laboratory of representative samples of each abrasive to be used on the jobsite. Samples must have been tested within the last three years. Note that this testing is for the purpose of pre-qualifying the abrasive.

1.5.6 Qualifications

The qualifications specified in this Section must be met throughout the duration of this contract. Personnel and corporate entities must provide proof of active certification to all qualifications specified in this Section. Work must not be provided by personnel and corporate entities unless all specified qualifications are met.

1.5.6.1 Qualifications of Certified Industrial Hygienist (CIH)

Submit name, address, telephone number, fax number, and e-mail address of the INDEPENDENT THIRD-PARTY CIH. Submit documentation that the hygienist is certified by the American Board of Industrial Hygiene in comprehensive practice, including certification number and date of certification/recertification. The CIH must remain certified during the entire project, and the Contracting Officer must be notified of any change in certification status within 10 days of the change. If a CIH's certification expires, the hygienist will not be allowed to perform any hygienist functions, and all hygienist work must stop, until the certification is reissued or another CIH is approved. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. Provide evidence of experience with hazards involved in industrial coating application work.

1.5.6.2 Qualifications of Pipe Coating Shop

Each shop that applies coatings to pipe must be certified to **SSPC QP 3** prior to contract award and must remain certified while accomplishing any surface preparation or coating application. If a shop's certification expires, the firm will not be allowed to perform any work until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. Notify the Contracting Officer of any change in the shop's certification status within 10 days of the change. If a shop's qualification expires, the shop will not be allowed to perform any coatings related functions until the qualification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive qualification will not be considered and liquidated damages will apply. Notify the Contracting Officer of all scheduled and unannounced on-site audits from AMPP and furnish a copy of all audit reports.

For shops located outside the United States, Guam, and Puerto Rico, the

certifications for the shop (SSPC QP 3) can be substituted if the coatings Contractor meets all of the below requirements:

- a. ISO 9001 certified;
- b. Eight years of experience with industrial coatings;
- c. Evidence of recent work that has Contractor Performance Assessment Report System (CPARS) ratings, and/or other quality/performance ratings, that are equivalent to, or exceed, "Above Average";
- d. Evidence of an INDEPENDENT THIRD-PARTY audit from AMPP demonstrating equivalency to SSPC QP 3 within the last two years.

The shop must be certified to ISO 9001 prior to contract award and must remain so certified for the duration of the project. Notify the Contracting Officer of any change in the shop's certification status within 10 days of the change. If a Contractor's qualification expires, the shop will not be allowed to perform any coatings related functions until the qualification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive qualification will not be considered and liquidated damages will apply. Notify the Contracting Officer of all scheduled and unannounced on-site inspections from the ISO certifying organization and furnish a copy of all inspection reports.

1.5.6.3 Qualifications of Certified Protective Coatings Specialist (PCS)

Submit name, address, telephone number, fax number, and e-mail address of the INDEPENDENT THIRD-PARTY PCS. Submit documentation that the PCS is certified by the Association for Materials Protection and Performance (AMPP) (formerly SSPC: The Society for Protective Coatings (SSPC)), including certification number and date of certification/recertification. If the PCS is employed by the same coatings inspection company to which the Quality Assurance Coatings Inspector is employed, this does not violate the INDEPENDENT THIRD-PARTY requirements. The PCS must be an INDEPENDENT THIRD-PARTY to the pipe coating shop. The PCS must remain certified during the entire project, and the Contracting Officer must be notified of any change in certification status within 10 days of the change. If a PCS's certification expires, the PCS will not be allowed to perform any PCS functions, and all coatings work must stop, until the certification is reissued or another PCS is approved. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. The PCS must not be the designated Quality Assurance Coatings Inspector. The PCS's responsibilities are outlined in PROTECTIVE COATINGS SPECIALIST (PCS).

1.5.6.4 Qualifications of Coatings Inspection Company

Submit documentation that the selected quality assurance coatings inspection company is accredited by AMPP to the requirements of SSPC QP 5 prior to contract award. The coatings inspection company that is submitted and approved, must remain and cannot be changed through completion of the contract. The coatings inspection company must remain SSPC QP 5 certified for the duration of the coatings work. If a coatings inspection company's certification expires, the firm will not be allowed to perform any inspection functions, and all surface preparation and coating application work must stop, until the certification is reissued.

Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. Notify the Contracting Officer of any change in the coatings inspection company certification status within 10 days of the change. Notify the Contracting Officer of all scheduled and unannounced on-site audits from AMPP and furnish a copy of all audit reports. The coatings inspection company must not engage in any activities that may conflict with their independence of judgment and integrity in relation to their inspection activities. In particular, they must not be engaged in the manufacture, supply, application, surface preparation, purchase, or maintenance of the applied coating in this project.

1.5.6.5 Qualifications of Quality Assurance Coatings Inspector

Submit documentation that each Quality Assurance Coatings Inspector is employed by the **SSPC QP 5** company and is qualified to a minimum certification of NACE CIP Level II. Each inspector must remain employed by the coatings inspection company while performing any coatings inspection functions. The Quality Assurance Coatings Inspector's responsibilities are outlined in QUALITY ASSURANCE COATINGS INSPECTOR'S FIELD RESPONSIBILITIES. The roles of the Quality Assurance Coatings Inspector are in addition to, and distinct from, the role of the QC Coatings Inspector employed by the coatings Contractor and the Coatings Inspector for Shop Coating.

1.5.6.6 Qualifications of Coatings Contractors for Field Coating

All Contractors and Subcontractors that perform surface preparation or coatings application must be certified to **SSPC QP 1** and **SSPC QS 1** prior to contract award and must remain certified while accomplishing any surface preparation or coating application. If a Contractor's or Subcontractor's certification expires, the firm will not be allowed to perform any work until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. Notify the Contracting Officer of any change in Contractor certification status within 10 days of the change. If a Contractor's qualification expires, the Contractor will not be allowed to perform any coatings related functions until the qualification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive qualification will not be considered and liquidated damages will apply. Notify the Contracting Officer of all scheduled and unannounced on-site audits from AMPP and furnish a copy of all audit reports.

For projects located outside the United States, Guam, and Puerto Rico, the certifications for the coatings Contractor (**SSPC QP 1** and **SSPC QS 1**) can be substituted if the coatings Contractor meets all of the below requirements:

- a. **ISO 9001** certified;
- b. Eight years of experience with industrial coatings;
- c. Evidence of recent work that has Contractor Performance Assessment Report System (CPARS) ratings, and/or other quality/performance ratings, that are equivalent to, or exceed, "Above Average";
- d. Evidence of an INDEPENDENT THIRD-PARTY audit from AMPP demonstrating

equivalency to **SSPC QP 1** and **SSPC QS 1** within the last two years.

The coatings Contractors and coatings Subcontractors must be certified to **ISO 9001** prior to contract award and must remain so certified for the duration of the project. Notify the Contracting Officer of any change in Contractor certification status within 10 days of the change. If a Contractor's qualification expires, the Contractor will not be allowed to perform any coatings related functions until the qualification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive qualification will not be considered and liquidated damages will apply. Notify the Contracting Officer of all scheduled and unannounced on-site inspections from the ISO certifying organization and furnish a copy of all inspection reports.

1.5.6.7 **Qualifications of Individuals Performing Abrasive Blasting for Field Coating**

Submit name, address, and telephone number of each person that will be performing abrasive blasting. All individuals performing abrasive blasting must be certified by AMPP to the SSPC C7 Dry Abrasive Blaster Qualification Program or CAS Coating Application Specialist Level 2 Certification Program (Interim Status), and must remain certified during the entire period of abrasive blasting. The Contracting Officer must be notified of any change in qualification status within 10 days of the change. If a blaster's qualification expires, the blaster will not be allowed to perform any blasting functions until the qualification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive qualification will not be considered and liquidated damages will apply.

This requirement applies to all manual abrasive blasting performed in shop and field locations. This requirement does not apply to automated abrasive blasting performed in the shop.

1.5.6.8 **Qualifications of Individuals Performing Coating Application for Field Coating**

Submit name, address, telephone number, and evidence of certification of each person that will be performing coatings application by any method. All individuals performing coatings application must be certified by AMPP to the SSPC CAS Coating Application Specialist Level 2 Certification Program (Interim Status) or SSPC C12 Spray Application Program. Each applicator must remain certified during the entire period of coatings application, and the Contracting Officer must be notified of any change in qualification status within 10 days of the change. If an applicator's qualification expires, the applicator will not be allowed to perform any coatings application functions until the qualification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive qualification will not be considered and liquidated damages will apply.

1.5.6.9 **Qualifications of Testing Laboratory for Coatings**

Submit name, address, telephone number, fax number, and e-mail address of the INDEPENDENT THIRD-PARTY laboratory or laboratories selected to perform testing of coating samples for qualification testing and for field sample testing for compliance with this Section. Submit documentation that the laboratory is regularly engaged in testing of paint samples for conformance with specifications and that the employees performing testing

are qualified.

1.5.6.10 Qualifications of Testing Laboratory for Abrasive

Submit name, address, telephone number, fax number, and e-mail address of the INDEPENDENT THIRD-PARTY laboratory or laboratories selected to perform testing of abrasive for compliance with this section. Submit documentation that the laboratory has experience in testing samples of abrasive for conformance with specifications and that the employees performing testing are qualified.

1.5.6.11 Coating Materials Certificate of Conformance

Provide manufacturer's certification of conformance to AWWA C203, AWWA C209, AWWA C210, AWWA C216, AWWA C217, and NACE RP0402 for exterior coatings used for repairs or girth welds on buried pipe. Provide manufacturer's certification of conformance to AWWA C213 or AWWA C215, as applicable, for shop applied exterior coatings for buried pipe.____

Provide manufacturer's certification of conformance to AWWA C213 for shop applied internal coatings for buried pipe.

1.5.6.12 Non-Metallic Abrasive Certificate of Conformance

Provide manufacturer's certification that the materials are currently in conformance with SSPC AB 1 and as modified in this Section, and have been tested within the last three years.

1.5.7 QA and QC Personnel

1.5.7.1 QC Manager

The QC Manager is as defined in Section 01 45 00 QUALITY CONTROL.

1.5.7.2 Protective Coatings Specialist (PCS)

The PCS must be considered a QC Specialist and must report to the QC Manager, as specified in Section 01 45 00 QUALITY CONTROL. The PCS must approve all submittals prior to submission to the QC Manager for approval or submission to the government for approval.

The PCS's responsibilities include, but are not limited to, the following:

- a. Obtain, review, and understand all project documentation including, but not limited to, this Section, project program, Coatings Work Plan, inspection and testing plan (ITP), and all submittals before the project starts, during the project, and all coatings related re-work;
- b. Attend all pre-job coatings meetings (in-person, phone, or virtually);
- c. Attend pre-final coatings walk-through (mandatory) and attend final coatings walk-through (as required).

1.5.7.3 Quality Assurance Coatings Inspector

The Quality Assurance Coatings Inspector must be considered a QC Specialist and must report to the QC Manager, as specified in Section 01 45 00 QUALITY CONTROL. The Quality Assurance Coatings Inspector must be present during all pre-preparation testing, surface preparation,

coating application, initial cure of the coating system, during all coating repair work, and during completion activities. The Quality Assurance Coatings Inspector must provide complete documentation of conditions and occurrences on the job site, and be aware of conditions and occurrences that are potentially detrimental to the coating system. The responsibilities of the Quality Assurance Coatings Inspector are defined in QUALITY ASSURANCE COATING INSPECTOR'S RESPONSIBILITIES. These responsibilities are separate and distinct from the responsibilities of the Coatings Contractor QC Coatings Inspector and Coatings Inspector for Shop Coating.

1.5.7.4 Coatings Inspector for Shop Coating

The coatings inspector must be the shop Quality Manager or appropriate designee. The coatings inspector must be considered a QC Specialist and must report to the prime Contractor's QC Manager, as specified in Section 01 45 00 QUALITY CONTROL. The coatings inspector must be present during all pre-preparation testing, surface preparation, coating application, initial cure of the coating system, and during all coating repair work required of the shop. The coatings inspector must provide complete documentation of conditions and occurrences on the job site, and be aware of conditions and occurrences that are potentially detrimental to the coating system.

1.5.7.5 Coatings Contractor QC Coatings Inspector

The Coatings Contractor QC Coatings Inspector must stop non-compliant work. The responsibilities of the Coatings Contractor QC Coatings Inspector are defined in COATINGS CONTRACTOR QC COATINGS INSPECTOR'S RESPONSIBILITIES. These responsibilities are separate and distinct from the responsibilities of the Quality Assurance Coatings Inspector.

1.5.8 Pre-Application Meeting for Field Coating

After approval of submittals, but prior to the initiation of coatings work, Contractor representatives, including at a minimum, project superintendent, QC manager, paint foreman, Quality Assurance Coatings Inspector, and PCS must have a pre-application coating preparatory meeting. This meeting must be in addition to the pre-construction conference. Specific items addressed must include: corrective action requirements and procedures, coatings work plan, safety plan, coordination with other Sections, inspection standards, inspection requirements and tools, test procedures, environmental control system, safety plan, and test logs. Notify Contracting Officer at least ten days prior to meeting.

