PMC Seed House Addition
Palmer, Alaska

Final Construction Documents

For:
State of Alaska Department of Natural Resources
550 West 7th Ave
Anchorage, Alaska 99501

July 10, 2025

Design Alaska

PMC Seed House Addition
Palmer, Alaska

Final Construction Documents

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By:
Design Alaska, Inc.
601 College Road
Fairbanks, Alaska 99701

July 10, 2025

Design Alaska

PROJECT CONSTRUCTION COST ESTIMATE

PROJECT: PMC SEED HOUSE ADDITION
LOCATION: PALMER, ALASKA
PHASE: FINAL CONSTRUCTION DOCUMENTS
DESCRIPTION: OVERVIEW

PREPARED BY: JB
CHECKED BY: JB
10-Jul-2025

DESCRIPTION		QUANTITY	UNIT		LABOR				TOTAL
GENERAL CONTRACTOR			COST/ UNIT	COST	HRS/ UNIT	TOTAL HRS.	LABOR RATE	LABOR COST	
ARCHITECTURAL CONTRACT TOTAL									[redacted]
SUBCONTRACTOR WORK									
HAZARDOUS MATERIALS CONTRACTOR				$0					$0
CIVIL SITE WORK CONTRACTOR				[redacted]					[redacted]
STRUCTURAL CONTRACTOR				[redacted]					[redacted]
MECHANICAL CONTRACTOR				[redacted]					[redacted]
ELECTRICAL CONTRACTOR				[redacted]					[redacted]
ADDITIONAL DIRECT COSTS FOR CONSTRUCTION CAMP AND TRAVEL									
OVERALL PROJECT LABOR	0	MAN HOURS							
ROOM & BOARD	0.00	MAN DAYS	[redacted]	$0					$0
TRAVEL COST FROM FAIRBANKS	0.00	ROUND TRIP	[redacted]	$0	[redacted]	0.00	[redacted]	$0	$0
0/H MARKUP ON SUBCONTRACTORS	[redacted]							[redacted]	[redacted]
SUBTOTAL									[redacted]
GENERAL CONTRACT CONDITIONS	[redacted]								[redacted]
SUBTOTAL									[redacted]
ESTIMATING CONTINGENCY	[redacted]								[redacted]
SUBTOTAL									[redacted]
ESCALATE CONSTRUCTION COSTS	[redacted]		Aug-25						[redacted]
TOTAL CONSTRUCTION COST									[redacted]

BASE BID [redacted]
TOTAL [redacted]

NOTES REGARDING THE PREPARATION OF THIS COST ESTIMATE

THIS ESTIMATE IS PREPARED USING CURRENT CONSTRUCTION COSTS & ASSUMES WILL RECEIVE AN OPEN COMPETITIVE BID.

THIS ESTIMATE DOES NOT CONTAIN AN ALLOWANCE FOR NEGOTIATED NON-COMPETITIVE CONTRACTS.

THIS ESTIMATE HAS AN ESCALATION ALLOWANCE.

THIS ESTIMATE DOES NOT HAVE AN ALLOWANCE TO TREAT / REMOVE ANY HAZARDOUS MATERIALS OR CONTAMINATED SOIL.

THIS ESTIMATE DOES NOT INCLUDE ANY PLAN CHECK FEES CHARGED BY THE STATE OF ALASKA OR ANY OTHER ENTITY CLAIMING JURISDICTION OVER THE WORK PAID DIRECTLY BY THE OWNER.

THIS ESTIMATE DOES NOT INCLUDE THE A/E FEES, SHOP EQUIPMENT OR COSTS FOR ANY WORK NOT INDICATED.

THIS ESTIMATE IS BASED ON A NORMAL WORK WEEK WITH SOME PROVISIONS FOR OVERTIME.

ESTIMATING CONTINGENCY - AN ALLOWANCE FOR CONSTRUCTION DOCUMENT REQUIREMENTS THAT ARE NOT INCLUDED IN THE ESTIMATE.

EITHER THE R.S. MEANS FACILITIES CONSTRUCTION COST DATA MANUAL, THE R.S. MEANS ASSEMBLIES COST DATA MANUAL PAST HISTORICAL DATA HAVE BEEN USED AS RESOURCES TO COMPILE THIS ESTIMATE.

Design Alaska

ARCHITECTURAL CONSTRUCTION COST ESTIMATE

PROJECT: PMC SEED HOUSE ADDITION
LOCATION: PALMER, ALASKA
PHASE: FINAL CONSTRUCTION DOCUMENTS
DESCRIPTION: BASE BID

PREPARED BY: JB
CHECKED BY: JB
10-Jul-2025

DESCRIPTION	QUANTITY		EQUIPMENT		MATERIAL		LABOR						
ARCHITECTURAL CONTRACTOR	No. UNITS UNITS		UNIT PRICE	EQUIP COST	PRICE PER FT.	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
TOTAL DIRECT COST, MATL & LAB.				$0		[redacted]			[redacted]		[redacted]		[redacted]
REGIONAL FACTOR (MEANS)	[redacted]					[redacted]							[redacted]
FREIGHT	[redacted]					[redacted]							[redacted]
OVERTIME	0.0%												$0
COMPLEXITY	[redacted]										[redacted]		[redacted]
SUBTOTAL				$0		[redacted]					[redacted]		[redacted]
CONTRACTORS OVERHEAD	[redacted]												[redacted]
CONTRACTORS PROFIT	[redacted]												[redacted]
SUBTOTAL													[redacted]
ARCHITECTURAL CONTRACT TOTAL													[redacted]

DESCRIPTION	QUANTITY		EQUIPMENT		MATERIAL		LABOR						
ARCHITECTURAL DIRECT COST ITEM	No. UNITS UNITS		UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
DEMOLITION -- HAZARDOUS MATERIALS NOT INCLUDED													
DIVISION 2 - BUILDING / SITE WORK													
Haul / dumpster - once per week	8.0	wk	$0.00	$0	[redacted]	[redacted]	.000	[redacted]	-	[redacted]	$0	[redacted]	[redacted]
DIVISION 7 - THERMAL AND MOISTURE													
Sheet Metal Flashing	84.8	ea	$0.00	$0	$0.00	$0	.000	[redacted]	-	[redacted]	$0	0.00	$0
DIVISION 8 - DOORS & WINDOWS													
Exterior Insulated Metal doors, frames and hardware	3.0	ea	$0.00	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Interior wood door, metal frame, hardware	2.0	SF	$0.00	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Snow guards	116.0	LF	$0.00	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Access doors restroom	1.0	ea	$0.00	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
DIVISION 9 - FINISHES													
R-A1 Roof Assembly	975.0	SF	$0.00	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Interior Wall Assembly	333.7	SF	$0.00	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Exterior Wall Assembly w/ Siding	689.9	SF	$0.00	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Exterior Wall Assembly w/o Siding	701.1	SF	$0.00	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rubber base	692.0	LF	$0.00	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Paint Walls - 2 coats	1,775.1	SF	$0.00	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Paint Ceiling - 2 coats	710.0	SF	$0.00	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
DIVISION 10 - SPECIALTIES													
Mirror 24x36	1.0	ea	$0.00	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sanitary Napkin disposal	1.0	ea	$0.00	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Toilet Paper Dispenser, double roll	1.0	ea	$0.00	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Paper Towel Dispenser	1.0	ea	$0.00	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
COLUMN TOTALS:				**$0**		[redacted]			[redacted]		[redacted]		[redacted]

Design Alaska

CIVIL CONSTRUCTION COST ESTIMATE

PROJECT: PMC SEED HOUSE ADDITION
LOCATION: PALMER, ALASKA
PHASE: FINAL CONSTRUCTION DOCUMENTS
DESCRIPTION: BASE BID

PREPARED BY: AJM
CHECKED BY: IAL
10-Jul-2025

DESCRIPTION	QUANTITY		EQUIPMENT		MATERIAL		LABOR						
CIVIL CONTRACTOR	No. UNITS UNITS		UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
TOTAL DIRECT COST, MATL & LAB				[redacted]		[redacted]			[redacted]		[redacted]		[redacted]
REGIONAL FACTOR (MEANS)	0.0%												$0
FREIGHT	0.0%												$0
OVER TIME	[redacted]										[redacted]		[redacted]
COMPLEXITY	0.0%												$0
SUBTOTAL				[redacted]		[redacted]					[redacted]		[redacted]
CONTRACTOR OVER HEAD	[redacted]												[redacted]
CONTRACTOR PROFIT	[redacted]												[redacted]
SUBTOTAL													[redacted]
CIVIL CONTRACT TOTAL													[redacted]

DESCRIPTION	QUANTITY		EQUIPMENT		MATERIAL		LABOR						
CIVIL CONTRACT TOTAL	No. UNITS UNITS		UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
DIRECT COSTS BY CSI DIVISIONS													
DIVISION 01 - GENERAL REQUIREMENTS													
(DE)MOBILIZATION - LARGE EQUIPMENT	2	EA	[redacted]	[redacted]	$0.00	$0.00	[redacted]		[redacted]		[redacted]	[redacted]	[redacted]
(DE)MOBILIZATION - SMALL EQUIPMENT PLACED IN BED OF PICKUP	1	EA	[redacted]	[redacted]	$0.00	$0.00	[redacted]		[redacted]		[redacted]	[redacted]	[redacted]
(DE)MOBILIZATION - SMALL EQUIPMENT ON FLATBED PULLED BY PICKUP	1	EA	[redacted]	[redacted]	$0.00	$0.00	[redacted]		[redacted]		[redacted]	[redacted]	[redacted]
TEMPORARY FENCING - 6' CHAIN LINK	450	LF	$0	$0	[redacted]	[redacted]	[redacted]		[redacted]		[redacted]	[redacted]	[redacted]
DUMPSTER RENTAL, 1 DUMP / WEEK, 6 CY CAPACITY	12	WEEK		$0	[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
DIVISION 02 - EXISTING CONDITIONS													
SAWCUT ASPHALT PAVING (3")	48	LF	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]		[redacted]	[redacted]	[redacted]
DEMO ASPHALT PAVING 3" THICK	32	SY											
DIVISION 3 - CONCRETE													
CONCRETE LANDINGS, 4" THICK, BAR REINFORCED	75	SF	$0.00	$0.00	[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
DIVISON 31 - EARTHWORK													
31 14 13 TOPSOIL STRIPPING AND STOCKPILING													
REMOVE 6" LOAM/TOPSOIL, 101-500 SY	462	SY	[redacted]	[redacted]	$0.00	$0.00	0.0		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
31 22 00 GRADING													
GRADE SUBGRADE FOR BASE COURSE, ROADWAYS	125	SY	[redacted]	[redacted]	$0.00	$0.00	[redacted]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
FINE GRADING WITH GRADER, LARGE AREA	268	SY	[redacted]	[redacted]	$0.00	$0.00	[redacted]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
31 23 00 EXCAVATION													
EXCAVATING, TRENCH 1'-4' DEEP	290	BCY	[redacted]	[redacted]	$0.00	$0.00	[redacted]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
MASS EXCAVATING DRY SOILS FOR FOUNDATIONS	141	BCY	[redacted]	[redacted]	$0.00	$0.00	[redacted]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
31 23 23 FILL													
TOPSOIL/LOAM, FRONT END LOADER, 1.5 CY BUCKET (NO COMPACTION)	154	CY	[redacted]	[redacted]	$0.00	$0.00	[redacted]		[redacted]		[redacted]	[redacted]	[redacted]
COMMON FILL, 200 HP LOADER, (NO COMPACTION)	283	CY	[redacted]	[redacted]	$0.00	$0.00	[redacted]		[redacted]		[redacted]	[redacted]	[redacted]
STRUCTURAL FILL, 200 HP LOADER (NO COMPACTION)	148	CY	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
CRUSHED AGGREGATE D-1	25	CY	[redacted]	[redacted]									
UTILITY BEDDING, SAND	46	CY											
COMPACTION, WALK-BEHIND VIBRATING PLATE	477	ECY	[redacted]	[redacted]	$0.00	$0.00	[redacted]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
HAULING - 12 CY TRUCK, 25 MPH, 8 MILES PER CYCLE	219	LCY	[redacted]		$0.00	$0.00	[redacted]		[redacted]		[redacted]	[redacted]	[redacted]
32 12 00 FLEXIBLE PAVEMENT									0.00				
ASPHALTIC BASE COURSE, 4" THICK	32	SY	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
ASPHALT PAVING, 3" THICK	32	SY											
32 17 00 PAVING SPECIALTIES													
BOLLARDS 6" DIA	6	EA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

CIVIL CONSTRUCTION COST ESTIMATE

Design Alaska

PROJECT: PMC SEED HOUSE ADDITION
LOCATION: PALMER, ALASKA
PHASE: FINAL CONSTRUCTION DOCUMENTS
DESCRIPTION: BASE BID

PREPARED BY: AJM
CHECKED BY: IAL

10-Jul-2025

DESCRIPTION	QUANTITY		EQUIPMENT		MATERIAL		LABOR						
CIVIL CONTRACTOR	No. UNITS UNITS		UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
32 92 00 TURF AND GRASSES													
HYDRO SEED	462	SY											
DIVISION 33 - UTILITIES													
33 11 00 WATER DISTRIBUTION													
3" CLOSED CELL, POLYURETHANE SPRAY FOAM INSULATION	100	SF											
3/4" COPPER, TYPE K, 20' JOINTS	167	LF	$0.00	$0.00									
33 20 00 WELLS													
DRILLED 4"-6", CASED	42	LF			$0.00	$0.00							
SUBMERSIBLE PUMP, 3/4 HP	1	Each	$0	$0									
33 31 00 SANITARY SEWAGE													
4" HDPE PIPE	246	LF	$0.00	$0.00									
4" HDPE PIPE FITTINGS, BENDS, ELBOWS	2	EACH	$0.00	$0.00									
3" CLOSED CELL, POLYURETHANE SPRAY FOAM INSULATION	205	SF											
YARD CLEANOUT W/ CONCRETE PAD	5	EACH											
COLUMN TOTALS:													

Design Alaska

STRUCTURAL CONSTRUCTION COST ESTIMATE

PROJECT: PMC SEED HOUSE ADDITION
LOCATION: PALMER, ALASKA
PHASE: FINAL CONSTRUCTION DOCUMENTS
DESCRIPTION: BASE BID

PREPARED BY: PND 10-Jul-2025
CHECKED BY: TAA

DESCRIPTION	QUANTITY		EQUIPMENT		MATERIAL		LABOR						
STRUCTURAL CONTRACTOR	No. UNITS UNITS		UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
TOTAL DIRECT COST, MATL & LAB.				[redacted]		[redacted]			[redacted]		[redacted]		[redacted]
REGIONAL FACTOR (MEANS)	0.0%												$0
FREIGHT	[redacted]					[redacted]							[redacted]
OVERTIME	0.0%												$0
COMPLEXITY	0.0%												$0
SUBTOTAL				[redacted]		[redacted]			[redacted]		[redacted]		[redacted]
CONTRACTORS OVERHEAD	[redacted]												[redacted]
CONTRACTORS PROFIT	[redacted]												[redacted]
SUBTOTAL													[redacted]
STRUCTURAL CONTRACT TOTAL													[redacted]

DESCRIPTION	QUANTITY		EQUIPMENT		MATERIAL		LABOR						
STRUCTURAL CONTRACT TOTAL	No. UNITS UNITS		UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
DIVISION 3 - CONCRETE													
4" CONC GRADE SLABS	10.0	CY	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
CONC THICKENED EDGE OF SLAB	176	LF	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
SLAB FINISHING - MACHINE TROWEL FINISH	840	SF	$0.00	$0.00	$0.00	$0.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
CONC CUTTING - CONTROL JOINTS	100	LF	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
MISC CONCRETE MATERIALS (EXP JOINT, SLIP DOWELS, ANCHOR BOLTS ETC.)	2	LS			[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
DIVISION 6 - WOOD AND PLASTIC													
5/8" PLYWOOD CDX SHEATHING (WALL)	1,760	SF	$0.00	$0.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
5/8" PLYWOOD CDX SHEATHING (ROOF)	1,071	SF	$0.00	$0.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
14" BCI 60-2.0E	584	LF	$0.00	$0.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
14"x1-3/4" LVL BLOCKING	178	LF	$0.00	$0.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
14"x1-3/4" LVL SUB-FASCIA	178	LF	$0.00	$0.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
MISC CONNECTIONS	1	LS	$0.00	$0.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2X10 HEADERS	370	LF	$0.00	$0.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
DIVISION 7 - THERMAL & MOISTURE													
5" RIGID FOAM INSULATION	710	SF	$0.00	$0.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2" RIGID FOAM INSULATION (UNDER-SLAB)	1,000	SF	$0.00	$0.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	$0.00	[redacted]	[redacted]
VAPOR BARRIER (UNDER-SLAB)	1,000	SF	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
COLUMN TOTALS:				[redacted]		[redacted]			[redacted]		[redacted]		[redacted]

Design Alaska

MECHANICAL CONSTRUCTION COST ESTIMATE

PROJECT: PMC SEED HOUSE ADDITION
LOCATION: PALMER, ALASKA
PHASE: FINAL CONSTRUCTION DOCUMENTS
DESCRIPTION: BASE BID

PREPARED BY: SHB
CHECKED BY: BAB
10-Jul-2025

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR						
MECHANICAL CONTRACTOR	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
TOTAL DIRECT COST, MATL & LAB.			$0		[redacted]			[redacted]		[redacted]		[redacted]
REGIONAL FACTOR (MEANS)	0.0%											$0
FREIGHT	[redacted]				[redacted]							[redacted]
OVERTIME	0.0%											$0
COMPLEXITY	0.0%											$0
SUBTOTAL			$0		[redacted]					[redacted]		[redacted]
CONTRACTORS OVERHEAD	[redacted]											[redacted]
CONTRACTORS PROFIT	[redacted]											[redacted]
SUBTOTAL												[redacted]
MECHANICAL CONTRACT TOTAL												[redacted]

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR						
MECHANICAL CONTRACT TOTAL	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
DIVISION 22 - PLUMBING												
DOMESTIC WATER PIPE AND FITTINGS												
HOT WATER PIPING, INTERIOR												
1/2" TYPE 'L' COPPER	15 Lin.Ft	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
90° ELL FITTING	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
TEE FITTING	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
INSULATION W/ FITTINGS	21 Lin.Ft	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
3/4" TYPE 'L' COPPER	35 Lin.Ft	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
90° ELL FITTING	2 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
TEE FITTING	2 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
COLD WATER PIPING, INTERIOR												
1/2" TYPE 'L' COPPER	25 Lin.Ft	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
90° ELL FITTING	2 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
TEE FITTING	2 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
INSULATION W/ FITTINGS	37 Lin.Ft	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
3/4" TYPE 'L' COPPER	50 Lin.Ft	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
90° ELL FITTING	3 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
TEE FITTING	3 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
INSULATION W/ FITTINGS	68 Lin.Ft	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
DOMESTIC WATER VALVES												
ISOLATION VALVES												
1/2" BALL VALVE, SOLDERED, 150 LB	5 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
3/4" BALL VALVE, SOLDERED, 150 LB	2 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
CHECK VALVES												
1/2" BRONZE, SWING CHECK, THREADED	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
PLUMBING FIXTURES - WATER CLOSETS AND LAVATORIES												
WATER CLOSETS - TANK TYPE												
FLOOR MOUNT, 1.28 GPF, ADA, TWO PIECE	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
LAVATORIES - WALL HUNG												
VITREOUS CHINA, 20" X 18", BACKSPLASH	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
PLUMBING FIXTURES - FAUCETS												
LAVATORY FAUCETS												
CENTERSET, POP-UP DRAIN, ANGLE STOPS	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
DOMESTIC WATER SPECIALTIES												
DOUBLE CHECK BACKFLOW PREVENTION DEVICES												
3/4" THREADED, BALL VALVES	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
DOMESTIC WATER HEATERS AND ACCESSORIES												
INSTANTANEOUS WATER HEATERS												
RESIDENTIAL, 20 GAL, SINGLE ELEMENT	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
DOMESTIC HOT WATER EXPANSION TANK												
ST-5 (2.0 GAL)	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]