1.6 PRODUCT DATA

1.6.1 Coating System Instructions

Submit manufacturer's printed instructions, including detailed mixing and application procedures, number and types of coats required, minimum and maximum application temperatures, and curing procedures of all coating materials. Include Safety Data Sheets (SDS) for materials to be used at the job site in accordance with 29 CFR 1926.59.

1.7 DELIVERY AND STORAGE

Ship, store, and handle materials in accordance with SSPC PA 1, applicable standards, and as modified in this Section. Maintain temperature in

storage spaces between 40 and 75 degrees F, and air temperature more than 5 degrees F above the dew-point at all times. Inspect materials for damage and return non-compliant materials to manufacturer. Remove materials with expired shelf life from government property immediately and notify the Contracting Officer.

If materials are approaching shelf life expiration and an extension is desired, samples must be sent to the manufacturer, along with complete records of storage conditions, with a request for shelf life extension. If the manufacturer finds the samples and storage data suitable for shelf life extension, the manufacturer must issue an extension, referencing the product evaluation and the review of storage records. Products must not be extended longer than allowed in the product specification.

1.8 COATING HAZARDS

Ensure that employees are trained in all aspects of the safety plan. Specified coatings may have potential health hazards if ingested or improperly handled. The coating manufacturer's written safety precautions must be followed throughout mixing, application, and curing of the coatings. During cleaning, cleanup, surface preparation, and paint application phases, ensure that employees are protected from toxic and hazardous chemical agents which exceed concentrations in 29 CFR 1910.1000. Comply with respiratory protection requirements in 29 CFR 1910.134. The CIH must approve work procedures and personal protective equipment.

1.9 JOB SITE REFERENCES - SHOP

Make available to the Contracting Officer a copy of each standard to which the shop will be applying coatings under this Section.

1.10 JOB SITE REFERENCES - FIELD

Make available to the Contracting Officer a copy of each standard to which field coatings will be applied to under this Section, and an SSPC Certified Contractor Evaluation Form at the job site.

PART 2 PRODUCTS

2.1 SHOP-APPLIED COATING FOR BURIED PIPING

2.1.1 External Pipe Coating

For carbon steel, FBE coating: AWWA C213.

For stainless steel, FBE coating: AWWA C213 or Extruded Polyolefin: AWWA C215, as applicable.

2.1.2 Internal Pipe Coating (Lining)

For carbon steel, FBE coating: AWWA C213. ~~A certification must be provided from the coating manufacturer stating that the coating system is suitable for immersion service in aviation fuel.~~

2.2 FIELD-APPLIED EXTERNAL PIPE COATING

All coating materials used to coat external girth welds or repair existing coating must be from the same manufacture as the shop applied coating. Use one or more of the following repair methods, as modified herein, to

repair shop applied coatings and coat external girth welds:

a. FBE Coating System: AWWA C213

(1) Fusion-Bonded Epoxy (FBE) Coating: NACE RP0402, coating material to be same as applied to pipe in shop

(2) Liquid-Epoxy Coating System: AWWA C210

b. Extruded Polyolefin Coating System: AWWA C215

(1) Coal Tar Enamel: AWWA C203, Type II enamel, Type III outerwrap

(2) Coal Tar Tape: AWWA C203

(3) Cold Applied Tape: AWWA C209

(4) Petrolatum or Petroleum Wax Tape Coating: AWWA C217

(5) Heat Shrink Sleeve: AWWA C216

2.3 COATING FIELD SAMPLE COLLECTION AND SHIPPING KIT

Provide a kit for each sample to be collected. For FBE coatings, each kit must contain: a one quart can for the dry/powder; dipping cups for sampling; a shipping box sized for the samples to be shipped; and packing material. For liquid coatings, each kit must contain: a one quart can for the base of each liquid coatings material; one appropriately sized can for the activator of each liquid coatings material; dipping cups for each component to be sampled; a shipping box sized for the samples to be shipped; and packing material. Mark cans for the appropriate components (powder, base, or activator), including manufacturer's name, address, batch numbers, batch size shipped to the project site, and date of manufacture. Provide shipping documents, including either pre-paid shipping or a shipping number that can be used by the QC Manager to arrange pickup, addressed to the INDEPENDENT THIRD-PARTY coating testing laboratory.

2.4 ABRASIVE FIELD SAMPLE COLLECTION AND SHIPPING KIT

Provide a kit for each sample to be collected. Each kit must contain: one suitable plastic bag or container for each sample to be collected. Mark containers with manufacturer's name, address, batch number, batch size, and date of manufacture. Provide shipping documents, including either pre-paid shipping label or a shipping number that can be used by the QC Manager to arrange pickup, addressed to the approved coating testing laboratory.

2.5 INSPECTION TEST KITS

2.5.1 Test Kit for Measuring Chloride, Sulfate, and Nitrate Ions on Steel and Coated Surfaces

Provide test kits that meet the following requirements:

- a. Contains all materials, supplies, tools, and instructions for field testing and on-site quantitative evaluation of chloride, sulfate, and nitrate ions;

- b. Extract solution is acidic, factory pre-measured, pre-packaged, and of uniform concentration;
- c. Components and solutions are mercury free and environmentally friendly;
- d. Contains new materials and solutions for each test extraction;
- e. Contains an extraction test container (vessel, sleeve, cell) creates a sealed, encapsulated environment during salt ion extraction;
- f. Contains a test extract container is suitable for testing the following steel surfaces: horizontal (up/down configuration), vertical, flat, curved, smooth, pitted, and rough;
- g. All salt ion concentrations are directly measured in micrograms per square centimeter.

2.5.2 Test Kit for Measuring Chlorides in Abrasives

Provide test kits that meet all of the following requirements:

- a. Be a completely self-contained test kit with all materials, supplies, tools, and instructions to take tests and identify results;
- b. Use identifiable, consistent, factory pre-measured test extract solution;
- c. Provide for testing equal volumes of abrasive and test solution;
- d. Provide for taking direct measurements of the chloride ion in parts per million (PPM), without using conversion charts or tables;
- e. Provide all new components for extraction and titration for each test;
- f. Provide a factory sealed titration device for each test;
- g. Use the extract sampling container as the titration container.

2.5.3 Test Kit for Identifying Amine Blush on Epoxy Surfaces

Provide test kits that meet all of the following requirements:

- a. Be a completely self-contained field test kit with all materials, supplies, tools, and instructions to perform tests and indicate the presence of unreacted amines;
- b. Use an identifiable, consistent, uniform, pre-packaged, factory pre-measured indicating solution;
- c. Contains no mercury or lead and is environmentally friendly;
- d. Contains a solution of an unreacted amine for the purpose of "self checking" the indicator solution.

2.6 ABRASIVE

Use abrasive that is specifically selected to provide a sharp, angular profile to the specified depth. Abrasive must meet all requirements of this Section each time that it is placed in the blast pot. The referenced

abrasive specifications have maximum limits for soluble salts contamination; however, this maximum level of contamination does not guarantee that contamination will not be transferred to the steel surface during abrasive blasting. Other factors, such as on-site handling and recycling, can allow contamination of abrasive that can be transferred to the steel surface. Contractors are cautioned to verify that the chosen abrasive, along with work and storage processes, allow the final surface cleanliness requirements to be achieved. Successful testing of contamination in abrasive does not negate the final acceptance testing of steel surfaces.

Non-ferrous abrasives must be used for abrasive blasting stainless steel piping.

Abrasive material must contain a maximum of one percent by weight of any toxic substance listed in either Table Z-1, Z-2, or Z-3 of 29 CFR 1910-SUBPART Z, with the exception of inert or nuisance dust materials, arsenic, beryllium, cadmium, cobalt, lead, mercury, rhodium, silver, tellurium, thallium, and uranium.

Gross gamma radioactivity must not exceed 5 picocuries per gram.

2.6.1 Non-Metallic Abrasive

Non-metallic abrasive must be graded to the appropriate surface profile range and must conform to the chemical and physical properties of SSPC AB 1, Class A except that:

- a. The maximum allowable chromium and cadmium content of the work mix must be less than 0.1 percent by weight when tested in accordance with ASTM D3718 for chromium and ASTM D3335 for cadmium.
- b. Must contain less than 7 PPM chlorides when tested with the kit provided in paragraph TEST KIT FOR MEASURING CHLORIDES IN ABRASIVES. Modify the requirements of SSPC AB 1 to substitute requirement for one chloride test for each "CONDUCTIVITY TEST" required in SSPC AB 1 (one random sample per 50 bags of abrasive or three random samples from each shipment, if abrasive is delivered in bulk).

PART 3 EXECUTION

Perform all work, rework, and repair in accordance with approved procedures in the Coatings Work Plan. The Coatings Work Plan must be submitted and approved by the PCS prior to mobilization in accordance with the paragraph entitled COATINGS WORK PLAN.

3.1 FIELD SAMPLE COLLECTION AND TESTING

Sample and test materials delivered to the jobsite as required in the subsequent subparagraphs. Notify Contracting Officer three days in advance of sampling. The QC Manager, and either the PCS or the Quality Assurance Coatings Inspector, must witness all sampling.

3.1.1 Coating Field Sample Collection

All coatings/resins applied in the shop and in the field require one sample to be collected from each coating type used. This sample must be collected and set aside for the duration of the project, and must be tested if unforeseen coatings issues arise or if testing is requested by

the Contracting Officer.

Field applied coatings require a random field sample from each lot of coating material used on-site in accordance with [ASTM D3925](#). Each random sample must be tested. Utilize sample collection kits as outlined in the paragraph entitled COATING FIELD SAMPLE COLLECTION AND SHIPPING KIT. For powder based coatings, collect a one [quart](#) sample from each lot by random selection. For two component liquid coatings, obtain a one [quart](#) sample of each base material, and proportional samples of each activator based on mix ratio, by random selection from sealed containers from each lot. Prior to sampling, mix contents of each sealed container to ensure uniformity. As an alternative to collecting small samples from kits, entire kits may be randomly selected and shipped to the THIRD-PARTY INDEPENDENT laboratory, observing all requirements for witnessing and traceability. For purposes of quality conformance inspection, a lot is defined as that quantity of materials from a single, uniform batch produced and offered for delivery at one time. A batch is defined as that quantity of material processed by the manufacturer at one time and identified by number on the label. Identify samples by designated name, specification number, batch number, project contract number, sample date, intended use, and quantity involved. The QC manager will take possession of the packaged samples, contact the shipping company to arrange for pickup, and ship one complete sample of each material in question (including powder or base and activator) with all batch information to the INDEPENDENT THIRD-PARTY laboratory for testing as required in paragraph COATING FIELD TESTING REPORTS.

3.1.2 Abrasive Field Sample Collection

Utilize the sample collection kits as required in paragraph ABRASIVE FIELD SAMPLE COLLECTION AND SHIPPING KIT to obtain samples from each lot of abrasive delivered to site using the sampling techniques and schedule of one sample per every 50 bags for ferrous metallic abrasive, paragraph 4 REQUIREMENTS FOR RECYCLED WORK MIX ABRASIVES of [SSPC AB 2](#) for recycled ferrous metallic abrasives, or paragraph 5.3 SAMPLING FOR QUALITY CONTROL TESTS of [SSPC AB 1](#) for non-metallic abrasives.

For purposes of quality conformance inspection, a lot must consist of all abrasive materials of the same type from a single, uniform batch produced and offered for delivery at one time. The addition of any substance to a batch must constitute a new lot. Identify samples by designated name, specification number, lot number, project contract number, sample date, intended use, and quantity involved. The QC manager will take possession of the packaged samples, contact the shipping company to arrange for pickup, and relinquish the samples only to the shipping representative for shipment to the approved INDEPENDENT THIRD-PARTY laboratory for testing required in paragraph ABRASIVE SAMPLE TEST REPORTS.

3.1.3 Coating Field Test Reports

Submit test results for each sample that requires testing in the paragraph COATINGS FIELD SAMPLE COLLECTION. Test samples of coating material for compliance with requirements of [AWWA C203](#), [AWWA C209](#), [AWWA C210](#), [AWWA C216](#), [AWWA C217](#), and [NACE RP0402](#). Reject entire batch represented by samples that fail one or more tests, select new lots, and test samples.

3.1.4 Abrasive Field Test Reports

Submit test results for each lot of abrasive delivered to the jobsite.

Test samples of ferrous metallic abrasive to the requirements of paragraph 5.2 TEST PARAMETERS of [SSPC AB 3](#), excluding paragraph 5.2.4 DURABILITY. Test samples of recycled ferrous metallic abrasives to the requirements of paragraph 4 REQUIREMENTS FOR RECYCLED WORK MIX ABRASIVES of [SSPC AB 2](#). Test samples of non-metallic abrasive to the requirements of paragraph 5.3 SAMPLING FOR QUALITY CONTROL TESTS of [SSPC AB 1](#). Reject entire lot represented by samples that fail one or more tests, select new lots, and test samples.

3.2 LIGHTING

Provide lighting for all work areas as prescribed in [SSPC Guide 12](#).

3.3 ENVIRONMENTAL CONDITIONS

3.3.1 Automated Monitoring Requirements for Shop Applied Coating

Provide continuous monitoring of temperature, relative humidity, and dew point data at pertinent points in the shop, during surface preparation, coating application, and initial cure. This data does not suffice for documentation of conformity to surface conditions during application and cure of coating. Locate sensors to provide pertinent data for the surface preparation and coating application being performed, as well as the temperature extremes on the structure. Describe the location plan in the Coatings Work Plan. Monitor any heating, cooling, or dehumidification equipment used. Provide monitoring equipment to perform as follows:

- a. Data is collected in 15-minute increments, and available for download (on-site) in a standard database format. Contractor must collect these data and make available to the Contracting Officer and QC Manager;
- b. Monitoring equipment must have backup power such that data collection will be uninterrupted during the entire period of the dehumidification requirement;
- c. Monitoring equipment must have capability to measure interior and exterior dry bulb temperature (DB), relative humidity (RH), and dewpoint temperature (DP).

There is no requirement for connectivity of the monitoring system to control the dehumidification equipment; therefore, any combination of equipment having the required functionality will be accepted.

3.3.2 Containment for Field Coating

Design and provide a containment system for the capture, containment, collection, storage, and disposal of the waste materials generated by the work under this Section, to meet the requirements of [SSPC Guide 6](#), Class 3. Vapor concentrations must be kept at or below 10 percent of Lower Explosive Limit (LEL) at all times. Containment may be designed as fixed containment for complete structure or portable containment for sections of structure; however, containment must remain in any one place from beginning of abrasive blasting through initial cure of coating. Waste materials covered by this paragraph must not include any material or residue from removal of coatings containing lead, chromium, cadmium, PCB, or any other hazardous material.

It is the Contractors responsibility to insure the feasibility and workability of the containment system. The Contractor must perform their

operations and work schedule in a manner as to minimize leakage of the containment system. The containment system must be properly maintained and must not deviate from the approved drawings. If the containment system fails to function satisfactorily, the Contractor must suspend all operations, except those required to minimize adverse impact on the environment or government property. Operations must not resume until modifications have been made to correct the cause of the failure.

3.3.3 Automated Monitoring Requirements for Field Coating

Provide continuous monitoring of temperature, relative humidity, and dew point data at pertinent points on the structure, during surface preparation, coating application, and initial cure. This data does not suffice for documentation of conformity to surface conditions during application and cure of coating. Locate sensors to provide pertinent data for the surface preparation and coating application being performed, as well as the temperature extremes on the structure. Describe the location plan, including required moves, in the Coatings Work Plan. Monitor any heating, cooling, or dehumidification equipment used. Provide monitoring equipment to perform as follows:

- a. Data is collected in the field unit in 15-minute increments, and available for download (on-site) in a standard database format. Contractor must collect these data and make available to the Contracting Officer, Quality Assurance Coatings Inspector, and QC Manager;
- b. Monitoring equipment must have backup power such that data collection will be uninterrupted during the entire period of the dehumidification requirement;
- c. Monitoring equipment must have capability to measure surface temperatures at a minimum of four locations anywhere on a structure, regardless of the size of the structure;
- d. Monitoring equipment must have capability to measure interior and exterior dry bulb temperature (DB), relative humidity (RH), and dewpoint temperature (DP).

There is no requirement for connectivity of the monitoring system to control the dehumidification equipment; therefore, any combination of equipment having the required functionality will be accepted.

3.4 SHOP APPLIED COATING OF BURIED PIPING

3.4.1 Surface Preparation for Shop Applied Coating

Prepare exterior steel surfaces in accordance with [AWWA C213](#) or [AWWA C215](#), as applicable.

3.4.1.1 Abrasive Blasting Equipment for Shop Applied Coating of Buried Piping

Confirm that air supply for abrasive blasting is free of oil and moisture when tested in accordance with [ASTM D4285](#). Test air quality at each startup, but in no case, less often than every five operating hours.

3.4.1.2 Contamination Evaluation of Abrasive for Shop Applied Coating of Buried Piping

Test abrasive for salt contamination and oil contamination as required [SSPC AB 1](#) for non-metallic abrasives, [SSPC AB 2](#) for recycled ferrous abrasives, and [SSPC AB 3](#) for ferrous metallic abrasives. Modify the schedule of testing to be daily, at startup, and every five operating hours thereafter.

3.4.1.3 Pre-Preparation Testing for Surface Contamination for Shop Applied Coating of Buried Piping

3.4.1.3.1 Pre-Preparation Testing for Oil and Grease Contamination for Shop Applied Coating of Buried Piping

Inspect all surfaces for oil or grease contamination using two or more of the following inspection techniques:

- 1) VISUAL INSPECTION - Observe surface for evidence of dirt or oil.
- 2) WATER BREAK TEST - Spray atomized mist of distilled water onto surface and observe for water beading. If water wets surface rather than beading up, surface can be considered free of oil or grease contamination. Beading of water (water forms droplets) is evidence of oil or grease contamination.
- 3) CLOTH RUB TEST - Rub a clean, white, lint-free, cotton cloth onto surface and observe for discoloration. To confirm oil or grease contamination in lightly stained areas, a non-staining solvent may be used to aid in oil or grease extraction. Any visible discoloration is evidence of oil or grease contamination.

Reject oil or grease contaminated surfaces, clean in accordance with [SSPC SP 1](#), and recheck for contamination until surfaces are free of oil and grease.

3.4.1.3.2 Pre-Preparation Testing for Soluble Salts Contamination for Shop Applied Coating of Buried Piping

Test each lot of pipe for soluble salt contamination on the [internal and external surfaces](#) using the test kit described in paragraph TEST KIT FOR MEASURING CHLORIDE, SULFATE, AND NITRATE IONS ON STEEL AND COATED SURFACES. For pipes with an outer diameter (OD) of less than [6 inches](#), one test per [20 lineal feet](#) is required. For pipes with an OD of more than [6 inches](#), three tests per [100 square feet](#) must be taken, with a minimum of one test per section of pipe. Label all test tubes and retain for test verification. Reject and wash surfaces of the entire lot if one or more readings greater than 3 micrograms per square centimeter of chlorides or 10 micrograms per square centimeter of sulfates or 5 micrograms per square centimeter of nitrates is measured.

Effective washing and removal of soluble salts will require removal of any barrier to the steel surface, including rust or mill scale. This procedure may necessitate combinations of wet abrasive blasting, high pressure water rinsing, and cleaning using a solution of water and soluble salt remover. The soluble salt remover must be acidic, biodegradable, non-toxic, non-corrosive, and after application, will not interfere with primer adhesion. Use potable water, or potable water modified with soluble salt remover, for all washing or wet abrasive blasting.

Additional testing is required when there are delays between testing and preparation or testing and coating application. Test methods and equipment used in this phase must be included in the Coatings Work Plan.

This phase is required because pre-preparation testing and washing are generally more advantageous than attempting to remove soluble salt contamination after abrasive blasting. Soluble salt testing is also required in paragraph PRE-APPLICATION TESTING FOR SOLUBLE SALTS CONTAMINATION as a final acceptance test of prepared surfaces after abrasive blasting. Successful completion of pre-preparation testing and washing does not negate the requirement for pre-application testing.

3.4.1.4 Abrasive Blasting External Surfaces for Shop Applied Coating of Buried Piping

For carbon steel, prepare surfaces in accordance with SSPC SP 10/NACE No. 2.

For stainless steel, prepare surfaces in accordance with SSPC SP 17. The surface profile must be in accordance with the coating manufacturer's recommended range. Non-ferrous abrasives must be used. The surface profile must be in accordance with AWWA C213 or AWWA C215, as applicable and measured in accordance with ASTM D4417, Method A and Method C. The appearance of the surface after blasting must have the appearance of a Sand or Grit comparator. A rounded profile shape or peened surface is not acceptable. Measure profile at a rate of three measurements per lot at the beginning of the day.____

After completion of abrasive blasting, stainless steel pipe must be re-passivated prior to shop applied coating.

3.4.1.5 Abrasive Blasting Internal Surfaces for Shop Applied Coating of Buried Piping

For carbon steel, prepare surfaces in accordance with SSPC SP 10/NACE No. 2. The surface profile must be in accordance with the coating manufacturer's recommended range. Measure surface profile in accordance with ASTM D4417, Method A and Method C. The appearance of the surface after blasting must have the appearance of a Sand or Grit comparator. A rounded profile shape or peened surface is not acceptable. For pipes with an outer diameter (OD) of less than 6 inches, one test per 20 lineal feet is required. For pipes with an OD of more than 6 inches, three tests per 100 square feet must be taken, with a minimum of one test per section of pipe. Internal lining must not be used for stainless steel piping.

3.4.1.6 Disposal of Used Abrasive for Shop Applied Coating of Buried Piping

Provide Disposal of Used Abrasive Shop Applied Coating, in accordance with Federal, State, and Local mandated regulations.

3.4.1.7 Pre-Application Testing for Surface Contamination for Shop Applied Coating of Buried Piping

3.4.1.7.1 Pre-Application Testing for Oil and Grease Contamination for Shop Applied Coating of Buried Piping

Ensure surfaces are free of contamination as described in paragraph PRE-PREPARATION TESTING FOR OIL AND GREASE CONTAMINATION FOR SHOP APPLIED COATING OF BURIED PIPING, except that only questionable areas need be checked for beading of water misted onto surface.

3.4.1.7.2 Pre-Application Testing for Surface Cleanliness for Shop Applied Coating of Buried Piping

Apply coatings to dust free surfaces. To test surfaces, use [ISO 8502-3](#). Use a kit that is compliant with [ISO 8502-3](#). A rating of 2 or better must be achieved for acceptance. If a test does not result in a rating of 2 or better, reject contaminated surfaces, clean by vacuum cleaning, and retest. Test surfaces at rate of one test per joint or repair area where application will be performed. Provide two additional tests for each failed test or questionable test. Document test results in the Daily Inspection Report and attach tape to the Inspection Logbook.

Ferrous abrasives may become magnetized and difficult to remove from the steel substrate. If ferrous abrasives are used, additional visual inspection must be performed to ensure no surface contamination by the abrasive is present.

3.4.2 Mixing and Application of Shop Applied Coating of Buried Piping

3.4.2.1 Mixing Liquid Epoxy Coatings

Mix materials as stated in coating system instructions. Mix materials in same temperature and humidity conditions specified in paragraph DELIVERY AND STORAGE. Allow mixed material to stand for the required induction time.

Apply mixed products within stated pot life for each product. Stop applying when material becomes difficult to apply in a smooth, uniform wet film. Do not add solvent to extend pot life. Add all required solvent, if allowable by the coating manufacturer, at time of mixing.

3.4.2.2 External Pipe Shop Applied Coating Application

Apply coatings in accordance with [SSPC PA 1](#) and as specified in [AWWA C213](#) or [AWWA C215, as applicable](#). Apply coatings to surfaces that meet all stated surface preparation requirements.

For the application of [AWWA C213](#), the DFT must be a minimum of [15 mils](#) and maximum of [20 mils](#). The coating thickness must not exceed the manufacturers recommendations.

For the application of AWWA C215, the total coating thickness must be a minimum of as shown in the below table:

<u>Pipe Diameter (in)</u>	<u>Adhesive (mils)</u>	<u>Polyolefin (mils)</u>	<u>Total Thickness (mils)</u>
<u>0 to 2</u>	<u>8</u>	<u>22</u>	<u>30</u>
<u>3 to 6</u>	<u>8</u>	<u>30</u>	<u>38</u>
<u>8 to 16</u>	<u>8</u>	<u>36</u>	<u>44</u>
<u>18 to 36</u>	<u>8</u>	<u>40</u>	<u>48</u>

<u>Pipe Diameter (in)</u>	<u>Adhesive (mils)</u>	<u>Polyolefin (mils)</u>	<u>Total Thickness (mils)</u>
<u>Greater than 38</u>	<u>8</u>	<u>60</u>	<u>68</u>

The coating thickness must not exceed the manufacturers recommendations.

3.4.2.3 Internal Pipe Coating Application

For AWWA C213, apply coatings in accordance with SSPC PA 1 and as specified in AWWA C213.

For the application of **AWWA C213**, the DFT must be a minimum of **12 mils**. The coating thickness must not exceed the manufacturers recommendations.

3.4.2.4 Holiday Testing and Shop Repair

Perform holiday testing on all shop-applied, externally coated areas and repair as outlined in **AWWA C213** or **AWWA C215**, as applicable.

3.5 FIELD REPAIRS TO EXTERNAL COATING OF BURIED PIPING

Field repairs must only be performed when repairing shop applied coatings in the field and coating external girth welds.

3.5.1 Surface Preparation for Field Coating of Buried Piping

Block or suspended pipeline at a height that will allow the blast nozzle to be perpendicular to the surface being blasted, and at the proper standoff distance, at all times.

3.5.1.1 Abrasive Blasting Equipment for Field Coating of Buried Piping

Use abrasive blasting equipment of conventional air, force-feed, or pressure type. Maintain a minimum pressure of **95 psig** at nozzle. Confirm that air supply for abrasive blasting is free of oil and moisture when tested in accordance with **ASTM D4285**. Test air quality at each startup, but in no case, less often than every five operating hours.

3.5.1.2 Contamination Evaluation of Abrasive for Field Coating of Buried Piping

Test abrasive for salt contamination and oil contamination as required **SSPC AB 1** for non-ferrous abrasives, **SSPC AB 2** for recycled ferrous abrasives, and **SSPC AB 3** for ferrous abrasives. Modify the schedule of testing to be daily, at startup, and every five operating hours thereafter.