MECHANICAL CONSTRUCTION COST ESTIMATE

PROJECT: PMC SEED HOUSE ADDITION
LOCATION: PALMER, ALASKA
PHASE: FINAL CONSTRUCTION DOCUMENTS
DESCRIPTION: BASE BID

PREPARED BY: SHB
CHECKED BY: BAB
10-Jul-2025

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR						
MECHANICAL CONTRACTOR	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
WATER WELLS, WELL PUMPS, AND ACCESSORIES												
WELL EXPANSION TANKS												
31 GAL. DIAPHRAGM STEEL ASME	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
WELL ACCESSORIES												
CARTRIDGE FILTER, DIRT/RUST	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
CARTRIDGE FILTER, TASTE/ODOR	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
SANITARY WASTE AND VENT PIPING AND FITTINGS												
ABOVE GRADE - COPPER DWV												
1-1/4" TYPE DWV COPPER	5 Lin.Ft	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
90° ELL FITTING	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
1-1/2" TYPE DWV COPPER	10 Lin.Ft	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
90° ELL FITTING	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
TEE FITTING	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
ABOVE GRADE - ABS												
1-1/2" ABS DWV	10 Lin.Ft	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
1/4 BEND FITTING, LONG SWEEP	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
TEE FITTING, SANITARY	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
2" TYPE DWV COPPER	45 Lin.Ft	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
90° ELL FITTING	3 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
TEE FITTING	3 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
3" TYPE DWV COPPER	10 Lin.Ft	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
90° ELL FITTING	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
TEE FITTING	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
BELOW GRADE - CAST IRON												
1 1/2" CAST IRON	10 Lin.Ft	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
FITTINGS	1 Each			$0.00	$0	0.000	1	0.00	$103.91	$0	$0.00	$0
2" CAST IRON	40 Lin.Ft	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
FITTINGS	2 Each			[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
3" CAST IRON	35 Lin.Ft	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
FITTINGS	2 Each			[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
SANITARY WASTE PIPING SPECIALTIES												
FLOOR DRAINS												
MEDIUM DUTY, CI, 7" FACE	1 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
PLUMBING VENT THROUGH ROOF AND FLASHING ASSEMBLIES												
EPDM ROOFING BOOT, STORM COLLAR	2 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
COMPRESSED AIR SYSTEM												
AIR COMPRESSORS												
COMPRESSOR, OFCI	1 Each	$0.00	$0	$0.00	$0	[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
SEISMIC EQUIPMENT BRACING												
WALL MOUNTED EQUIPMENT	3 Each	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
DIVISION 23 - HVAC												
DEMOLITION -- NO HAZMAT												
SELECTIVE EQUIPMENT DEMOLITION												
GAS/OIL FURNACE, UP TO 120 MBH	2 Each	$0.00	$0	$0.00	$0	[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
BASE MOUNTED EQUIPMENT-SMALL	1 Each	$0.00	$0			[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
SUSPENDED EQUIPMENT	2 Each	$0.00	$0			[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
SELECTIVE PIPE DEMOLITION												
UP THROUGH 1-1/2"	140 Lin.Ft	$0.00	$0			[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
SELECTIVE DUCT DEMOLITION												
12" SEMI-PERIMETER	40 Lin.Ft	$0.00	$0			[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
36" SEMI-PERIMETER	10 Lin.Ft	$0.00	$0			[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
FUEL GAS SYSTEMS												
ABOVE GROUND PIPING												
1/2" BLACK STEEL	15 Lin.Ft	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
FITTINGS	1 Each			[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
3/4" BLACK STEEL	20 Lin.Ft	$0.00	$0	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
FITTINGS	1 Each			[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	[redacted]	[redacted]

Design Alaska

MECHANICAL CONSTRUCTION COST ESTIMATE

PROJECT: PMC SEED HOUSE ADDITION
LOCATION: PALMER, ALASKA
PHASE: FINAL CONSTRUCTION DOCUMENTS
DESCRIPTION: BASE BID

PREPARED BY: SHB
CHECKED BY: BAB
10-Jul-2025

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR						
MECHANICAL CONTRACTOR	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
HYDRONIC SYSTEMS												
GLYCOL												
PROPYLENE GLYCOL	30 Gallons	$0.00	$0									
HYDRONIC PIPING												
3/4" TYPE 'L' COPPER	40 Lin.Ft	$0.00	$0									
FITTINGS	2 Each											
1" TYPE 'L' COPPER	115 Lin.Ft	$0.00	$0									
FITTINGS	6 Each											
INSULATION	115 Lin.Ft	$0.00	$0									
1 1/2" TYPE 'L' COPPER	160 Lin.Ft	$0.00	$0									
FITTINGS	8 Each											
INSULATION	160 Lin.Ft	$0.00	$0									
2" TYPE 'L' COPPER	170 Lin.Ft	$0.00	$0									
FITTINGS	9 Each											
INSULATION	170 Lin.Ft	$0.00	$0									
1/2" RAUPEX O2 BARRIER PIPE												
9" On Center:	265 Sq.Ft	$0.00	$0									
12" On Center:	200 Sq.Ft	$0.00	$0									
GATE VALVES												
3/4" GATE VALVE	12 Each	$0.00	$0									
1" GATE VALVE	10 Each	$0.00	$0									
2" GATE VALVE	6 Each	$0.00	$0									
CHECK VALVES												
2" CHECK VALVE	2 Each	$0.00	$0									
MANUAL BALANCE VALVES												
1/2", 0.5-2 GPM, LF BRASS, SWEAT	3 Each	$0.00	$0									
1", 4-8 GPM, LF BRASS, SWEAT	5 Each	$0.00	$0									
HYDRONIC CONTROL VALVES												
3/4 " RADIATION VALVES	3 Each	$0.00	$0									
1" RADIATION VALVES	4 Each	$0.00	$0									
1" MIXING VALVE	1 Each	$0.00	$0									
COALESCING AIR SEPARATORS - INTEGRAL AIR VENT												
2", BRASS, SS INTERNALS	1 Each	$0.00	$0									
AUTOMATIC AIR VENT												
CAST IRON, AUTO AIR VENT, 1/2" 250 PSI	12 Each	$0.00	$0									
EXPANSION TANKS												
19 GAL. EXP. TANK,	1 Each	$0.00	$0									
HYDRONIC CIRCULATORS												
IN-LINE PUMPS												
2" SIZE, 1/6 HP	2 Each	$0.00	$0									
CONDENSING BOILER												
155 MBH LOCHINVAR KNIGHT	2 Each	$0.00	$0									
CONDENSATE NEUTRALIZER	2 Each	$0.00	$0									
CPVC VENTING												
3" SCHEDULE 80 CPVC, SOCKET JOINT	40 Lin.Ft	$0.00	$0									
90° ELL FITTING	2 Each	$0.00	$0									
UNIT HEATERS												
HYDRONIC, HORIZONTAL BLOW, TRANE												
30-S (30-S)	1 Each	$0.00	$0									
68-S (68-S)	1 Each	$0.00	$0									
105-S (105-S)	1 Each	$0.00	$0									
HYDRONIC, EXPLOSION PROOF, HAZLOC												
HHP2-24	3 Each	$0.00	$0									
SEISMIC BRACING												
SEISMIC EQUIPMENT BRACING												
UNIT HEATERS	5 Each	$0.00	$0									
SEISMIC PIPE JOINTS												
2" metraloop, 4" compensation	2 Each	$0.00	$0									
3/4" metraloop, 4" compensation	1 Each	$0.00	$0									
1-1/4" metraloop, 4" compensation	1 Each	$0.00	$0									
COLUMN TOTALS:			**$0**									

Design Alaska

ELECTRICAL CONSTRUCTION COST ESTIMATE

PROJECT: PMC SEED HOUSE ADDITION
LOCATION: PALMER, ALASKA
PHASE: FINAL CONSTRUCTION DOCUMENTS
DESCRIPTION: BASE BID

PREPARED BY: MWK
CHECKED BY: DLH

10-Jul-2025

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR						
ELECTRICAL CONTRACTOR	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
TOTAL DIRECT COST, MATL & LAB.			$0		[redacted]			[redacted]		[redacted]		[redacted]
REGIONAL FACTOR (MEANS)	0.0%											$0
FREIGHT	[redacted]				[redacted]							[redacted]
OVERTIME - (5) 8-HR DAYS	0.0%											$0
COMPLEXITY	[redacted]							[redacted]		[redacted]		[redacted]
SUBTOTAL			$0		[redacted]			[redacted]		[redacted]		[redacted]
CONTRACTOR'S OVERHEAD	[redacted]											[redacted]
CONTRACTOR'S PROFIT	[redacted]											[redacted]
SUBTOTAL												[redacted]
ELECTRICAL CONTRACT TOTAL												[redacted]

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR						
ELECTRICAL CONTRACT TOTAL	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
WIRE CONDUCTORS AND CABLE												
12 AWG THHN	1,404 Lin.Ft	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
10 AWG THHN	1,755 Lin.Ft	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
10 AWG XHHW	700 Lin.Ft	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
RACEWAYS												
(INCLUDES FITTINGS AND ASSEMBLY)												
3/4" RMC	25 Lin.Ft	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1" RMC	200 Lin.Ft	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1/2" EMT	1010 Lin.Ft	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
3/4" EMT	510 Lin.Ft	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
3/4" PVC-SCH-40	160 Lin.Ft	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
3/4" LFMC	21 Lin.Ft	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
RECEPTACLES												
DUPLEX RECEPTACLE	10 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
QUAD RECEPTACLE	2 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
GFI RECEPTACLE	2 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
WP GFCI RECEPTACLE	3 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
SWITCHES												
SPST SWITCH	1 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
3-WAY SWITCH	3 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
3-WAY SWITCH W/ DIMMING	1 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
OCCUPANCY SENSOR 'OSW'	2 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
PILOT-LIGHTED SPST SWITCH	3 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
OVERCURRENT PROTECTION DEVICES												
QOB - 15/1, 10KAIC	3 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
QOB - 20/1, 10KAIC	5 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
QOB-GFPE - 30/1, 10KAIC	2 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
QOB - 15/3, 10KAIC	1 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
MOTORS												
SINGLE PH MOTOR CONN.	6 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
THREE PH MOTOR CONN.	1 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
30A TT SWITCH	6 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
COMB. STARTER/DISC, NEMA TYPE 0	1 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
HEATING CABLE												
5W/FT - SFHT	780 Lin.Ft	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
HT 1-PC & END SEAL	4 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
LIGHTING												
TYPE 'A1'	7 Each	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Design Alaska

ELECTRICAL CONSTRUCTION COST ESTIMATE

PROJECT: PMC SEED HOUSE ADDITION
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10-Jul-2025

DESCRIPTION	QUANTITY	EQUIPMENT		MATERIAL		LABOR						
ELECTRICAL CONTRACTOR	No. UNITS UNITS	UNIT PRICE	EQUIP COST	PRICE PER UNIT	MATERIAL COST	HRS/ UNIT	MULT FACT	TOTAL HRS.	LABOR RATE	LABOR COST	UNIT COST	TOTAL COST
TYPE 'B1'	1 Each	$0	$0	[redacted]	[redacted]	[redacted]	1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
TYPE 'C1'	3 Each	$0	$0	[redacted]	[redacted]	[redacted]	1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
TYPE 'EM'	3 Each	$0	$0	[redacted]	[redacted]	[redacted]	1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
TYPE 'EX'	1 Each	$0	$0	[redacted]	[redacted]	[redacted]	1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
COMMUNICATIONS SYSTEMS												
CAT6 CABLE	800 Lin. Ft.	$0	$0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
CAT6, TERMINATE AND TEST	8 Each	$0	$0	[redacted]	[redacted]	[redacted]	1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
TELEDATA OUTLETS	3 Each	$0	$0	[redacted]	[redacted]	[redacted]	1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
COLUMN TOTALS:			$0		[redacted]			[redacted]		[redacted]		[redacted]

Specifications

PART 1 GENERAL

1.1 SCOPE: SECTION 02 41 19 – SELECTIVE DEMOLITION

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

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.