3.5.1.3 Surface Standard

Inspect surfaces to be coated, and select plate with similar properties and surface characteristics for use as a surface standard. Blast clean one or more **one foot** square steel panels in the manner specified in paragraph ABRASIVE BLASTING FOR FIELD COATING OF BURIED PIPING. Record blast nozzle type and size, air pressure at nozzle and compressor, distance of nozzle from panel, and angle of blast to establish procedures for blast cleaning. Measure surface profile in accordance with **ASTM D4417**, Method C. When the surface standard complies with all specified requirements, seal with a clearcoat protectant. Use the surface standard for comparison to abrasive blasted surfaces throughout the course of work.

After completion of abrasive blasting, stainless steel pipe must be re-passivated prior to field coating repairs.

3.5.1.4 Pre-Preparation Testing for Surface Contamination for Field Coating of Buried Piping

3.5.1.4.1 Pre-Preparation Testing for Oil and Grease Contamination for Field Coating of Buried Piping

Inspect all surfaces for oil or grease contamination using two or more of the following inspection techniques:

- 1) VISUAL INSPECTION - Observe surface for evidence of dirt or oil.
- 2) WATER BREAK TEST - Spray atomized mist of distilled water onto surface and observe for water beading. If water wets surface rather than beading up, surface can be considered free of oil or grease contamination. Beading of water (water forms droplets) is evidence of oil or grease contamination.
- 3) CLOTH RUB TEST - Rub a clean, white, lint-free, cotton cloth onto surface and observe for discoloration. To confirm oil or grease contamination in lightly stained areas, a non-staining solvent may be used to aid in oil or grease extraction. Any visible discoloration is evidence of oil or grease contamination.

Reject oil or grease contaminated surfaces, clean using a water based pH neutral degreaser in accordance with [SSPC SP 1](#), and recheck for contamination until surfaces are free of oil and grease.

3.5.1.4.2 Pre-Preparation Testing for Soluble Salts Contamination for Field Coating of Buried Piping

Prior to abrasive blasting, test all exposed girth welds and areas to be recoated for soluble salt contamination using the test kit described in paragraph TEST KIT FOR MEASURING CHLORIDE, SULFATE, AND NITRATE IONS ON STEEL AND COATED SURFACES. Label all test tubes and retain for test verification. Reject and wash surfaces if one or more readings greater than 3 micrograms per square centimeter of chlorides or 10 micrograms per square centimeter of sulfates or 5 micrograms per square centimeter of nitrates is measured.

Effective washing and removal of soluble salts will require removal of any barrier to the steel surface, including rust. This procedure may necessitate combinations of wet abrasive blasting, high pressure water rinsing, and cleaning using a solution of water and soluble salts remover. The soluble salts remover must be acidic, biodegradable, non-toxic, non-corrosive, and after application, will not interfere with coating adhesion. Delays between testing and preparation, or testing and coating application, may allow for the formation of new contamination. Use potable water, or potable water modified with soluble salt remover, for all washing or wet abrasive blasting. Test methods and equipment used in this phase must be included in the Coatings Work Plan.

This phase is required because pre-preparation testing and washing are generally more advantageous than attempting to remove soluble salt contamination after abrasive blasting. Soluble salt testing is also required in paragraph PRE-APPLICATION TESTING FOR SOLUBLE SALTS

CONTAMINATION FOR FIELD COATING OF BURIED PIPING as a final acceptance test of prepared surfaces after abrasive blasting. Successful completion of pre-preparation testing and washing does not negate the requirement for pre-application testing.

3.5.1.5 Abrasive Blasting for Field Coating of Buried Piping

For carbon steel, prepare girth welds and repairs to bare steel to SSPC SP 10/NACE No. 2 immediately prior to coating application. Verify that prepared surfaces comply with SSPC VIS 1 and match the prepared test-panels from the paragraph SURFACE STANDARD at the time of coating application. The surface profile must be in accordance with the coating manufacturer's recommended range. Measure the surface profile in accordance with ASTM D4417, Method A and Method C. The appearance of the surface after blasting must have the appearance of a Sand or Grit comparator. A rounded profile shape or peened surface is not acceptable. For pipes with an outer diameter (OD) of less than 6 inches, one test per 20 lineal feet is required. For pipes with an OD of more than 6 inches, three tests per 100 square feet must be taken, with a minimum of one test per section of pipe. Internal lining must not be used for stainless steel piping. When surfaces are re-blasted for any reason, retest profile as specified. Following abrasive blasting, remove dust and debris by vacuum cleaning. Dust and debris tend to collect at welds, plate overlaps, and surface irregularities. Do not attempt to wipe surface clean.

For stainless steel, prepare girth welds and repairs to bare steel to **SSPC SP 17** immediately prior to coating application. Verify that prepared surfaces comply with **SSPC VIS 1** at time of coating application. All other surfaces must be prepared in accordance with the appropriate coating standard referenced herein. The surface profile must be in accordance with the coating manufacturer's recommended range. Measure the surface profile in accordance with **ASTM D4417**, Method A and Method C. The appearance of the surface after blasting must have the appearance of a Sand or Grit comparator. A rounded profile shape or peened surface is not acceptable. For pipes with an outer diameter (OD) of less than **6 inches**, one test per **20 lineal feet** is required. For pipes with an OD of more than **6 inches**, three tests per **100 square feet** must be taken, with a minimum of one test per section of pipe. Internal lining must not be used for stainless steel piping. Non-ferrous abrasive must be used. When surfaces are re-blasted for any reason, retest profile as specified. Following abrasive blasting, remove dust and debris by vacuum cleaning. Dust and debris tend to collect at welds, plate overlaps, and surface irregularities. Do not attempt to wipe surface clean.

3.5.1.6 Disposal of Used Abrasive for Field Coating of Buried Piping

Provide **Disposal of Used Abrasive Field Applied Coating** off Government property in accordance with Federal, State, and Local mandated regulations.

3.5.1.7 Pre-Application Testing for Surface Contamination for Field Coating of Buried Piping

3.5.1.7.1 Pre-Application Testing for Oil and Grease Contamination for Field Coating of Buried Piping

Ensure surfaces are free of contamination as described in paragraph PRE-PREPARATION TESTING FOR OIL AND GREASE CONTAMINATION FOR FIELD COATING OF BURIED PIPING, except that only questionable areas need to be checked for beading of water misted onto surface.

3.5.1.7.2 Pre-Application Testing for Soluble Salts Contamination for Field Coating of Buried Piping

Test surfaces for soluble salts using the test kit described in paragraph TEST KIT FOR MEASURING CHLORIDE, SULFATE, AND NITRATE IONS ON STEEL AND COATED SURFACES, test girth welds and areas to be recoated for soluble salts. Label all test tubes and retain for test verification. One or more readings greater than 3 micrograms per square centimeter of chlorides or 10 micrograms per square centimeter of sulfates or 5 micrograms per square centimeter of nitrates is evidence of soluble salt contamination. Reject contaminated surfaces, wash as required in paragraph PRE-PREPARATION TESTING FOR SOLUBLE SALTS CONTAMINATION FOR FIELD COATING OF BURIED PIPING, allow to dry, and re-test, and re-wash until all required tests show allowable results. Re-blast tested areas using vacuum equipped blast equipment.

3.5.1.7.3 Pre-Application Testing for Surface Cleanliness for Field Coating of Buried Piping

Apply coatings to dust free surfaces. To test surfaces, use [ISO 8502-3](#). Use a kit that is compliant with [ISO 8502-3](#). A rating of 2 or better must be achieved for acceptance. If a test does not result in a rating of 2 or better, reject contaminated surfaces, clean by vacuum cleaning, and retest. Test surfaces at rate of one test per joint or repair area where application will be performed. Provide two additional tests for each failed test or questionable test. Document test results in the Daily Inspection Reports and attach tape to the Inspection Logbook.

Ferrous abrasives may become magnetized and difficult to remove from the steel substrate. If ferrous abrasives are used, additional visual inspection must be performed to ensure no surface contamination by the abrasive is present.

3.5.2 Coating Mixing and Application for Field Coating of Buried Piping

3.5.2.1 Mixing Coating Materials for Field Coating of Buried Piping

- a. Mix and apply coating materials in accordance with the approved coating system instructions, which may differ for each product. Do not mix partial kits unless standardized measuring cups are utilized. Do not alter mix ratios. Mix materials in same temperature and humidity conditions specified in paragraph DELIVERY AND STORAGE. Allow mixed material to stand for the required induction time. All mixing processes must be witnessed by the Quality Assurance Coatings Inspector.
- b. Apply mixed products within stated pot life for each product. Stop applying when material becomes difficult to apply in a smooth, uniform wet film. Do not add solvent to extend pot life. Add all required solvent at time of mixing, as allowable per the coating system instructions.
- c. If coating materials are not liquid materials (i.e., powder or extrusion materials), this paragraph may not apply. Follow the recommended instructions per the approved coating system instructions.

3.5.2.2 Application Conditions and Recoat Windows for Field Coating of Buried Piping

The application condition requirements for coatings are time and temperature sensitive. Plan coating application to ensure that specified temperature, humidity, and condensation conditions are met. If conditions do not allow for proper application of the coating materials, use appropriate means of controlling air and surface temperatures, as required. Partial or total enclosures, insulation, heating, cooling, or other appropriate measures may be required to control conditions to allow for orderly application of all required coats.

Maintain air and steel surface temperature within the range allowable by the approved coating system instructions during application and initial cure. Maintain steel surface temperature more than 5 degrees F above the dew-point of the ambient air for the same period. These conditions may require environmental controls through containment.

3.5.2.3 Coating Application for Field Coating of Buried Piping

Apply coatings in accordance with SSPC PA 1 and as specified in AWWA C203, AWWA C209, AWWA C210, AWWA C216, AWWA C217, NACE RP0402. Apply coatings to surfaces that meet all stated surface preparation requirements.

3.5.2.4 Holiday Testing and Field Repair

Perform holiday testing on all field coated areas and repair as outlined in AWWA C203, AWWA C209, AWWA C210, AWWA C216, AWWA C217, NACE RP0402.

3.5.3 Final Inspection of Pipeline Prior to Burial

Verify that all surfaces of the pipeline are holiday-free at time of placement of backfill over pipe. Use holiday inspection requirements and acceptance criteria of the standards applicable to the coatings being tested.

3.5.4 Final Cleanup

Following completion of the work, remove debris, equipment, and materials from the site. Remove all foreign matter such as blast media, dust, dirt, debris, grease, and oils. Wipe all dry to handle coated surfaces with damp lint-free cloth. Remove temporary connections to Government- or Contractor-furnished water and electrical services. Restore existing facilities in and around the work areas to their original condition.

3.6 FIELD AND SHOP QUALITY CONTROL

For marking of surfaces, use chalk for marking bare steel and water based markers for marking coated surfaces. Remove marks prior to coating. Do not use any wax or grease based markers, or any other markers that leave a residue or stain.

3.6.1 Inspection

3.6.1.1 Inspection Requirements

- a. Perform inspections in accordance with ASTM D3276 and the approved Coatings Work Plan.

- b. Provide all tools and instruments required to perform the required testing, as well as any tools or instruments that the inspector considers necessary to perform the required inspections and tests. Document each inspection and test, including required hold points and other required inspections and tests, as well as those inspections and tests deemed prudent from on-site evaluation to document a particular process or condition, as follows:
 - (1) Location or area;
 - (2) Purpose (required or special);
 - (3) Method;
 - (4) Criteria for evaluation;
 - (5) Results;
 - (6) Determination of compliance;
 - (7) List of required rework;
 - (8) Observations.
- c. Collect and record environmental conditions as described in [ASTM D3276](#) on a 24 hour basis, as follows:
 - (1) During surface preparation, every hour, or when changes occur;
 - (2) During coating application and the first four days of initial cure, every hour, or when changes occur;
 - (3) Note location, time, and temperature of the highest and lowest surface temperatures each day;
 - (4) Use a non-contact thermometer to locate temperature extremes, then verify with contact thermometers.
- d. Data collected on environmental conditions in AUTOMATED MONITORING REQUIREMENTS may be used for overnight data; however, the data must be constantly verified as to location of sensors and validity of data with respect to the coating work being accomplished.
- e. Document all equipment used in inspections and testing, including manufacturer, model number, serial number, last calibration date and future calibration date, and results of on-site calibration performed. Work documented using data from equipment found to be out of calibration must be considered as non-compliant since last calibration or calibration check, as required.
- f. Document Contractors compliance with the Coatings Work Plan.

3.6.1.2 [Inspection Report Forms](#)

Develop project-specific report forms as required to report measurements, test results, and observations being complete and conforming to contract requirements. This includes all direct requirements of the contract documents and indirect requirements of referenced documents. Show acceptance criteria with each requirement and indication of conformity of

each inspected item. The data may be in any format, but must be legible and presented so that entered data can be quickly compared to the appropriate requirement.

3.6.1.3 Daily Inspection Reports

Submit one copy of daily inspection report completed each day when performing work under this Section, to the Contracting Officer. Note all non-compliance issues, and all issues that were reported for rework in accordance with QC procedures of Section 01 45 00 QUALITY CONTROL. Each report must be signed by the Quality Assurance Coatings Inspector and the QC Manager. Submit report within 24 hours of date recorded on the report.

3.6.1.4 Inspection Logbook

A continuous record of all activity related to this Section must be maintained in an Inspection Logbook on a daily basis. The logbook must be hard or spiral-bound book or digital program with consecutively numbered pages, and must be used to record all information provided in the Daily Inspection Reports, as well as other pertinent observations and information. Submit the original Inspection Logbook to the Contracting Officer upon completion of the project and prior to final payment.

3.6.1.5 Inspection Equipment

All equipment must be in good condition, operational within its design range, and calibrated as required by the specified standard for use of each device.

3.6.2 Coatings Contractor QC Coatings Inspector's Responsibilities

The Coatings Contractor QC Coatings Inspector responsibilities include complete documentation of all daily inspection and production activities for the entire coatings project as outlined in the Coatings Work Plan, project program, and this Section. This includes, but is not limited to, the following:

- a. Attending and documenting the pre-job meeting and acquiring the project program, inspection and testing plan (ITP), schedule, and a list of who will receive the QC daily inspection reports;
- b. Performing a project site walk-through with the Quality Assurance Evaluator (QAE) or asset owner, Coatings Contractor QC, QC Manager, and Quality Assurance Coatings Inspector, inspecting at least the following:
 - (1) Asset(s) to be coated;
 - (2) Equipment and placement of equipment;
 - (3) Materials delivery and storage;
 - (4) Facility operational requirements during the project.
- c. Perform all daily and hold point inspections including, but not limited to, the following:
 - (1) Check equipment, including blotter test to verify compressed air cleanliness;

- (2) Perform non-visible contaminants testing (in accordance with PRE-PREPARATION TESTING FOR SOLUBLE SALT CONTAMINATION FOR SHOP APPLIED COATING OF BURIED PIPING, PRE-APPLICATION TESTING FOR SOLUBLE SALT CONTAMINATION FOR SHOP APPLIED COATING OF BURIED PIPING, PRE-PREPARATION TESTING FOR SOLUBLE SALT CONTAMINATION FOR FIELD COATING OF BURIED PIPING, and PRE-APPLICATION TESTING FOR SOLUBLE SALT CONTAMINATION FOR FIELD COATING OF BURIED PIPING);
 - (3) Perform visible contaminants testing (in accordance with PRE-PREPARATION TESTING FOR OIL AND GREASE CONTAMINATION FOR SHOP APPLIED COATING OF BURIED PIPING, PRE-APPLICATION TESTING FOR OIL AND GREASE CONTAMINATION FOR SHOP APPLIED COATING OF BURIED PIPING, PRE-PREPARATION TESTING FOR OIL AND GREASE CONTAMINATION FOR FIELD COATING OF BURIED PIPING, and PRE-APPLICATION TESTING FOR OIL AND GREASE CONTAMINATION FOR FIELD COATING OF BURIED PIPING);
 - (4) Obtain environmental readings;
 - (5) Perform abrasive testing per **SSPC AB 1**, **SSPC AB 2**, or **SSPC AB 3**;
 - (6) Perform surface preparation monitoring and testing;
 - (7) Perform surface cleanliness testing;
 - (8) Perform dust quantity testing;
 - (9) Record materials storage documentation (record all coatings and abrasive materials information, batch numbers, segregation, and storage temperature);
 - (10) Witness all coatings materials mixing and record mix materials temperatures, with verification of time of coatings pot life;
 - (11) Verify, witness, and record application method;
 - (12) Perform random wet film thickness (WFT) readings;
 - (13) Perform inspection of coatings application;
 - (14) Obtain dry film thickness (DFT) readings per **SSPC PA 2**;
 - (15) Perform holiday testing in accordance with HOLIDAY TESTING AND SHOP REPAIR and HOLIDAY TESTING AND FIELD REPAIR;
 - (16) Label asset identification (label stickers);
 - (17) Write Correction Action Reports (CAR), if needed;
 - (18) Write Non-Conformance Reports (NCR), if needed.
- d. Writing a daily detailed summary of the work shift inspections, testing, and the day's events, including any meetings and prevalent conversations. The final daily report must include a project summary that must be part of the daily coatings inspection report.
- e. The Coatings Contractor QC Coatings Inspector must stop all non-compliant work.

3.6.3 Quality Assurance Coatings Inspector's Responsibilities

The Quality Assurance Coatings Inspector's responsibilities include complete documentation of all on-site work associated with the coatings project. These responsibilities include, but are not limited to, the following:

- a. Attending and documenting the pre-job meeting and acquiring the [project program](#), inspection and testing plan (ITP), schedule, and a list of who will receive the QC daily inspection reports;
- b. Performing a project site walk-through with the Quality Assurance Evaluator (QAE) or asset owner, prime Contractor, and coatings Contractor (QC Coatings Inspector and QC Manager), inspecting at least the following:
 - (1) Asset(s) to be coated;
 - (2) Equipment and placement of equipment;
 - (3) Materials delivery and storage;
 - (4) Facility operational requirements during the project.
- c. Verifying all daily and hold point inspections performed by the Coatings Contractor QC Coatings Inspector or QC Manager by performing mirror inspections including, but not limited to, the following:
 - (1) Verify equipment check, including blotter test to verify compressed air cleanliness;
 - (2) Verify visible contaminants testing;
 - (3) Take environmental readings;
 - (4) Perform surface preparation monitoring and testing;
 - (5) Perform surface cleanliness testing;
 - (6) Perform dust quantity test;
 - (7) Record materials storage documentation (record all coating and abrasive information, batch numbers, segregation, and storage temperature);
 - (8) Witness all coatings materials mixing and record mix materials temperatures, with verification of time of coatings pot life;
 - (9) Verify, witness, and record application method;
 - (10) Inspect coatings application;
 - (11) Perform dry film thickness (DFT) readings per [SSPC PA 2](#);
 - (12) Inspect asset identification (label stickers);
 - (13) Write Correction Action Reports (CAR), if needed;

- (14) Write Non-Conformance Reports (NCR), if needed.
- d. The following testing is witnessed by the Quality Assurance Coatings Inspector and performed by the Coatings Contractor QC Coatings Inspector or QC Manager:
- (1) Wet film thickness (WFT) readings by coatings applicator(s);
 - (2) Non-visible contaminants testing for chlorides, sulfates, and nitrates (CSN);
 - (3) Abrasive testing per **SSPC AB 1**, **SSPC AB 2**, or **SSPC AB 3**;
 - (4) Holiday testing.
- e. Writing a daily detailed summary of the work shift inspections, testing, and the day's events, including any meetings and prevalent conversations. The final daily report must include a project summary that will be part of the last daily coatings inspection report.

3.7 PROJECT IDENTIFICATION

At the completion of the work, affix pertinent coating data on structure at a location that is readily accessible and visible from the ground. Use either stencils or nameplates. The following list generally describes the pertinent coating data, but should be modified as required to describe the coating systems.

Date coated/accepted: _____/_____

Project Number: _____

Contractor: _____

Address: _____

Coating System

Manufacturer: _____

Surface Prep: SSPC SP ____ Profile: _____

Primer: _____ Thickness: _____

Intermediate: _____ Thickness: _____

Topcoat: _____ Thickness: _____

Total Thickness: _____

3.7.1 Stencils

Use stencils on piping **8 in** or larger. Use stencils with 3/4- to one-inch Helvetica style letters and acrylic stencil paint of contrasting color.

3.7.2 Nameplates

Use nameplates for piping smaller than 8 inches. Construct plates of stainless steel. Install nameplates in prominent locations with

nonferrous screws, nonferrous bolts, or permanent adhesive. Minimum size of nameplates must be one by 2.5 in. Lettering must be the normal block style with a minimum 0.25 in height. Accurately align all lettering on nameplates.

-- End of Section --

SECTION 33 82 00

TELECOMMUNICATIONS OUTSIDE PLANT (OSP)
04/06

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 B1 (2013) Standard Specification for Hard-Drawn Copper Wire
- ASTM B8 (2023) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- ASTM D709 (2017) Standard Specification for Laminated Thermosetting Materials
- ASTM D1557 (2012; E 2015) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2700 kN-m/m³)

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

- IEEE 100 (2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
- IEEE C2 (2023) National Electrical Safety Code

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

- ICEA S-84-608 (2012) Broadband Twisted Pair Telecommunication Cable Filled, Polyolefin Insulated, Copper Conductors Technical Requirements
- ICEA S-87-640 (2023) Optical Fiber Outside Plant Communications Cable; 4th Edition
- ICEA S-98-688 (2012) Broadband Twisted Pair Telecommunication Cable, Aircore, Polyolefin Insulated, Copper Conductors Technical Requirements

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- ANSI C62.61 (1993) American National Standard for Gas Tube Surge Arresters on Wire Line Telephone Circuits

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2023; ERTA 1 2024; TIA 24-1; TIA 25-2)
National Electrical Code

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 6/NACE No.3 (2007) Commercial Blast Cleaning

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-455-107-A (1999) FOTP-107 Determination of Component
Reflectance or Link/System Return Loss
using a Loss Test Set

TIA-455-204-A (2013) FOTP-204 Measurement of Bandwidth
on Multimode Fiber

TIA-455-C (2014) General Requirements for Standard
Test Procedure for Optic Fibers, Cables,
Transducers, Sensors, Connecting and
Terminating Devices, and Other Fiber Optic
Components

TIA-472D000-B (2007) Standard for Optical Fiber Outside
Plant Communications Cable

TIA-455-78-B (2020c) FOTP-78 Optical Fibres - Part
1-40: Measurement Methods and Test
Procedures - Attenuation

TIA-492CAAA (1998; R 2002) Detail Specification for
Class IVa Dispersion-Unshifted Single-Mode
Optical Fibers

TIA-492E000 (1996; R 2002) Sectional Specification for
Class IVd Nonzero-Dispersion Single-Mode
Optical Fibers for the 1550 nm Window

TIA-526-7-A (2015) OFSTP-7 Measurement of Optical
Power Loss of Installed Single-Mode Fiber
Cable Plant

TIA-526-14-C (2015) OFSTP-14A Optical Power Loss
Measurements of Installed Multimode Fiber
Cable Plant

TIA-568.1-D (2015; Add 1 2018) Commercial Building
Telecommunications Infrastructure Standard

TIA-568.2-D (2018) Balanced Twisted-Pair
Telecommunications Cabling and Components
Standards

TIA-568.3-D (2016; Add 1 2019) Optical Fiber Cabling
Components Standard

TIA-569-E (2019) Telecommunications Pathways and
Spaces

TIA-590-A	(1997) Standard for Physical Location and Protection of Below Ground Fiber Optic Cable Plant
TIA-598-D	(2014; Add 1 2018; Add 2 2018) Optical Fiber Cable Color Coding
TIA-606-C	(2017) Administration Standard for the Telecommunications Cabling Infrastructure
TIA-607-D	(2019) Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
TIA-758-B	(2012) Customer-Owned Outside Plant Telecommunications Infrastructure Standard

U.S. DEPARTMENT OF AGRICULTURE (USDA)

RUS 1755	Telecommunications Standards and Specifications for Materials, Equipment and Construction
RUS Bull 345-50	(1979) Trunk Carrier Systems (PE-60)
RUS Bull 345-65	(1985) Shield Bonding Connectors (PE-65)
RUS Bull 345-72	(1985) Filled Splice Closures (PE-74)
RUS Bull 345-83	(1979; Rev Oct 1982) Gas Tube Surge Arrestors (PE-80)
RUS Bull 1751F-630	(1996) Design of Aerial Plant
RUS Bull 1751F-640	(1995) Design of Buried Plant, Physical Considerations
RUS Bull 1751F-643	(2002) Underground Plant Design
RUS Bull 1751F-815	(1979) Electrical Protection of Outside Plant
RUS Bull 1753F-201	(1997) Acceptance Tests of Telecommunications Plant (PC-4)
RUS Bull 1753F-401	(1995) Splicing Copper and Fiber Optic Cables (PC-2)

UL SOLUTIONS (UL)

UL 83	(2017; Reprint Mar 2020) UL Standard for Safety Thermoplastic-Insulated Wires and Cables
UL 497	(2001; Reprint Jul 2022) UL Standard for Safety Protectors for Paired Conductor Communication Circuits

UL 510

(2020; Dec 2022) UL Standard for Safety
Polyvinyl Chloride, Polyethylene and
Rubber Insulating Tape

1.2 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in this specification shall be as defined in TIA-568.1-D, TIA-568.2-D, TIA-568.3-D, TIA-569-E, TIA-606-C, and IEEE 100 and herein.

1.2.1 Campus Distributor (CD)

A distributor from which the campus backbone cabling emanates.
(International expression for main cross-connect - (MC).)

1.2.2 Entrance Facility (EF) (Telecommunications)

An entrance to the building for both private and public network service cables (including antennae) including the entrance point at the building wall and continuing to the entrance room or space.

1.2.3 Entrance Room (ER) (Telecommunications)

A centralized space for telecommunications equipment that serves the occupants of a building. Equipment housed therein is considered distinct from a telecommunications room because of the nature of its complexity.

1.2.4 Building Distributor (BD)

A distributor in which the building backbone cables terminate and at which connections to the campus backbone cables may be made. (International expression for intermediate cross-connect - (IC).)

1.2.5 Pathway

A physical infrastructure utilized for the placement and routing of telecommunications cable.

1.3 SYSTEM DESCRIPTION

The telecommunications outside plant consists of cable, conduit, manholes, poles, etc. required to provide signal paths from the closest point of presence to the new facility, including free standing frames or backboards, interconnecting hardware, terminating cables, lightning and surge protection modules at the entrance facility. The work consists of providing, testing and making operational cabling, interconnecting hardware and lightning and surge protection necessary to form a complete outside plant telecommunications system for continuous use.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Telecommunications Outside Plant; G

Telecommunications Entrance Facility Drawings; G

In addition to Section 01 33 00 SUBMITTAL PROCEDURES, provide shop drawings in accordance with paragraph SHOP DRAWINGS.