2. Demolition and removal of selected site elements.

3. Salvage of existing items to be reused or recycled.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse, or store as directed by Owner.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project Site.

1. Inspect and discuss condition of construction to be selectively demolished.

2. Review structural load limitations of existing structure.

3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control, and for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner on-site operations are uninterrupted.

2. Interruption of utility services. Indicate how long utility services will be interrupted.

3. Coordination for shutoff, capping, and continuation of utility services.

4. Coordination of Owner continuing occupancy of portions of existing building and of Owner partial occupancy of completed Work.

C. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations.

D. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 FIELD CONDITIONS

A. Owner will occupy portions of the building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Multiple construction projects will be conducted on site by Owner. Contractor to coordinate schedules and access with owner and other contractors on premises for duration of work.

C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

D. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

E. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed under a separate contract.

F. Storage or sale of removed items or materials on-site is not permitted.

G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.10 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Survey of Existing Conditions: Record existing conditions by use of measured drawings, preconstruction photographs or video, and templates.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.

2. Arrange to shut off utilities with utility companies.

3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

   a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

   b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.

   c. Equipment to Be Removed: Disconnect and cap services and remove equipment.

   d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

   e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

   f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

   g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.3 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

4. Cover and protect furniture, furnishings, and equipment that have not been removed.

5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.

5. Maintain fire watch during and for at least 4 hours after flame-cutting operations.

6. Maintain adequate ventilation when using cutting torches.

7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

10. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:

1. Clean salvaged items.

2. Pack or crate items after cleaning. Identify contents of containers.

3. Store items in a secure area until delivery to Owner.

4. Transport items to Owner's storage area designated by Owner.

5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.

2. Pack or crate items after cleaning and repairing. Identify contents of containers.

3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4-inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

D. Roofing and siding: Remove no more existing roofing than what can be covered in one day by new roofing and siding and so that building interior remains watertight and weathertight.

1. Remove existing membrane, flashings, copings, and roof accessories.

2. Remove existing system down to substrate.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

4. Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Thickened edge footings.

2. Slabs-on-grade.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

B. Cold Weather: ACI 306, Cold weather conditions are met when the air temperature has fallen to, or is expected to fall below, 40 degrees Fahrenheit during the concrete placement or protection period.

1. Protection Period: See Section 3.

C. Hot Weather: ACI 305R. Work plans shall include preparation to limit the temperature effects on concrete. As the selected limiting temperatures, usually but not always between 75 degrees Fahrenheit to 100 degrees Fahrenheit is approached and exceeded, unfavorable effects of high temperature are likely.

1.3 SUBMITTALS

A. Product Data: For the following, as applicable:

1. Admixtures

2. Liquid floor treatments

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Cold-Weather Placement and Protection Plan: Required only when placement and/or curing will be done during cold weather as defined in earlier section.

1. Placement Plan: For each concrete pour. Submit methods for batch plant aggregate heating, surface preparation plan including massive embedment identification and heating, subgrade thawing, and concrete temperature protection during placement.

2. Protection Plan: Submit methods for temperature protection, plan for monitoring and recording concrete temperature, and methods for testing of in-place concrete strength.

E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates.

F. Field quality-control reports.

1. Testing and Inspection Agency Reports

2. Special Inspection Reports

3. Concrete Testing Reports

4. Cold Weather Temperature Reports. If placed/cured during cold weather

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated. Agency shall be qualified and shall meet all requirements to operate in the state of Alaska.

C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.

2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 PRODUCTS

2.1 FORM-FACING MATERIALS

A. Form surfaces may be of any material which provides the required structural strength and surface properties to produce specified finish.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

2.4 VAPOR RETARDERS

A. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

2.5 CONCRETE MIXTURES

A. Plant Mix:

1. Strength:

a. Exterior structural application (concrete aprons and other concrete exposes to freeze/thaw): 4,500 psi concrete with 6 ± 1.5 percent air entrainment.

b. Interior structural application (thickened edge slabs, housekeeping pads etc): 4,500 psi concrete with no air entrainment additives.

1) Interior structural applications that will be exposed to freeze-thaw cycles during construction shall be coordinated in writing via RFI/DCVR with the Engineer [or other required authority].

2. Proportions: ACI 211:1.

3. Cement:

   a. Use Portland Cement, ASTM C 150, of the same type, brand, and source, throughout Project: Quantity as needed for concrete strength.

4. Aggregates:

   a. ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source.

   b. Maximum aggregate size to be 3/4-inch minus for finished slabs and curbs, 75 percent of minimum clear space between steel or between steel and forms in formed concrete and 3/8-inch for grouting concrete masonry.

   c. Fine Aggregate to be free of materials with deleterious reactivity to alkali in cement.

5. Water:

   a. ASTM C 94/C 94M and potable.

   b. Maximum Water/Cement ratio: 0.45.

6. Slump of concrete: Slump of concrete shall not be changed by addition of water at the jobsite unless indicated on batch ticket, added water shall not exceed that indicated on batch ticket. Plasticizers shall be used to change the slump as indicated on the concrete plant batch ticket.

   a. Structural applications: 8 inches maximum at truck chute discharge point when using plasticizers.

2.6 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

   2. Retarding Admixture: ASTM C 494/C 494M, Type B.

   3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

   4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Water: Potable.

2.8 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment – Sealer/Densifier: Clear, chemically reactive, waterborne solution of inorganic silicate or lithium materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces. Dayton Superior Pentra-Hard Densifier or equal.

2.9 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.

1. When air temperature is between 85 and 90 degrees Fahrenheit, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 degrees Fahrenheit, reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. The sole responsibility for form design and for any resulting structural damage due to form failure rests with the Contractor.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarders according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

C. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations listed on batch ticket.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.

2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Maintain reinforcement in position on chairs during concrete placement.

3. Screed slab surfaces with a straightedge and strike off to correct elevations.

4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleed water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: When cold weather conditions exist or are anticipated during placement and or curing comply with ACI 306.1, Standard Specification for Cold Weather Concreting and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. Surface Preparation

a. Do not place concrete on snow, ice, standing water, or frozen subgrade.

2. Concrete Mix

a. Minimum concrete temperature when batched is as follows. Listed ambient air temperature is that predicted at time of concrete placement:

1) Air temperature above 30 degrees F: 60 degrees F

2) Air temperature between 0 and 30 degrees F: 65 degrees F

3) Air temperature below 0 degrees F: 70 degrees F

b. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

c. Do not use frozen materials or materials containing ice or snow. Submit method for heating aggregate.

d. Avoid water temperatures that could cause flash setting.

e. For flatwork, use low slump concrete to mitigate problems due to bleed water.

3. Delivery

a. Minimum concrete delivery temperature of 55 degrees Fahrenheit.

b. Any water added on site to the concrete mix shall not be less than 55 degrees Fahrenheit.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 degrees Fahrenheit at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

G. Inclement weather

1. Protect freshly placed concrete against damage by infiltration of any adverse weather. When damage might occur: (1) stop the concrete placement against the nearest construction joint or bulkhead and (2) cover the concrete at once with waterproof protection until concrete has set.

2. Sprayed-on Protective Coatings: Apply in accordance with manufacturer's written instructions. Protection from rain, air moisture, or large temperature ranges shall be provided in accordance with the manufacturer's instructions.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Interior Concrete:

1. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

C. Exterior Concrete:

1. Broom Finish.

3.9 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.10 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.

b. Continuous water-fog spray.

c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

D. Cold Weather Protection: When cold weather conditions exist or are anticipated during placement and or curing, protect concrete according to ACI 306.1, Standard Specification for Cold Weather Concreting and as follows:

1. Protection Period

a. Maintain a minimum concrete surface temperature of 55 degrees Fahrenheit during the protection period.

b. Protection Period Duration: Maintain the required minimum surface temperature for the maximum applicable duration below:

1) 5 days for concrete foundations including thickened edge slabs.

2) Until a minimum strength of 3500 psi has been reached

a) Test in-place strength of concrete using cylinders cured on-site in the same weather conditions as the placed concrete, or other pre-approved method.

c. Do not remove formwork during protection period.

d. Submit plan for concrete temperature protection during the protection period, including temperature monitoring of the concrete. Avoid overheating and drying concrete surfaces.

e. Test and report concrete temperature per Field Quality Control requirements.

2. Protection Termination

a. Following the minimum protection period, gradually cool the concrete surface by no more than 50 degrees Fahrenheit over a 24-hour period until the concrete surface temperature is within 20 degrees of the ambient air temperature at which point protection may be removed.

3.11 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.

2. Application of liquid floor treatment to green concrete prior to the application of curing compound is allowed if approved by liquid floor treatment and curing compound manufacturer.

3.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2-inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01-inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4-inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair random cracks and single holes 1-Inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.13 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

B. Inspections: Per structural design drawings special inspection table.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture from 0 to 25 cubic yards, plus one set for each additional 50 cubic yard or fraction thereof.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231; pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Temperature: ASTM C1064/C1064M; Monitor and record concrete placement temperatures.

5. Compression Test Specimens: ASTM C 31/C 31M.

   a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

   a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

8. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Engineer.

11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Cold Weather Concrete Temperatures:

1. Concrete Placement: Measure and record concrete temperature of each truck or site-mixed batch immediately prior to placement on-site.

2. Concrete Protection: Measure and record concrete temperature at regular time intervals, at least twice every 24 hours.

3.14 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 06 10 00 - ROUGH CARPENTRY

A. Section Includes:

1. Structural framing and sheathing.
2. Miscellaneous wood framing and sheathing.
3. Blocking and framing for wall and roof openings.
4. Preservative Treatment.

1.2 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NLGA: National Lumber Grades Authority.
2. WCLIB: West Coast Lumber Inspection Bureau.
3. WWPA: Western Wood Products Association.

1.3 SUBMITTALS

A. Product Data:

1. Preservative treated wood
2. Power driven Fasteners
3. Dowel Type Fasteners
4. Wood Connectors

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Shear panels.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory Moisture Content of Lumber: maximum 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Lumber or plywood indicated as treated, or unfinished lumber exposed to weather, water, soil or concrete, shall be treated.

1. Treatment is not required if a naturally durable wood species is indicated.

B. Comply with applicable requirements of AWPA Standard U1, with Use Categories as indicated below:

1. UC2:

a. Interior members in contact with concrete, such as sill plates.

b. Wood framing members, including wood sheathing, that rest on exterior foundation walls and are less than 8 inches from exposed earth.

2. UC3A: Exterior, above-ground members protected from weather, such as covered porch planks.

3. UC3B: Exterior, above-ground members exposed to weather but not in contact with ground, water, or concrete, such as deck planks, joists, beams and railings.

4. UC4A:

a. Members in contact with ground, unless listed under UC4B

b. Members in contact with water, unless listed under UC4B

c. Exterior members in contact with concrete, unless listed under UC4B.

C. Mark each treated item with the AWPB Quality Mark Requirements.

D. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment and to comply with AWPA MR. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

E. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

2.3 DIMENSION LUMBER FRAMING

A. Framing: No. 2 or better grade.

1. Application: Exterior walls and interior load-bearing and non-load bearing partitions.

2. Species:

a. Douglas fir-larch; WCLIB or WWPA.

2.4 CONSTRUCTION PANELS

A. Construction Panel Standards: Comply with PS 1" US Product Standard for Construction and Industrial Plywood" for plywood panels and, for products not manufactured under PS1 provisions, with American Plywood Association (APA) "Performance Standard and Policies for Structural-Use Panels", Form No E445.

B. Trademark: Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.

C. Concealed APA Performance-rated Panels: Where construction panels will be used for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements indicated for grade designations, span rating, exposure durability classifications, edge detail (where applicable) and thickness.

1. Wall Sheathing: APA RATED SHEATHING:

   a. Exposure Durability Classification: Exposure 1.

   b. Thickness per drawings.

2. Roof Sheathing: APA RATED SHEATHING:

   a. Exposure Durability Classification: Exposure 1.

   b. Edge Detail – Square.

   c. Thickness per drawings.

D. Interior applications: Where construction panels will be installed in the building interior, provide products containing no added urea formaldehyde.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.

2. Nailers.

3. Cants.

4. Furring.

5. Grounds.

B. For items of dimension lumber size, provide No. 2 or better grade lumber of any species.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and No. 2 or better grade lumber of any species:

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling**.**

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. NES NER-272 covers power-driven staples, nails, P-nails, and allied fasteners.

D. Power-Driven Fasteners: NES NER-272.

E. Wood Screws: ASME B18.6.1.

F. Lag Bolts: ASME B18.2.1.

G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

H. Wood Connectors: Provide Simpson Strong-tie connectors or equal, as indicated in the drawings.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

D. Shear Wall Panels: Install shear wall panels to comply with manufacturer's written instructions.

E. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

F. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

G. Do not splice structural members between supports unless otherwise indicated.

H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

I. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

J. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

K. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

L. Use inorganic boron for items that are continuously protected from liquid water.

M. Use copper naphthenate for items not continuously protected from liquid water.

N. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated on Drawings. If fastening is not indicated comply with the following:

1. NES NER-272 for power-driven fasteners.

2. Table 2304.10.1, "Fastening Schedule," in ICC's International Building Code.

O. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

P. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction unless otherwise indicated.

B. For exterior walls, provide studs sized and spaced as indicated on Drawings.

C. For interior walls, provide studs sized and spaced as indicated on Drawings.

D. Provide continuous horizontal blocking at midheight of interior partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.

E. Construct corners and intersections with three or more studs. Exterior corners shall be constructed as California Corners.

F. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs for interior non-load-bearing partitions, support headers on jamb studs. Construct load-bearing wall headers as indicated on Drawings.

3.4 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 06 17 33 – ENGINEERED WOOD JOISTS

A. Section includes framing using engineered lumber joists.

1.2 RELATED SECTIONS

A. 06 10 00 Rough Carpentry.

B. 06 18 00 Glued-Laminated Construction.

1.3 REFERENCES

A. ASTM International (ASTM):

1. ASTM D5055: Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.

B. National Institute of Standards and Technology:

1. Voluntary Product Standard PS 2 Performance Standard for Wood-Based Structural-Use Panels.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery and Acceptance Requirements: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Unload material in accordance with manufacturer's recommendations.

B. Storage and Handling Requirements: Handle and store materials in accordance with manufacturer's recommendations. Protect from exposure to harmful environmental conditions.

PART 2 PRODUCTS

2.1 WOOD I-JOISTS

A. General: Provide engineered wood joists that comply with ASTM D5055 Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists or research/evaluation reports acceptable to authorities having jurisdiction.

1. Compatibility: Ensure components and materials are compatible with specified accessories and adjacent materials.

2. Type: As indicated on drawings.

3. Height: As indicated on drawings.

4. Flange Material: Laminated Veneer Lumber (LVL).

5. Web Material: Oriented Strand Board (OSB) in accordance with PS 2.

6. Adhesive: Meets requirements of ASTM D5055.

B. Manufacturer:

1. Boise Cascade, LLC. Three Centerpointe Dr., Suite 180, Lake Oswego, OR 97035; Telephone: (800) 391-5491; Email: AlanHeckart@Contractor.BC.com; Website: www.bc.com .

2. Product substitutions of equal or better performance may be submitted for engineer approval.

2.2 FRAMING CONNECTORS

A. Subject to compliance with requirements, provide products indicated on Drawings or comparable product.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates in areas to receive engineered wood joists, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Coordinate I-joists with work of other trades for proper time and sequence to avoid construction delays or conflicts.

B. Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

C. Install I-joists plumb, level and as indicated.

D. Fasten joists to supporting framing as indicated on Drawings.

E. Provide temporary bracing as recommended by the manufacturer to hold joists in position until permanently secured.

F. Cut openings in joist webs only as allowed by the manufacturer.

G. Install framing connectors per manufacturer’s instructions.

3.3 SITE TOLERANCES

A. Joists: Not more than 1/2-inch (12.7 mm) from indicated position.

3.4 CLEANING

A. Upon completion and verification of performance of installation, remove surplus materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 06 83 16 – FIBERGLASS REINFORCED PANELING

1.2 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics 2010 (Reapproved 2018).

B. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2016.

C. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels 2017.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

1.3 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns, and colors available; and installation instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels (Utility and storge rooms):

1. Crane Composites, Inc; www.cranecomposites.com.

2. Or equal.

2.2 PANEL SYSTEMS

A. Wall Panels:

1. Panel Size: 4 by 8 feet.

2. Panel Thickness: 0.075-inch.

3. Surface Design: Smooth.

4. Color: As indicated on drawings.

5. Attachment Method: Adhesive only, with trim and sealant in joints.

2.3 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.

1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.

2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

3. Impact Strength: Greater than 6 ft lb force per inch, when tested in accordance with ASTM D256.

B. Sealant: Type recommended by panel manufacturer; clear.

PART 3 EXECUTION

3.1 INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E. Install panels with manufacturer's recommended gap for panel field and corner joints.

F. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

G. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 07 21 00 - THERMAL INSULATION

A. This section includes the following:

1. Board insulation at perimeter foundation wall, underside of floor slabs, exterior wall behind interior wall finish, and exterior wall behind cladding..

1.2 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

1.3 SUBMITTALS

A. Product Data: Provide data on product characteristics and performance criteria.

B. Manufacturer's Installation Instructions: Include information on installation techniques.

1.4 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.1 APPLICATIONS

A. Perimeter Insulation: Expanded Polystyrene (EPS) board.

2.2 FOAM BOARD INSULATION MATERIALS

A. Expanded Polystyrene (EPS) Board Insulation: Comply with ASTM C578.

1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.

2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.

3. Board Size: 48 inch by 96 inch.

4. Board Thickness: as indicted on drawings.

5. Board Edges: Square.

6. Type and Compressive Resistance: Type IX, 25 psi (173 kPa), minimum.

7. Type and Thermal Resistance, R-value: Type IX, 4.2 (0.74), minimum, per 1 inch thickness at 75 degrees F mean temperature.

2.3 ACCESSORIES

A. Sheet Vapor Retarder: See Section 07 25 00

B. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.2 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Install boards horizontally on foundation perimeter.

1. Place boards to maximize adhesive contact.

2. Install in running bond pattern.

3. Butt edges and ends tightly to adjacent boards and to protrusions.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.3 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install boards horizontally on walls.

1. Fasten boards per manufacturer's recommendations.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.4 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 07 25 00 – BUILDING ENVELOPE BARRIERS

A. Building Envelope Barriers: Materials that form a system to stop passage of air, liquid water, or water vapor through all exterior building surfaces, including walls, roofs, and floors, transitions thereof, and all exterior openings and penetrations.

1. The specified properties of each building envelope barrier function collectively to prevent moisture accumulation in floor, wall, and roof assemblies. Only approved product substitutions are allowed.

2. Barrier materials may serve more than one of the functions defined below.

1.2 DEFINITIONS

A. Air Barrier: Airtight barrier made of material that is relatively air impermeable to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.

1. All air barrier materials have specified degrees of vapor permeability, and as such may or may not be classified as vapor retarders.

2. Some air barrier materials may also serve the purpose of a water-resistive barrier, as defined below.

B. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water.

1. Some water-resistive barrier materials may also be water vapor impermeable, to the degree specified.

C. Vapor Retarder: Airtight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.

1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.

1.3 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 2014.

C. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

F. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

G. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; ICC Evaluation Service, Inc; 2013.

H. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; ICC Evaluation Service, Inc; 2011.

I. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; ICC Evaluation Service, Inc; 2015.

J. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012.

1.4 SUBMITTALS

A. Product Data: Provide data on performance criteria for each barrier listed.

B. Manufacturer’s Installation Instructions: Indicate preparation and installation methods.

C. Air Barrier Quality Control Reports.

1.5 QUALITY ASSURANCE

A. Air Barrier Quality Control Inspections: Contractor’s Quality Control staff shall perform air barrier quality control inspections as described in this section.

1.6 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.1 BE-4 - AIR BARRIER SHEET, MECHANICALLY FASTENED: AIR AND VAPOR IMPERMEABLE.

A. Location: Installed on the interior face of the exterior wall studs and roof trusses, and beneath the sub-slab insulation, as indicated in drawings.

B. General: Provide vapor retarder sheet, conforming to ASTM D4397 polyethylene film, clear.

C. Performance Criteria:

1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.

2. Water Vapor Permeance: 0.06 perms, maximum, when tested in accordance with ASTM E96/E96M, Procedure B.

3. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.

4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.

D. Seam and Perimeter Tape: As recommended by sheet manufacturer.

E. Seam and Perimeter Sealant: Acoustic Sealant

F. Material:

1. ASTM D4397 polyethylene film, clear.

2. Thickness: 6 mil, above grade.

3. Thickens: 10 mil, below grade.

2.2 BE-5 - AIR BARRIER SHEET, (SELF-ADHERED) (MECHANICALLY FASTENED): AIR AND WATER-RESISTIVE BARRIER.

A. Location: Installed on the exterior face of the exterior wall system, as indicated in drawings.

B. General: Must exhibit no visible water leakage when tested in accordance with ASTM E331 and must perform as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration.