Existing Telecommunications System Survey; G

SD-03 Product Data

Wire and Cable; G

Cable Splices, and Connectors; G

Closures; G

Building Protector Assemblies; G

Protector Modules; G

Cross-Connect Terminal Cabinets; G

Spare Parts; G

Submittals must include the manufacturer's name, trade name, place of manufacture, and catalog model or number. Submittals must also include applicable federal, military, industry, and technical society publication references. Should manufacturer's data require supplemental information for clarification, the supplemental information must be submitted as specified in paragraph REGULATORY REQUIREMENTS and as required for certificates in Section 01 33 00 SUBMITTAL PROCEDURES.

Original submittals must clearly indicate on product sheet which product, option and/or accessory is being proposed if multiple products, options or accessories are available. Selected product, option or accessory must be highlighted in a contrasting color from the product sheet to indicate its selection.

Resubmittals must clearly indicate on product sheet which product, option or accessory is being proposed if multiple products, options or accessories are available. Selected product, option or accessory must be highlighted in a contrasting color from the product sheet to indicate its selection. Resubmittals must also be clouded to clearly indicate to the reviewer what selections have changed from the original submittal.

Failure to indicate specific product information as outlined above will require corrected submission of product data by Contractor.

SD-06 Test Reports

Pre-installation Tests; G

Acceptance Tests; G

Outside Plant Test Plan; G

SD-07 Certificates

Telecommunications Contractor Qualifications; G

Key Personnel Qualifications; G

Minimum Manufacturer's Qualifications; G

SD-08 Manufacturer's Instructions

Building Protector Assembly Installation; G

Cable Tensions; G

Fiber Optic Splices; G

Submit instructions prior to installation.

SD-09 Manufacturer's Field Reports

Factory Reel Test Data; G

SD-10 Operation and Maintenance Data

Telecommunications Outside Plant (OSP), Data Package 5; G

Commercial off-the-shelf manuals must be provided for operation, installation, configuration, and maintenance of products provided as a part of the telecommunications outside plant (OSP). Submit operations and maintenance data in accordance with Section 01 78 23, OPERATION AND MAINTENANCE DATA and as specified herein not later than 2 months prior to the date of beneficial occupancy. In addition to requirements of Data package 5, include the requirements of paragraphs TELECOMMUNICATIONS OUTSIDE PLANT SHOP DRAWINGS and TELECOMMUNICATIONS ENTRANCE FACILITY DRAWINGS.

SD-11 Closeout Submittals

Record Documentation; G

In addition to other requirements, provide in accordance with paragraph RECORD DOCUMENTATION.

1.5 QUALITY ASSURANCE

1.5.1 Shop Drawings

Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams must identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings must indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. Submittals must include the nameplate data, size, and capacity. Submittals must also include applicable federal, military, industry, and technical society publication references.

1.5.1.1 Telecommunications Outside Plant Shop Drawings

Provide Outside Plant Design in accordance with TIA-758-B, RUS Bull 1751F-630 for aerial system design, and RUS Bull 1751F-643 for underground system design. Provide T0 shop drawings that show the physical and logical connections from the perspective of an entire campus, such as actual building locations, exterior pathways and campus backbone cabling on plan view drawings, major system nodes, and related connections on the logical system drawings in accordance with TIA-606-C. Drawings must include wiring and schematic diagrams for fiber optic and copper cabling and splices, copper conductor gauge and pair count, fiber pair count and type, pathway duct and innerduct arrangement, associated construction materials, and any details required to demonstrate that cable system has been coordinated and will properly support the switching and transmission system identified in specification and drawings. Provide Registered Communications Distribution Designer (RCDD) approved drawings of the telecommunications outside plant. The telecommunications outside plant (OSP) shop drawings must be included in the operation and maintenance manuals.

1.5.1.2 Telecommunications Entrance Facility Drawings

Provide T3 drawings for EF Telecommunications in accordance with TIA-606-C that include telecommunications entrance facility plan views, pathway layout (cable tray, racks, ladder-racks, etc.), mechanical/electrical layout, and cabinet, backboard and wall elevations. Drawings must show layout of applicable equipment including incoming cable stub or connector blocks, building protector assembly, outgoing cable connector blocks, patch panels and equipment spaces and cabinet/racks. Drawings must include a complete list of equipment and material, equipment rack details, proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearance for maintenance and operation. Drawings may also be an enlargement of a congested area of T1 or T2 drawings. The telecommunications entrance facility shop drawings must be included in the operation and maintenance manuals.

1.5.1.3 Existing Telecommunications System Survey

Locate and verify existing telecommunications systems within the identified areas prior to starting work. The survey must include a review of maintenance holes, handholes, ductbanks, fiber optic and copper cabling. Provide drawings that show discrepancies between survey information and design drawings.

1.5.2 Telecommunications Qualifications

Work under this section must be performed by and the equipment must be provided by the approved telecommunications contractor and key personnel. Qualifications must be provided for: the telecommunications system contractor, the telecommunications system installer, the supervisor (if different from the installer), and the cable splicing and terminating personnel. A minimum of 30 days prior to installation, submit documentation of the experience of the telecommunications contractor and of the key personnel.

1.5.2.1 Telecommunications Contractor Qualifications

The telecommunications contractor must be a firm which is regularly and

professionally engaged in the business of the applications, installation, and testing of the specified telecommunications systems and equipment. The telecommunications contractor must demonstrate experience in providing successful telecommunications systems that include outside plant and broadband cabling within the past 3 years. Submit documentation for a minimum of three and a maximum of five successful telecommunication system installations for the telecommunications contractor. Each of the key personnel must demonstrate experience in providing successful telecommunications systems in accordance with **TIA-758-B** within the past 3 years.

1.5.2.2 Key Personnel Qualifications

Provide key personnel who are regularly and professionally engaged in the business of the application, installation and testing of the specified telecommunications systems and equipment. There may be one key person or more key persons proposed for this solicitation depending upon how many of the key roles each has successfully provided. Each of the key personnel must demonstrate experience in providing successful telecommunications systems within the past 3 years.

Cable splicing and terminating personnel assigned to the installation of this system or any of its components must have training in the proper techniques and have a minimum of 3 years experience in splicing and terminating the specified cables. Modular splices must be performed by factory certified personnel or under direct supervision of factory trained personnel for products used.

Supervisors and installers assigned to the installation of this system or any of its components must have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products.

Submit documentation for a minimum of three and a maximum of five successful telecommunication system installations for each of the key personnel. Documentation for each key person must include at least two successful system installations provided that are equivalent in system size and in construction complexity to the telecommunications system proposed for this solicitation. Include specific experience in installing and testing telecommunications outside plant systems, including broadband cabling, and provide the names and locations of at least two project installations successfully completed using optical fiber and copper telecommunications cabling systems. All of the existing telecommunications system installations offered by the key persons as successful experience must have been in successful full-time service for at least 18 months prior to the issuance date for this solicitation. Provide the name and role of the key person, the title, location, and completed installation date of the referenced project, the referenced project owner point of contact information including name, organization, title, and telephone number, and generally, the referenced project description including system size and construction complexity.

Indicate that all key persons are currently employed by the telecommunications contractor, or have a commitment to the telecommunications contractor to work on this project. All key persons must be employed by the telecommunications contractor at the date of issuance of this solicitation, or if not, have a commitment to the telecommunications contractor to work on this project by the date that the bid was due to the Contracting Officer.

Note that only the key personnel approved by the Contracting Officer in the successful proposal must do work on this solicitation's telecommunications system. Key personnel must function in the same roles in this contract, as they functioned in the offered successful experience. Any substitutions for the telecommunications contractor's key personnel requires approval from The Contracting Officer.

1.5.2.3 Minimum Manufacturer's Qualifications

Cabling, equipment and hardware manufacturers must have a minimum of 3 years experience in the manufacturing, assembly, and factory testing of components which comply with, TIA-568.1-D, TIA-568.2-D and TIA-568.3-D. In addition, cabling manufacturers must have a minimum of 3 years experience in the manufacturing and factory testing of cabling which comply with ICEA S-87-640, ICEA S-98-688, and ICEA S-84-608.

1.5.3 Outside Plant Test Plan

Prepare and provide a complete and detailed test plan for field tests of the outside plant including a complete list of test equipment for the copper conductor and optical fiber cables, components, and accessories for approval by the Contracting Officer. Include a cut-over plan with procedures and schedules for relocation of facility station numbers without interrupting service to any active location. Submit the plan at least ~~30~~120 days prior to tests for Contracting Officer approval. Provide outside plant testing and performance measurement criteria in accordance with TIA-568.1-D and RUS Bull 1753F-201. Include procedures for certification, validation, and testing that includes fiber optic link performance criteria.

1.5.4 Standard Products

Provide materials and equipment that are standard products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship and must be the manufacturer's latest standard design that has been in satisfactory commercial or industrial use for at least 2 years prior to bid opening. The 2-year period must include applications of equipment and materials under similar circumstances and of similar size. The product must have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Products supplied must be specifically designed and manufactured for use with outside plant telecommunications systems. Where two or more items of the same class of equipment are required, these items must be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.5.4.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is provided.

1.5.4.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site must not be used, unless specified otherwise.

1.5.5 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "must" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship must be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.5.5.1 Independent Testing Organization Certificate

In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. The certificate must state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.6 DELIVERY, STORAGE, AND HANDLING

Ship cable on reels in 1000 feet length with a minimum overage of 10 percent. Radius of the reel drum must not be smaller than the minimum bend radius of the cable. Wind cable on the reel so that unwinding can be done without kinking the cable. Two meters of cable at both ends of the cable must be accessible for testing. Attach permanent label on each reel showing length, cable identification number, cable size, cable type, and date of manufacture. Provide water resistant label and the indelible writing on the labels. Apply end seals to each end of the cables to prevent moisture from entering the cable. Reels with cable must be suitable for outside storage conditions when temperature ranges from minus 40 degrees C to plus 65 degrees C, with relative humidity from 0 to 100 percent. Equipment, other than cable, delivered and placed in storage must be stored with protection from weather, humidity and temperature variation, dirt and dust, or other contaminants in accordance with manufacturer's requirements.

1.7 MAINTENANCE

1.7.1 Record Documentation

Provide the activity responsible for telecommunications system maintenance and administration a single complete and accurate set of record documentation for the entire telecommunications system with respect to this project.

Provide T5 drawings including documentation on cables and termination hardware in accordance with TIA-606-C. T5 drawings must include schedules to show information for cut-overs and cable plant management, patch panel layouts, cross-connect information and connecting terminal layout as a minimum. T5 drawings must be provided on electronic media using Windows based computer cable management software. A licensed copy of the cable management software including documentation, must be provided. Provide the following T5 drawing documentation as a minimum:

- a. Cables - A record of installed cable must be provided in accordance with TIA-606-C. The cable records must include the required data

fields for each cable and complete end-to-end circuit report for each complete circuit from the assigned outlet to the entry facility in accordance with TIA-606-C. Include manufacture date of cable with submittal.

- b. Termination Hardware - Provide a record of installed patch panels, cross-connect points, campus distributor and terminating block arrangements and type in accordance with TIA-606-C. Documentation must include the required data fields as a minimum in accordance with TIA-606-C.

1.7.2 Spare Parts

In addition to the requirements of Section 01 78 23 OPERATION AND MAINTENANCE DATA, provide a complete list of parts and supplies, with current unit prices and source of supply, and a list of spare parts recommended for stocking. Spare parts must be provided no later than the start of field testing.

1.8 WARRANTY

The equipment items must be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Products supplied must be specifically designed and manufactured for use with outside plant telecommunications systems.

2.2 TELECOMMUNICATIONS ENTRANCE FACILITY

2.2.1 Building Protector Assemblies

Provide self-contained 5 pin solid state unit supplied with a field cable stub factory connected to protector socket blocks to terminate and accept protector modules for pairs as indicated on plans of outside cable. Building protector assembly must have interconnecting hardware for connection to interior cabling at full capacity. Provide manufacturers instructions for building protector assembly installation.

2.2.2 Protector Modules

Provide in accordance with UL 497 three-electrode gas tube or solid state type 5 pin rated for the application. Provide gas tube protection modules in accordance with RUS Bull 345-83 and must be heavy duty, A>10kA, B>400, C>65A where A is the maximum single impulse discharge current, B is the impulse life and C is the AC discharge current in accordance with ANSI C62.61. The gas modules must shunt high voltage to ground, fail short, and be equipped with an external spark gap and heat coils in accordance with UL 497. Provide the number of surge protection modules equal to the number of pairs of exterior cable of the building protector assembly.

2.3 CLOSURES

2.3.1 Copper Conductor Closures

2.3.1.1 Underground Cable Closures

- a. In vault or manhole: Provide underground closure suitable to house a straight, butt, and branch splice in a protective housing into which can be poured an encapsulating compound. Closure must be of suitable thermoplastic, thermoset, or stainless steel material supplying structural strength necessary to pass the mechanical and electrical requirements in a vault or manhole environment. Encapsulating compound must be reenterable and must not alter the chemical stability of the closure. Provide filled splice cases in accordance with **RUS Bull 345-72**.