C. Performance Criteria:

1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.

2. Water Vapor Permeance: 28 perms, minimum, when tested in accordance with ASTM E96/E96M, Procedure B.

3. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.

4. Tensile Strength: Not less than 20 lb/in., when tested in accordance with ASTM D828.

5. Water Penetration Resistance: No water penetration after 90 minutes at 6.24 psf or 15 minutes at 15 psf, when tested in accordance with ASTM E 331.

6. Water Penetration Resistance around Nails: Pass, when tested in accordance with ASTM D1970/D1970M (modified).

7. Smoke Developed Index Rating not higher than 100

D. Seam and Perimeter Sealant: As recommended by sheet manufacturer.

E. Manufacturers:

1. (Self-Adhered) VaproShield WrapShield SA: www.vaproshield.com

2. (Mechanically Fastened) VaproShield WallShield IT: www.vaproshield.com

3. (Mechanically Fastened) Tyvek Commercial Wrap: www.dupont.com

4. (Mechanically Fastened) Tyvek DrainWrap: www.dupont.com

5. Or equal

2.3 BE-7 – ROOF UNDERLAYMENT, SELF-ADHERED: AIR AND WATER-RESISTIVE BARRIER.

A. Location: Installed as part of roofing system, as indicated in drawings.

B. General: Provide fully self-adhering, water-resistive, air barrier membrane. Self-adhering roof underlayment must exhibit no visible water leakage when tested in accordance with ASTM D1970. Use regular or low temperature formulation depending on site conditions, within temperature ranges specified by manufacturer.

C. Performance Criteria:

1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.

2. Water Vapor Permeance: 25 perms, minimum, when tested in accordance with ASTM E96/E96M, Procedure B.

3. Water Penetration Resistance around Nails: Pass, when tested in accordance with ASTM D1970/D1970M (modified).

4. Tensile Strength: Not less than 16 lb/in (MD) or 8 lb/in. (XMD), when tested in accordance with ASTM D2523).

5. Ultimate Elongation: Not more than 40% (MD or XMD), when tested in accordance with ASTM D2523.

6. Puncture Resistance: Not less than 80 lbs, when tested in accordance with ASTM D5602.

7. Cold Bending: Not less than minus 45 degrees, when tested in accordance with ASTM D5147.

8. Lap Adhesion: Not less than 2.5 lbs per inch when tested in accordance with ASTM D1876.

9. Peel Adhesion: Not less than 5.0 lbs per inch with plywood substrate, when tested in accordance with ASTM D903.

10. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.

11. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.

12. *COLD TEMPERATURE PLIABILITY: PASS, WHEN TESTED IN ACCORDANCE WITH ASTM D1970*

D. Seam and Perimeter Tape: As recommended by sheet manufacturer.

E. Substrate Primer: As recommended by sheet manufacturer.

F. Manufacturers:

1. VaproShield SlopeShield Plus SA: www.vaproshield.com

2. Or Equal.

2.4 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Sealing Air Barrier to Adjacent Substrates: As indicated in drawings or as recommended by air barrier manufacturer.

B. Sealants, Tapes, and Accessories for Sealing Water-Resistive Barrier and Sealing Water-Resistive Barrier to Adjacent Substrates: As indicated in drawings or as recommended by Water-Resistive Barrier manufacturer.

C. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.

1. Composition: per Air Barrier manufacturer. Ensure chemical compatibility with all receiving materials.

2. Ultraviolet (UV) Light and Weathering Exposure: In accordance with ICC-ES AC 148.

3. Peel Adhesion: Pass, when tested in accordance with ASTM D 3330 Method F.

4. Cold Temperature Pliability: Pass, when tested in accordance with ASTM D 1970, AAMA 711.

5. Manufacturers:

a. As indicated by Air Barrier manufacturer.

D. Liquid Flashing: One part, fast curing, non-sag, elastomeric, gun grade, trowelable liquid flashing.

1. Composition: per material manufacturer. Ensure chemical compatibility.

2. Manufacturers:

a. As indicated by material manufacturer.

b. If air barrier manufacturer does not indicate suitable flashing products, submit product that meets the above criteria.

c. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.2 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and primers in accordance with manufacturer's instructions.

3.3 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water.

D. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.

E. Mechanically Fastened Sheets – Air and Vapor Barrier on Interior at Walls and Ceiling, and Floors (BE-4):

1. Seal entire perimeter to structure, window and door frames, and other penetrations.

2. Provide continuous bead of acoustical sealant across entire perimeter of each sheet.

a. Lap joints:

1) Lap sheets minimum of 12 inches.

2) Locate laps at a framing member to prevent movement due to differential air pressures.

3) Fasten one sheet to framing member then seal and tape overlapping sheet to first sheet.

4) Apply continuous bead of sealant within 6 inches of lap.

5) Apply vapor-resistive tape at edge of lap.

b. Terminations:

1) Apply continuous bead of sealant within 2 inches of sheet edge.

2) Mechanically fasten edge of sheet to structural elements to prevent movement due to differential air pressures.

3) Door and Windows openings: Lap with air barrier membrane from exterior side of wall assembly. Apply vapor-resistive tape at sheet edge.

4) Bottom of wall: Extend sheet minimum 1-inch beyond wall-to-floor joint. Apply sealant to wall bottom plate, bottom track, or SIP edge.

3. Use only electrical boxes that have air/vapor seal rings. Seal sheet to box ring with acoustic sealant.

4. Seal penetrations, tears, and cuts with vapor-resistive tape, making airtight seal.

5. Seal at openings and penetrations as indicated in drawings, and as described in "Openings and Penetrations in Air- and Water-Resistive Barriers" section below.

F. Self-Adhered Sheets - Air and Water-Resistive Barrier on Exterior at Roof and Walls (BE-5, BE-7):

1. Prepare substrate in manner recommended by sheet manufacturer; fill and tape joints in substrate and between dissimilar materials.

2. Lap sheets shingle-fashion to shed water and seal laps airtight.

3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that laps are firmly adhered with no gaps or fishmouths.

4. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.

5. At wide joints, provide extra flexible membrane allowing joint movement.

6. Seal at openings and penetrations as indicated in drawings, and as described in "Openings and Penetrations in Air- and Water-Resistive Barriers" section below.

G. Door Openings in Air- and Water-Resistive Barriers:

1. Wrap interior air- and vapor barrier (BE-4) into rough opening, and seal to jamb and head stud framing.

2. Install flexible flashing over jamb and head of door opening, covering all areas of rough opening that will be concealed by door frame and finishes, extending at least 4 inches onto air- and vapor barrier (BE-4) at interior side of wall. At corners, use reinforcing strips or flexible sill flashing in accordance with manufacturer instructions.

3. At interior face of openings, insulate and seal gap between window/door frame and rough framing, using joint sealant over low-expansion foam insulation.

H. Penetrations in Air- and Water-Resistive Barriers:

1. At roof:

a. Form flexible flashing around penetrating item and seal to air barrier surface on both interior and exterior faces of assembly.

2. At wall:

a. Form flexible flashing around penetrating item and seal to air barrier surface on the interior of wall assembly.

b. Apply continuous bead of compatible sealant around penetrating item at the exterior face of wall assembly.

3.4 FIELD QUALITY CONTROL

A. Coordination of Air Barrier Inspections:

1. Provide Air Barrier inspection described below.

2. Notify Project Manager and General Contractor in writing of schedule for air barrier work and allow adequate time for General Contractor inspection.

3. Allow access to air barrier work areas and staging.

4. Do not cover air barrier work until inspected and accepted.

B. Take digital photographs of each portion of the installation prior to covering up.

C. Air Barrier Quality Control Inspections:

1. Conduct the following tests and inspections as applicable in the presence of the Project Manager during installation of the air barrier system, and submit quality control reports as indicated below.

a. Provide, at minimum, three inspections during construction.

D. Inspect to assure continuity of the air barrier system throughout the building enclosure and that all gaps are covered, the covering is structurally sound, and all penetrations are sealed allowing for no infiltration or exfiltration through the air barrier system.

E. Inspect to assure structural support of the air barrier system to withstand design air pressures.

F. Inspect and test to assure site conditions for application temperature, and dryness of substrates are within guidelines.

G. Inspect to assure substrate surfaces are properly primed if applicable and in accordance with manufacturer's instructions. Priming must extend at least 2 inches beyond the air barrier material to make it obvious that the primer was applied to the substrate before the air barrier material.

H. Inspect to assure laps in materials are as specified by this section or manufacturer instructions, shingled in the correct direction.

I. Inspect to assure that a roller has been used to enhance adhesion. Identify any defects such as fishmouths, wrinkles, areas of lost adhesion, and improper curing. Note the intended remedy for the deficiencies.

J. Inspect to assure that the correct materials are installed for compatibility.

K. Inspect to assure proper transitions for change in direction and materials.

L. Inspect to assure proper connection between assemblies (membrane and sealants) for cleaning, preparation and priming of surfaces, structural support, integrity and continuity of seal.

M. Inspected areas to include wall-to-floor interface; wall penetrations; window head, sill and jamb seal; door head and jamb seal; wall corners, wall-to-roof interface; parapets; roof penetrations, roof ridge; and other similar conditions.

3.5 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 07 41 13 – METAL ROOF PANELS

A. This section includes the following:

1. Roofing system of preformed steel panels.

2. Vented metal soffit panels.

1.2 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.

C. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems; 2018.

1.3 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Storage and handling requirements and recommendations.

2. Installation methods.

3. Specimen warranty.

B. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.

1. Show work to be field-fabricated or field-assembled.

C. Manufacturer Qualification Statement: Provide documentation showing metal roof panel fabricator is accredited under IAS AC472.

D. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.6 WARRANTY

A. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of five years from Date of Substantial Completion.

B. Waterproofing Warranty: Provide manufacturer's warranty for weathertightness of roofing system, including agreement to repair or replace roofing that fails to keep out water within specified warranty period of five years from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 METAL ROOF PANELS

A. Metal Roof Panels: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Metal Panels: Factory-formed panels with factory-applied finish.

1. Steel Panels:

a. Zinc-coated steel complying with ASTM A653/A653M; minimum G60 galvanizing.

b. Steel Thickness: Minimum 24 gage (0.024-inch).

2. Profile: Lapped seam, with integral sealant bead and exposed fastener system.

3. Texture: Smooth.

4. Width: Maximum panel coverage of 24 inches.

C. Metal Soffit Panels:

1. Profile: Style as indicated, with venting provided.

2. Material: Precoated steel sheet, 22 gage, 0.0299-inch minimum thickness.

3. Color: As indicated.

2.2 ATTACHMENT SYSTEM

A. Exposed System: Provide manufacturer's recommended stainless steel fasteners engineered to meet performance requirements and equipped with appropriate sealant separators to provide weathertight connections that will accommodate anticipated thermal movement.