2.3.2 Fiber Optic Closures

2.3.2.1 In Vault or Manhole

Provide underground closure suitable to house splice organizer in a protective housing into which can be poured an encapsulating compound. Closure must be of thermoplastic, thermoset, or stainless steel material supplying structural strength necessary to pass the mechanical and electrical requirements in a vault or manhole environment. Encapsulating compound must be reenterable and must not alter the chemical stability of the closure.

2.4 PAD MOUNTED CROSS-CONNECT TERMINAL CABINETS

Provide in accordance with **RUS 1755.910** and the following:

- a. Constructed of 14 gauge steel.
- b. Equipped with a double set of hinged doors with closed-cell foam weatherstripping. Doors must be locked and contain a marker as indicated.
- c. Equipped with spool spindle bracket, mounting frames, binding post log, jumpering instruction label, and load coil mounting provisions.
- d. Complete with cross connect modules to terminate number of pairs as indicated.
- e. Sized as indicated.

2.5 CABLE SPLICES, AND CONNECTORS

2.5.1 Copper Cable Splices

Provide multipair, in-line splices of a moisture resistant, three-wire insulation displacement connector held rigidly in place to assure maximum continuity in accordance with **RUS Bull 1753F-401**. Cables greater than 25 pairs must be spliced using multipair splicing connectors, which accommodate 25 pairs of conductors at a time. Provide correct connector size to accommodate the cable gauge of the supplied cable.

2.5.2 Copper Cable Splice Connector

Provide splice connectors with a polycarbonate body and cap and a tin-plated brass contact element. Connector must accommodate 22 to 26 AWG solid wire with a maximum insulation diameter of 0.065 inch. Fill connector with sealant grease to make a moisture resistant connection, in accordance with [RUS Bull 1753F-401](#).

2.5.3 Fiber Optic Cable Splices

Provide fiber optic cable splices and splicing materials for fusion methods at locations shown on the construction drawings. The splice insertion loss must be 0.3 dB maximum when measured in accordance with [TIA-455-78-B](#) using an Optical Time Domain Reflectometer (OTDR). Splices must be designed for a return loss of 40.0 db max for single mode fiber when tested in accordance with [TIA-455-107-A](#). Physically protect each fiber optic splice by a splice kit specially designed for the splice.

2.5.4 Fiber Optic Splice Organizer

Provide splice organizer suitable for housing fiber optic splices in a neat and orderly fashion. Splice organizer must allow for a minimum of 3 feet of fiber for each fiber within the cable to be neatly stored without kinks or twists. Splice organizer must accommodate individual strain relief for each splice and allow for future maintenance or modification, without damage to the cable or splices. Provide splice organizer hardware, such as splice trays, protective glass shelves, and shield bond connectors in a splice organizer kit.

2.5.5 Shield Connectors

Provide connectors with a stable, low-impedance electrical connection between the cable shield and the bonding conductor in accordance with [RUS Bull 345-65](#).

2.6 CONDUIT

Provide conduit as specified in Section [33 71 02](#) UNDERGROUND ELECTRICAL DISTRIBUTION.

2.7 PLASTIC INSULATING TAPE

[UL 510](#).

2.8 WIRE AND CABLE

2.8.1 Copper Conductor Cable

Solid copper conductors, covered with an extruded solid insulating compound. Insulated conductors must be twisted into pairs which are then stranded or oscillated to form a cylindrical core. For special high frequency applications, the cable core must be separated into compartments. Cable must be completed by the application of a suitable core wrapping material, a corrugated copper or plastic coated aluminum shield, and an overall extruded jacket. Telecommunications contractor must verify distances between splice points prior to ordering cable in specific cut lengths. Gauge of conductor must determine the range of numbers of pairs specified; 19 gauge (6 to 400 pairs), 22 gauge (6 to 1200 pairs), 24 gauge (6 to 2100 pairs), and 26 gauge (6 to 3000 pairs).

Copper conductor must conform to the following:

2.8.1.1 Underground

Provide filled cable meeting the requirements of ICEA S-84-608 and RUS 1755.390 RUS 1755.890.

2.8.1.2 Screen

Provide screen-compartmental core cable filled cable meeting the requirements of ICEA S-84-608 and RUS 1755.390.

2.8.2 Fiber Optic Cable

Provide single-mode, 8/125-um, 0.10 aperture 1310 nm fiber optic cable in accordance with TIA-492CAA single-mode, 8/125-um, 0.10 aperture 1550 nm fiber optic cable in accordance with TIA-492E000, TIA-472D000-B, and ICEA S-87-640 including any special requirements made necessary by a specialized design. Provide optical fibers as indicated. Fiber optic cable must be single-armored and specifically designed for outside use with loose buffer construction. Provide fiber optic color code in accordance with TIA-598-D

2.8.2.1 Strength Members

Provide central, non-metallic strength members with sufficient tensile strength for installation and residual rated loads to meet the applicable performance requirements in accordance with ICEA S-87-640. The strength member is included to serve as a cable core foundation to reduce strain on the fibers, and must not serve as a pulling strength member.

2.8.2.2 Shielding or Other Metallic Covering

Provide copper, copper alloy or copper and steel laminate dual tape covering or shield in accordance with ICEA S-87-640.

2.8.2.3 Performance Requirements

Provide fiber optic cable with optical and mechanical performance requirements in accordance with ICEA S-87-640.

2.8.3 Grounding and Bonding Conductors

Provide grounding and bonding conductors in accordance with RUS 1755.200, TIA-607-D, IEEE C2, and NFPA 70. Solid bare copper wire meeting the requirements of ASTM B1 for sizes No. 8 AWG and smaller and stranded bare copper wire meeting the requirements of ASTM B8, for sizes No. 6 AWG and larger. Insulated conductors must have 600-volt, Type TW insulation meeting the requirements of UL 83.

2.9 T-SPAN LINE TREATMENT REPEATERS

Provide as indicated. Repeaters must be pedestal mounted with non-pressurized housings, sized as indicated and must meet the requirements of RUS Bull 345-50.

2.10 CABLE TAGS IN MANHOLES, HANDHOLES, AND VAULTS

Provide tags for each telecommunications cable or wire located in

manholes, handholes, and vaults. Cable tags must be stainless steel and labeled in accordance with TIA-606-C. Handwritten labeling is unacceptable.

2.10.1 Stainless Steel

Provide stainless steel, cable tags 1 5/8 inches in diameter 1/16 inch thick minimum, and circular in shape. Tags must be die stamped with numbers, letters, and symbols not less than 0.25 inch high and approximately 0.015 inch deep in normal block style.

2.10.2 Polyethylene Cable Tags

Provide tags of polyethylene that have an average tensile strength of 3250 pounds per square inch; and that are 0.08 inch thick (minimum), non-corrosive non-conductive; resistive to acids, alkalis, organic solvents, and salt water; and distortion resistant to 170 degrees F. Provide 0.05 inch (minimum) thick black polyethylene tag holder. Provide a one-piece nylon, self-locking tie at each end of the cable tag. Ties must have a minimum loop tensile strength of 175 pounds. The cable tags must have black block letters, numbers, and symbols one inch high on a yellow background. Letters, numbers, and symbols must not fall off or change positions regardless of the cable tags' orientation.

2.11 BURIED WARNING AND IDENTIFICATION TAPE

Provide fiber optic media marking and protection in accordance with TIA-590-A. Provide color, type and depth of tape as specified in paragraph BURIED WARNING AND IDENTIFICATION TAPE in Section 31 00 00 EARTHWORK.

2.12 GROUNDING BRAID

Provide grounding braid that provides low electrical impedance connections for dependable shield bonding in accordance with RUS 1755.200. Braid must be made from flat tin-plated copper.

2.13 MANUFACTURER'S NAMEPLATE

Each item of equipment must have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.14 FIELD FABRICATED NAMEPLATES

Provide laminated plastic nameplates in accordance with ASTM D709 for each patch panel, protector assembly, rack, cabinet and other equipment or as indicated on the drawings. Each nameplate inscription must identify the function and, when applicable, the position. Nameplates must be melamine plastic, 0.125 inch thick, white with black center core. Surface must be matte finish. Corners must be square. Accurately align lettering and engrave into the core. Minimum size of nameplates must be one by 2.5 inches. Lettering must be a minimum of 0.25 inch high normal block style.

2.15 TESTS, INSPECTIONS, AND VERIFICATIONS

2.15.1 Factory Reel Test Data

Test 100 percent OTDR test of FO media at the factory in accordance with TIA-568.1-D and TIA-568.3-D. Use TIA-526-7-A for single mode fiber and TIA-526-14-C Method B for multi mode fiber measurements. Calibrate OTDR to show anomalies of 0.2 dB minimum. Enhanced performance filled OSP copper cables, referred to as Broadband Outside Plant (BBOSP), must meet the requirements of ICEA S-84-608. Enhanced performance air core OSP copper cables must meet the requirements of ICEA S-98-688. Submit test reports, including manufacture date for each cable reel and receive approval before delivery of cable to the project site.

PART 3 EXECUTION

3.1 INSTALLATION

Install all system components and appurtenances in accordance with manufacturer's instructions IEEE C2, NFPA 70, and as indicated. Provide all necessary interconnections, services, and adjustments required for a complete and operable telecommunications system.

3.1.1 Contractor Damage

Promptly repair indicated utility lines or systems damaged during site preparation and construction. Damages to lines or systems not indicated, which are caused by Contractor operations, must be treated as "Changes" under the terms of the Contract Clauses. When Contractor is advised in writing of the location of a nonindicated line or system, such notice must provide that portion of the line or system with "indicated" status in determining liability for damages. In every event, immediately notify the Contracting Officer of damage.

3.1.2 Cable Inspection and Repair

Handle cable and wire provided in the construction of this project with care. Inspect cable reels for cuts, nicks or other damage. Damaged cable must be replaced or repaired to the satisfaction of the Contracting Officer. Reel wraps must remain intact on the reel until the cable is ready for placement.

3.1.3 Direct Burial System

Installation must be in accordance with RUS Bull 1751F-640. Under railroad tracks, paved areas, and roadways install cable in conduit encased in concrete. Slope ducts to drain. Excavate trenches by hand or mechanical trenching equipment. Provide a minimum cable cover of 24 inches below finished grade. Trenches must be not less than 6 inches wide and in straight lines between cable markers. Do not use cable plows. Bends in trenches must have a radius of not less than 36 inches. Where two or more cables are laid parallel in the same trench, space laterally at least 3 inches apart. When rock is encountered, remove it to a depth of at least 3 inches below the cable and fill the space with sand or clean earth free from particles larger than 1/4 inch. Do not unreel and pull cables into the trench from one end. Cable may be unreel on grade and lifted into position. Provide color, type and depth of warning tape as specified in paragraph BURIED WARNING AND IDENTIFICATION TAPE in Section 31 00 00 EARTHWORK.

3.1.3.1 Cable Placement

- a. Separate cables crossing other cables or metal piping from the other cables or pipe by not less than **3 inches** of well tamped earth. Do not install circuits for communications under or above traffic signal loops.
- b. Cables must be in one piece without splices between connections except where the distance exceeds the lengths in which the cable is furnished.
- c. Avoid bends in cables of small radii and twists that might cause damage. Do not bend cable and wire in a radius less than 10 times the outside diameter of the cable or wire.
- d. Leave a horizontal slack of approximately **3 feet** in the ground on each end of cable runs, on each side of connection boxes, and at points where connections are brought aboveground. Where cable is brought aboveground, leave additional slack to make necessary connections.

3.1.3.2 Identification Markers

Provide a marker at each change of direction of the cable, over the ends of ducts or conduits which are installed under paved areas and roadways and over each splice. Identification markers must be of concrete, approximately **20 inches** square by **6 inches** thick.

3.1.3.3 Backfill for Rocky Soil

When placing cable in a trench in rocky soil, the cable must be cushioned by a fill of sand or selected soil at least **2 inches** thick on the floor of the trench before placing the cable or wire. The backfill for at least **4 inches** above the wire or cable must be free from stones, rocks, or other hard or sharp materials which might damage the cable or wire. If the buried cable is placed less than **24 inches** in depth, a protective cover of concrete must be used.

3.1.4 Cable Protection

Provide direct burial cable protection in accordance with **NFPA 70** and as specified in Section **33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION**. Galvanized conduits which penetrate concrete (slabs, pavement, and walls) must be PVC coated and must extend from the first coupling or fitting outside either side of the concrete minimum of **6 inches per 12 inches** burial depth beyond the edge of the surface where cable protection is required; all conduits must be sealed on each end. Where additional protection is required, cable may be placed in galvanized iron pipe (GIP) sized on a maximum fill of 40 percent of cross-sectional area, or in concrete encased **4 inches** PVC pipe. Conduit may be installed by jacking or trenching. Trenches must be backfilled with earth and mechanically tamped at **6 inches** lift so that the earth is restored to the same density, grade and vegetation as adjacent undisturbed material.

3.1.4.1 Cable End Caps

Cable ends must be sealed at all times with coated heat shrinkable end caps. Cables ends must be sealed when the cable is delivered to the job site, while the cable is stored and during installation of the cable. The caps must remain in place until the cable is spliced or terminated.

Sealing compounds and tape are not acceptable substitutes for heat shrinkable end caps. Cable which is not sealed in the specified manner at all times will be rejected.

3.1.5 Underground Duct

Provide underground duct and connections to existing manholes, handholes, concrete pads, and existing ducts as specified in Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION with any additional requirements as specified herein.

3.1.6 Reconditioning of Surfaces

Provide reconditioning of surfaces as specified in Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION.

3.1.7 Penetrations

Caulk and seal cable access penetrations in walls, ceilings and other parts of the building. Seal openings around electrical penetrations through fire resistance-rated wall, partitions, floors, or ceilings ~~in accordance with Section 07 84 00 FIRESTOPPING.~~

3.1.8 Cable Pulling

Test duct lines with a mandrel and swab out to remove foreign material before the pulling of cables. Avoid damage to cables in setting up pulling apparatus or in placing tools or hardware. Do not step on cables when entering or leaving the manhole. Do not place cables in ducts other than those shown without prior written approval of the Contracting Officer. Roll cable reels in the direction indicated by the arrows painted on the reel flanges. Set up cable reels on the same side of the manhole as the conduit section in which the cable is to be placed. Level the reel and bring into proper alignment with the conduit section so that the cable pays off from the top of the reel in a long smooth bend into the duct without twisting. Under no circumstances must the cable be paid off from the bottom of a reel. Check the equipment set up prior to beginning the cable pulling to avoid an interruption once pulling has started. Use a cable feeder guide of suitable dimensions between cable reel and face of duct to protect cable and guide cable into the duct as it is paid off the reel. As cable is paid off the reel, lubricate and inspect cable for sheath defects. When defects are noticed, stop pulling operations and notify the Contracting Officer to determine required corrective action. Cable pulling must also be stopped when reel binds or does not pay off freely. Rectify cause of binding before resuming pulling operations. Provide cable lubricants recommended by the cable manufacturer. Avoid bends in cables of small radii and twists that might cause damage. Do not bend cable and wire in a radius less than 10 times the outside diameter of the cable or wire.

3.1.8.1 Cable Tensions

Obtain from the cable manufacturer and provide to the Contracting Officer, the maximum allowable pulling tension. This tension must not be exceeded.

3.1.8.2 Pulling Eyes

Equip cables 1.25 inches in diameter and larger with cable manufacturer's factory installed pulling-in eyes. Provide cables with diameter smaller

than 1.25 inches with heat shrinkable type end caps or seals on cable ends when using cable pulling grips. Rings to prevent grip from slipping must not be beaten into the cable sheath. Use a swivel of 3/4 inch links between pulling-in eyes or grips and pulling strand.

3.1.8.3 Installation of Cables in Manholes, Handholes, and Vaults

Do not install cables utilizing the shortest route, but route along those walls providing the longest route and the maximum spare cable lengths. Form cables to closely parallel walls, not to interfere with duct entrances, and support cables on brackets and cable insulators at a maximum of 4 feet. In existing manholes, handholes, and vaults where new ducts are to be terminated, or where new cables are to be installed, modify the existing installation of cables, cable supports, and grounding as required with cables arranged and supported as specified for new cables. Identify each cable with corrosion-resistant embossed metal tags.

3.1.9 Aerial Cable Installation

Where physical obstructions make it necessary to pull distribution wire along the line from a stationary reel, use cable stringing blocks to support wire during placing and tensioning operations. Do not place ladders, cable coils, and other equipment on or against the distribution wire. Wire must be sagged in accordance with the data shown. Protect cable installed outside of building less than 8 feet above finished grade against physical damage.

3.1.9.1 Figure 8 Distribution Wire

Perform spiraling of the wire within 24 hours of the tensioning operation. Perform spiraling operations at alternate poles with the approximate length of the spiral being 15 feet. Do not remove insulation from support members except at bonding and grounding points and at points where ends of support members are terminated in splicing and dead-end devices. Ground support wire at poles to the pole ground.

3.1.9.2 Suspension Strand

Place suspension strand as indicated. Tension in accordance with the data indicated. When tensioning strand, loosen cable suspension clamps enough to allow free movement of the strand. Place suspension strand on the road side of the pole line. In tangent construction, point the lip of the suspension strand clamp toward the pole. At angles in the line, point the suspension strand clamp lip away from the load. In level construction place the suspension strand clamp in such a manner that it will hold the strand below the through-bolt. At points where there is an up-pull on the strand, place clamp so that it will support strand above the through-bolt. Make suspension strand electrically continuous throughout its entire length, bond to other bare cables suspension strands and connect to pole ground at each pole.

3.1.9.3 Aerial Cable

Keep cable ends sealed at all times using cable end caps. Take cable from reel only as it is placed. During placing operations, do not bend cables in a radius less than 10 times the outside diameter of cable. Place temporary supports sufficiently close together and properly tension the cable where necessary to prevent excessive bending. In those instances where spiraling of cabling is involved, accomplish mounting of enclosures

for purposes of loading, splicing, and distribution after the spiraling operation has been completed.

3.1.10 Cable Splicing

3.1.10.1 Copper Conductor Splices

Perform splicing in accordance with requirements of [RUS Bull 1753F-401](#) except that direct buried splices and twisted and soldered splices are not allowed. Exception does not apply for pairs assigned for carrier application.

3.1.10.2 Fiber Optic Splices

Fiber optic splicing must be in accordance with manufacturer's recommendation and must exhibit an insertion loss not greater than 0.2 dB for fusion splices.

3.1.11 Surge Protection

All cables and conductors, except fiber optic cable, which serve as communication lines through off-premise lines, must have surge protection installed at each end which meet the requirements of [RUS Bull 1751F-815](#).

3.1.12 Grounding

Provide grounding and bonding in accordance with [RUS 1755.200](#), [TIA-607-D](#), [IEEE C2](#), and [NFPA 70](#). Ground exposed noncurrent carrying metallic parts of telephone equipment, cable sheaths, cable splices, and terminals.

3.1.12.1 Primary Bonding Busbar (PBB)

The PBB is the hub of the basic telecommunications grounding system providing a common point of connection for ground from outside cable, CD, and equipment. Establish a PBB for connection point for cable stub shields to connector blocks and CD protector assemblies as specified in Section [26 20 00](#) INTERIOR DISTRIBUTION SYSTEM.

3.1.12.2 Incoming Cable Shields

Shields must not be bonded across the splice to the cable stubs. Ground shields of incoming cables in the EF Telecommunications to the PBB.

3.1.12.3 Campus Distributor Grounding

- a. Protection assemblies: Mount CD protector assemblies directly on the telecommunications backboard. Connect assemblies mounted on each vertical frame with No. 6 AWG copper conductor to provide a low resistance path to PBB.
- b. PBB connection: Connect PBB to Secondary Bonding Busbar (SBB) with copper conductor with a total resistance of less than 0.01 ohms.

3.1.13 Cut-Over

All necessary transfers and cut-overs, must be accomplished by the telecommunications contractor.

3.2 LABELING

3.2.1 Labels

Provide labeling for new cabling and termination hardware located within the facility in accordance with TIA-606-C. Handwritten labeling is unacceptable. Stenciled lettering for cable and termination hardware must be provided using laser printer.

3.2.2 Cable Tag Installation

Install cable tags for each telecommunications cable or wire located in manholes, handholes, and vaults including each splice. Tag new wire and cable provided under this contract and existing wire and cable which are indicated to have splices and terminations provided by this contract. The labeling of telecommunications cable tag identifiers must be in accordance with TIA-606-C. Do not provide handwritten letters. Install cable tags so that they are clearly visible without disturbing any cabling or wiring in the manholes, handholes, and vaults.

3.2.3 Termination Hardware

Label patch panels, distribution panels, connector blocks and protection modules using color coded labels with identifiers in accordance with TIA-606-C.

3.3 FIELD APPLIED PAINTING

Provide ferrous metallic enclosure finishes in accordance with the following procedures. Ensure that surfaces are dry and clean when the coating is applied. Coat joints and crevices. Prior to assembly, paint surfaces which will be concealed or inaccessible after assembly. Apply primer and finish coat in accordance with the manufacturer's recommendations. Provide ferrous metallic enclosure finishes as specified in Section 09 90 00 PAINTS AND COATINGS.

3.3.1 Cleaning

Clean surfaces in accordance with SSPC SP 6/NACE No.3.

3.3.2 Priming

Prime with a two component polyamide epoxy primer which has a bisphenol-A base, a minimum of 60 percent solids by volume, and an ability to build up a minimum dry film thickness on a vertical surface of 5.0 mils. Apply in two coats to a total dry film thickness of 5 to 8 mils.

3.3.3 Finish Coat

Finish with a two component urethane consisting of saturated polyester polyol resin mixed with aliphatic isocyanate which has a minimum of 50 percent solids by volume. Apply to a minimum dry film thickness of 2 to 3 mils. Color must be the manufacturer's standard.

3.4 FIELD FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

3.5 FIELD QUALITY CONTROL

Provide the Contracting Officer 10 working days notice prior to each test. Provide labor, equipment, and incidentals required for testing. Correct defective material and workmanship disclosed as the results of the tests. Furnish a signed copy of the test results to the Contracting Officer within 3 working days after the tests for each segment of construction are completed. Perform testing as construction progresses and do not wait until all construction is complete before starting field tests.

3.5.1 Pre-Installation Tests

Perform the following tests on cable at the job site before it is removed from the cable reel. For cables with factory installed pulling eyes, these tests must be performed at the factory and certified test results must accompany the cable.

3.5.1.1 Cable Capacitance

Perform capacitance tests on at least 10 percent of the pairs within a cable to determine if cable capacitance is within the limits specified.

3.5.1.2 Loop Resistance

Perform DC-loop resistance on at least 10 percent of the pairs within a cable to determine if DC-loop resistance is within the manufacturer's calculated resistance.

3.5.1.3 Pre-Installation Test Results

Provide results of pre-installation tests to the Contracting Officer at least 5 working days before installation is to start. Results must indicate reel number of the cable, manufacturer, size of cable, pairs tested, and recorded readings. When pre-installation tests indicate that cable does not meet specifications, remove cable from the job site.

3.5.2 Acceptance Tests

Perform acceptance testing in accordance with [RUS Bull 1753F-201](#) and as further specified in this section. Provide personnel, equipment, instrumentation, and supplies necessary to perform required testing. Notification of any planned testing must be given to the Contracting Officer at least 14 days prior to any test unless specified otherwise. Testing must not proceed until after the Contractor has received written Contracting Officer's approval of the test plans as specified. Test plans must define the tests required to ensure that the system meets technical, operational, and performance specifications. The test plans must define milestones for the tests, equipment, personnel, facilities, and supplies required. The test plans must identify the capabilities and functions to be tested. Provide test reports in booklet form showing all field tests performed, upon completion and testing of the installed system. Measurements must be tabulated on a pair by pair or strand by strand basis.

3.5.2.1 Copper Conductor Cable

Perform the following acceptance tests in accordance with [TIA-758-B](#):

- a. Wire map (pin to pin continuity)
- b. Continuity to remote end
- c. Crossed pairs
- d. Reversed pairs
- e. Split pairs
- f. Shorts between two or more conductors

3.5.2.2 Fiber Optic Cable

Test fiber optic cable in accordance with [TIA-455-C](#) and as further specified in this section. Two optical tests must be performed on all optical fibers: Optical Time Domain Reflectometry (OTDR) Test, and Attenuation Test. In addition, a Bandwidth Test must be performed on all multimode optical fibers. These tests must be performed on the completed end-to-end spans which include the near-end pre-connectorized single fiber cable assembly, outside plant as specified, and the far-end pre-connectorized single fiber cable assembly.

- a. OTDR Test: The OTDR test must be used to determine the adequacy of the cable installations by showing any irregularities, such as discontinuities, micro-bendings or improper splices for the cable span under test. Hard copy fiber signature records must be obtained from the OTDR for each fiber in each span and must be included in the test results. The OTDR test must be measured in both directions. A reference length of fiber, [66 feet](#) minimum, used as the delay line must be placed before the new end connector and after the far end patch panel connectors for inspection of connector signature. Conduct OTDR test and provide calculation or interpretation of results in accordance with [TIA-526-7-A](#) for single-mode fiber and [TIA-526-14-C](#) for multimode fiber. Splice losses must not exceed 0.3 db.
- b. Attenuation Test: End-to-end attenuation measurements must be made on all fibers, in both directions, using a 850 1300 1310 1550 nanometer light source at one end and the optical power meter on the other end to verify that the cable system attenuation requirements are met in accordance with [TIA-455-78-B](#) for multimode and [TIA-526-7-A](#) for single-mode fiber optic cables. The measurement method must be in accordance with [TIA-455-78-B](#). Attenuation losses must not exceed 0.5 db/km at 1310 nm and 1550 nm for single-mode fiber. Attenuation losses must not exceed 5.0 db/km at 850 nm and 1.5 db/km at 1300 nm for multimode fiber.
- c. Bandwidth Test: The end-to-end bandwidth of all multimode fiber span links must be measured by the frequency domain method. The bandwidth must be measured in both directions on all fibers. The bandwidth measurements must be in accordance with [TIA-455-204-A](#).

3.5.3 Soil Density Tests

- a. Determine soil-density relationships for compaction of backfill material in accordance with [ASTM D1557](#), Method D.
- b. Determine soil-density relationships as specified for soil tests in Section [31 00 00](#) EARTHWORK.

-- End of Section --