2.3 FINISHES

A. Fluoropolymer Coil Coating System: Manufacturer's standard multi-coat aluminum coil coating system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of coil coated aluminum surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009-inch; color and gloss to match sample.

2.4 ACCESSORIES

A. Miscellaneous Sheet Metal Items: Provide flashings and closure strips of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.

B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.

C. Sealants:

1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.

2. Concealed Sealant: Non-curing butyl sealant or tape sealant.

PART 3 EXECUTION

3.1 INSTALLATION

A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.

1. Install roofing system with exposed fasteners prefinished to match panels.

2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.

B. Accessories: Install all components required for a complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.

C. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.

3.2 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.3 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 07 42 13 – METAL WALL PANELS

A. This section includes the following:

1. Manufactured metal panels for exterior wall panels, with related flashings and accessory components.

1.2 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2019a.

B. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components 2019.

1.3 ACTION SUBMITTALS

A. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:

1. Physical characteristics of components shown on shop drawings.

2. Storage and handling requirements and recommendations.

3. Installation instructions and recommendations.

B. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.

1.4 INFORMATIONAL SUBMITTALS

A. Test Reports: Submit test report verifying compliance with NFPA 285 for previously-tested exterior wall assembly.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.7 WARRANTY

A. Correct defective work within a five-year period after Date of Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.

B. Correct defective work within a five-year period after Date of Substantial Completion, including defects in water tightness and integrity of seals for metal wall panels.

PART 2 PRODUCTS

2.1 MANUFACTURED METAL PANELS

A. Wall Panel System: Factory fabricated prefinished metal panel system; site assembled.

1. Provide exterior wall panels.

2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.

3. Design Pressure: In accordance with applicable codes.

4. Fire Performance: Tested in accordance with and complying with acceptance criteria of NFPA 285.

5. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.

6. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.

7. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.

8. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.

B. Exterior Wall Panels:

1. Profile: Vertical, as indicated; style as indicated.

2. Material: Precoated steel sheet, 24 gauge 0.024-inch.

3. Color: As indicated on drawings.

C. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

2.2 MATERIALS

A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.3 FINISHES

A. Exposed Surface Finish: Panel manufacturer's standard polyvinylidene fluoride (PVDF) coating, topcoat over epoxy primer.

B. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated aluminum surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009-inch; color and gloss as selected by Contracting Officer from manufacturer’s standard line.

2.4 ACCESSORIES

A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.

B. Concealed Sealants: Non-curing butyl sealant or tape sealant.

C. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.

D. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.

E. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that building framing members are ready to receive panels.

3.2 INSTALLATION

A. Install panels on walls in accordance with manufacturer's instructions.

B. Fasten panels to structural supports; aligned, level, and plumb.

C. Lap panel ends minimum 2 inches.

D. Use concealed fasteners unless otherwise approved by Contracting Officer.

E. Seal and place gaskets to prevent weather penetration. Maintain a neat appearance.

3.3 CLEANING

A. Remove site cuttings from finish surfaces.

B. Remove protective material from wall panel surfaces.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECCTION 07 62 00 – SHEET METAL FLASHING AND TRIM

A. This section includes the following:

1. Fabricated sheet metal items, including flashings and counter flashings.

2. Sealants for joints within sheet metal fabrications.

1.2 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. CDA A4050 - Copper in Architecture - Handbook; current edition.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.3 SUBMITTALS

A. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239) inch thick base metal, shop pre-coated with PVDF coating.

1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.

2. Color: As indicated on drawings.

2.2 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2-inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.3 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

PART 3 EXECUTION

3.1 INSTALLATION

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.

B. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 07 912 00 – JOINT SEALANTS

A. This section includes the following:

1. Nonsag gunnable joint sealants.

1.2 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015.

B. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants; 2018.

C. ASTM C834 - Standard Specification for Latex Sealants; 2017.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2016.

F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2018.

H. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2014.

I. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2019.

J. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.

2. List of backing materials approved for use with the specific product.

3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.

4. Substrates the product should not be used on.

B. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

C. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.

1. Adhesion Testing: In accordance with ASTM C794.

2. Compatibility Testing: In accordance with ASTM C1087.

3. Allow sufficient time for testing to avoid delaying the work.

4. Deliver to manufacturer sufficient samples for testing.

5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.

6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

1.5 WARRANTY

A. Correct defective work within a five year period after Date of Substantial Completion.

B. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.1 JOINT SEALANT APPLICATIONS

A. Scope:

1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.

   a. Wall expansion and control joints.

   b. Joints between door, window, and other frames and adjacent construction.

   c. Joints between different exposed materials.

   d. Openings below ledge angles in masonry.

   e. Other joints indicated below.

2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.

   a. Joints between door, window, and other frames and adjacent construction.

   b. Other joints indicated below.

3. Do not seal the following types of joints.

   a. Intentional weepholes in masonry.

   b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.

   c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.

   d. Joints where installation of sealant is specified in another section.

   e. Joints between suspended panel ceilings/grid and walls.

B. Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.

2.2 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 25 percent, minimum.

2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.

3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.

4. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.

5. Color: Match adjacent finished surfaces.

6. Service Temperature Range: Minus 20 to 180 degrees F.

B. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 25 percent, minimum.

2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.

3. Color: Match adjacent finished surfaces.

4. Service Temperature Range: Minus 40 to 180 degrees F.

C. Non-Curing Butyl Sealant: Solvent-based, single component, non-sag, non-skinning, non-hardening, non-bleeding; non-vapor-permeable; intended for fully concealed applications.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

3.2 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Install bond breaker backing tape where backer rod cannot be used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 09 11 13 – HOLLOW METAL DOORS AND FRAMES

A. This section includes the following:

1. Non-fire-rated hollow metal doors and frames.

2. Thermally insulated hollow metal doors with thermally broken frames.

1.2 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2018.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

H. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

I. ITS (DIR) - Directory of Listed Products; current edition.

J. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2007.

K. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

L. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.

M. UL (DIR) - Online Certifications Directory; Current Edition.

N. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

C. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

D. Manufacturer's Qualification Statement.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

B. Maintain at project site copies of reference standards relating to installation of products specified.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:

1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.

2. Accessibility: Comply with ICC A117.1 and ADA Standards.

3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.

4. Door Edge Profile: Manufacturers standard for application indicated.

5. Typical Door Face Sheets: Flush.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.2 METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated.

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

a. Level 3 - Extra Heavy-duty.

b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.

c. Model 1 - Full Flush.

d. Door Face Metal Thickness: 16 gage, 0.053-inch, minimum.

e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.

C. Door Thermal Resistance: R-Value of 6.0 minimum, for installed thickness of polystyrene.

1. Door Thickness: 1-3/4 inches, nominal.

2.3 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished

C. Exterior Door Frames: Thermally broken, Knock-down type.

1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.

2. Frame Metal Thickness: 16 gauge, 0.053-inch, minimum.

3. Insulation: Full depth of frame.

D. Door Frames: Knock-down type.

1. Frame Metal Thickness: 16 gauge, 0.053-inch, minimum.

E. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.

2.4 INTERIOR DOOR FRAMES, NON-FIRE RATED: KNOCK-DOWN TYPE.

A. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inch, maximum, above floor at 45 degree angle.

B. Frame Metal Thickness: 18 gauge, 0.042-inch, minimum.

C. Frame Finish: Factory primed and field finished.

2.5 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.6 ACCESSORIES

A. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

3.2 TOLERANCES

A. Maximum Diagonal Distortion: 1/16-inch measured with straight edge, corner to corner.

3.3 ADJUSTING

A. Adjust for smooth and balanced door movement.

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE: SECTION 08 14 16 - FLUSH WOOD DOORS

A. This section includes the following:

1. Flush wood doors; flush and flush glazed configuration; fire-rated, non-rated, and acoustical.

1.02 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

D. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

B. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

C. Samples: Submit two samples of door veneer to match existing, 4 by 4 inches in size illustrating wood grain, stain color, and sheen.

D. Warranty, executed in Owner's name.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.06 WARRANTY

A. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.

1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors: Alternate Brand Request or Substitution Request not required. Alternate manufacturers include, but are not limited to, the following:

1. Krieger Specialty Products: www.kriegerproducts.com.

2. VT Industries, Inc: www.vtindustries.com.

3. Or equal.

2.02 DOORS AND PANELS

A. Doors: See drawings for locations and additional requirements.

1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.

1. Provide solid core doors at each location.

2. Wood veneer facing for field transparent finish as indicated on drawings.

3. Acoustical Rating – STC 32.

2.03 DOOR FACINGS

A. Veneer Facing for Transparent Finish: Match existing. Record documents reference Hard Maple, contractor to field verify. Provide veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.

1. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.

2.04 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:

1. Provide solid blocks at lock edge for hardware reinforcement.

C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

E. Provide edge clearances in accordance with the quality standard specified.

2.05 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

1. Transparent:

a. System - 1, Lacquer, Nitrocellulose.

b. Sheen: match existing.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

3.02 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 08 31 00 – ACCESS DOORS AND PANELS

A. This section includes:

1. Wall- and ceiling-mounted access units.

1.2 SUBMITTALS

A. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

B. Shop Drawings: Indicate exact position of each access door and/or panel unit.

C. Manufacturer's Installation Instructions: Indicate installation requirements.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

A. Acceptable Manufacturers:

1. Babcock-Davis, Minneapolis, MN www.babcock-davis.com.

2. The Bilco Company, New Haven, CT www.bilco.com or Bilco Canada, London, ON (519) 659-7331.

3. Larsen's Manufacturing Co, Minneapolis, MN www.larsensmfg.com.

4. Williams Brothers Corporation of America, Reno, NV www.wbdoors.com.

5. Or equal.

2.2 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall and Ceiling Mounted Units:

1. Location: As indicated on drawings.

2. Material: Steel; factory powder-coated prime finish.

3. Door/Panel: Continuous piano hinged, standard duty, manually operated with single key-operated lock, interior latch release, and continuous piano hinge hardware.

4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.

B. Non-Fire-Rated Access panel, Class Two Quality Standards:

1. Acoustical Tile: DSC-210 by Karp.

2. Plaster: DSC-210 PL by Karp.

3. Drywall: KDW or Sesame (KSTDW or KSTE) by Karp.

4. Masonry: DSC-214M by Karp.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

A. This section includes the following:

1. Acoustic insulation.

2. Gypsum wallboard.

3. Joint treatment and accessories.

1.2 REFERENCE STANDARDS

A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).

C. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020.

D. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2023.

H. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

I. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

J. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

K. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

L. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.

1.3 SUBMITTALS

A. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

1. Provide data on gypsum board, accessories, and joint finishing system.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

2.2 BOARD MATERIALS

A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.

2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

a. Mold resistant board is required at all locations.

3. Thickness:

a. Vertical Surfaces: Type “X” 5/8-inch.

4. Mold-Resistant, Paper-Faced Products:

2.3 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness Full depth of wall.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.2 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

1. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.3 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

3.4 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

1. Not more than 30 feet apart on walls and ceilings over 50 feet long.

B. Corner Beads: Install at external corners, using longest practical lengths.

3.5 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:

1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.

2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

3.6 PROTECTION

A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 09 65 00 - RESILIENT FLOORING

A. This section includes the following:

1. Resilient base.

2. Installation accessories.

1.2 REFERENCE STANDARDS

A. ASTM D6329 - Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers 1998 (Reapproved 2015).

B. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading 2017.

C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile 2020.

D. ASTM F1913 - Standard Specification for Vinyl Sheet Floor Covering Without Backing 2019.

E. UL 2824 - GREENGUARD Certification Program Method for Measuring Microbial Resistance from Various Sources Using Static Environmental Chambers Current Edition, Including All Revisions.

1.3 ACTION SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

1.4 INFORMATIONAL SUBMITTALS

A. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

B. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

1.6 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; style as scheduled.

1. Basis of Design: 700 Series wall base system by ROPPE.

2. Height: 4-inch.

3. Finish: Satin.

4. Length: Roll or 8-foot sections, miter corners.

5. Color: As indicated in the drawings.

2.2 ACCESSORIES

A. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

3.2 PREPARATION

A. Prepare substrates as recommended by flooring and adhesive manufacturers.

B. Remove ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

3.3 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

3.4 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.5 CLEANING

A. Remove excess adhesive from base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 09 91 13 – EXTERIOR PAINTING

A. This section includes the following:

1. Surface preparation.

2. Field application of paints.

3. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

4. Do Not Paint or Finish the Following Items:

a. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.

b. Items indicated to receive other finishes.

c. Items indicated to remain unfinished.

d. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.

e. Floors, unless specifically indicated.

f. Glass.

g. Concealed pipes, ducts, and conduits.

1.2 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

1.3 SUBMITTALS

A. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").

2. MPI product number (e.g. MPI #47).

3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

B. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.

1. Where sheen is specified, submit samples in only that sheen.

C. Manufacturer's Instructions: Indicate special surface preparation procedures.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

PART 2 PRODUCTS

2.1 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.

1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Supply each paint material in quantity required to complete entire project's work from a single production run.

3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:

1. Provide paints and finishes that comply with the most stringent requirements specified in the following:

a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.

2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Colors: As indicated on drawings.

2.2 PAINT SYSTEMS - EXTERIOR

A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including primed metal.

1. Two top coats and one coat primer.

2. Top Coat(s): Exterior Light Industrial Coating, Water Based; MPI #161, 163, or 164.

2.3 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.2 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.3 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.4 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 09 91 23 - INTERIOR PAINTING

A. This section includes the following:

1. Surface preparation.

2. Field application of paints.

3. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

4. Do Not Paint or Finish the Following Items:

a. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.

b. Items indicated to receive other finishes.

c. Items indicated to remain unfinished.

d. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.

e. Floors, unless specifically indicated.

f. Glass.

g. Concealed pipes, ducts, and conduits.

1.2 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

C. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

1.3 SUBMITTALS

A. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").

2. MPI product number (e.g., MPI #47).

3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

B. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.6 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.

1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Supply each paint material in quantity required to complete entire project's work from a single production run.

3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:

1. Provide paints and finishes that comply with the most stringent requirements specified in the following:

a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.

2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Colors: As indicated on drawings.

2.2 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, uncoated steel, and shop primed steel.

1. Two topcoats and one coat primer.

2. Topcoat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.

3. Topcoat Sheen:

a. Eggshell: MPI gloss level 3; use this sheen at all locations.

B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:

1. Two topcoats and one coat primer.

2. Topcoat(s): Interior Light Industrial Coating, Water Based; MPI #151, 153 or 154.

3. Primer: As recommended by topcoat manufacturer for specific substrate.

2.3 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

F. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.

2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

3.2 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.3 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

A. Commercial toilet accessories.

1.2 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

D. ASTM C1036 - Standard Specification for Flat Glass; 2016.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

F. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.

G. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004, with Editorial Revision (2016).

1.3 SUBMITTALS

A. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:

1. AJW Architectural Products: www.ajw.com.

2. American Specialties, Inc: www.americanspecialties.com.

3. Bobrick washroom Equipment, Inc.: Bobrick.com.

4. Bradley Corporation: www.bradleycorp.com.

5. Or equal.

2.2 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Stainless Steel Sheet: ASTM A666, Type 304.

C. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

D. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

E. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

2.3 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.4 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Vertical, Double roll, surface mounted bracket type, stainless steel, spindleless type for tension spring delivery designed to prevent theft of tissue roll.

B. Paper Towel Dispenser: Folded paper type, stainless steel, semi-recessed, with viewing slots on sides as refill indicator and tumbler lock.

1. Capacity: 300 C-fold minimum.

C. Mirrors: Stainless steel framed, 1/4-inch thick annealed float glass; ASTM C1036.

1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.

2. Frame: 0.05-inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.

D. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

3.2 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

A. This section includes the following:

1. Fire extinguishers.

2. Accessories.

1.2 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2017, with Errata (2018).

1.3 SUBMITTALS

A. Product Data: Provide extinguisher operational features.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fire Extinguishers:

1. Activar Construction Products Group, Inc. - JL Industries; Cosmic Extinguisher - Multipurpose Chemical: www.activarcpg.com.

2. Ansul, a Tyco Business: www.ansul.com.

3. Nystrom, Inc: www.nystrom.com.

4. Or equal.

2.2 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.

1. Class: A:B:C type.

2. Size: 10 pound.

3. Temperature range: Minus 40 degrees F to 120 degrees F.

2.3 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome plated.

B. Lettering: FIRE EXTINGUISHER decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 20 01 00 - OPERATION AND MAINTENANCE FOR MECHANICAL

A. This Section covers form, content, and submittal of mechanical system Operation and Maintenance Manuals.

PART 2 PRODUCTS

2.1 FORM

A. Arrange operation and maintenance data sequentially by Specification Section.

B. Provide two indexes at the front of the binder that locates individual items by tab number. The first by Specification Section. The second, an alphabetical index of all items without regard to Specification Section.

C. Separate each item with consecutively numbered heavy stock divider sheets with plastic index tab. Type item number on both sides of paper inserts.

D. Precede each item with a completed Item Data Sheet. See required format attached to the end of this Specification Section.

E. Material included shall indicate the specific item(s) utilized for this Project. Delete or cross out all other items.

F. Provide complete operation and maintenance manual submittals. Partial or incomplete submittals required under this Section will be returned without review.

2.2 DATA

A. Provide data for all items, equipment, and equipment components specified or indicated under this Division, so that the Owner's maintenance personnel will have complete service and replacement information required for routine maintenance and repair and to provide maximum usable life. Include data not only for maintainable and repairable items, but also for replaceable but not repairable items. Typical items for which information is required include:

1. Equipment including all components and accessories such as motors, pulleys, belts, couplings, switches, etc.

2. Valves, thermometers, pressure gauges, strainers, filters, and other piping accessories.

3. Plumbing fixtures including fixtures, faucets, floor drains, cleanouts, and other components.

4. Heating and ventilation system terminal units including unit heaters, etc.

B. Include the following data for each item as applicable. Some of this data can be extracted from equipment review submittals and included with the Operation and Maintenance Manuals.

1. Manufacturer's catalog literature and illustrations.

2. Operating characteristics including capacity data, performance curves, flow rates, pressure drops, etc.

3. Electrical characteristics and wiring diagrams.

4. Dimensions and connection sizes.

5. Installation and adjustment instructions, requirements, and recommendations.

6. Parts lists and assembly Drawings.

7. Maintenance, operational, and troubleshooting instructions.

8. Warranty data.

C. Data shall be as provided by the equipment manufacturer or supplier.

D. Data is required for all component items of equipment whether or not the components are products of the equipment manufacturer.

E. All material must be clearly readable. "Faxed" then photocopied information is not acceptable.

F. Include a chart, neatly typed and arranged by system, summarizing periodic inspections and maintenance recommended by equipment manufacturers and/or required to properly maintain the facility's new mechanical systems. The periodic maintenance summary chart shall include equipment name, identification symbol, location, type of maintenance or inspection required, and recommended time interval.

G. Include an equipment schedule, neatly typed and arranged by system, listing new equipment with equipment symbol, nomenclature, function and area served, location, manufacturer, nameplate data including model and serial number and motor data including full load amps, horsepower, volts and phase.

H. Include a valve schedule, neatly typed and arranged by system, listing new valve tags with information required on valve tag plus location and normal position, open or closed.

2.3 BINDING

A. Bind the Operation and Maintenance Manuals in three ring, D-ring style binders with page lifters and vinyl covers. Expandable catalog type two-hole binders with soft board covers and metal prong fasteners will not be accepted.

B. Provide multiple binders as required to limit single binder thickness to three inches. Divide binders at logical points. Do not overfill binders.

C. Controls system Operation and Maintenance Manuals and fire protection system Operation and Maintenance Manuals may be bound and submitted for review as separate manuals.

D. Label the front cover and end panel. Label to include Project title, Project number, date, and facility name.

PART 3 EXECUTION

3.1 REQUIRED COPIES AND TIMING

A. Review Submittals:

1. Submit one electronic copy (PDF format) of the Operation and Maintenance Manual for review and acceptance from the Contracting Officer. Electronically Index (Bookmark) each section and item, by item data number and name within the electronic submittal.

2. Submit for review prior to Substantial Completion Inspection.

3. Provide one complete digital copy (PDF format) of the accepted Operation and Maintenance Manuals to the Contracting Officer as part of the Final Operation and Maintenance Manual submittal. Provide digital copies USB compatible memory card (Flash).

END OF SECTION

ATTACHMENT: ITEM DATA SHEET

ITEM DATA SHEET

1. Item name/Drawing equipment number:

2. Specification section/Drawing number:

3. Manufacturer/model number:

4. Size/capacity:

5. Use and location: (1)

6. Spare parts source:

7. Providers of warranty service:

8. Other Contractor comments:

(1) This information must be provided for all items. Be specific as possible.

PART 1 GENERAL

1.1 SCOPE: SECTION 20 05 00 - COMMON WORK RESULTS

A. This Section covers general mechanical requirements for Work covered under Divisions 20, 21, 22, 23 and 33.

B. All Work and services specifically covered under this Division are supplementary to that covered under other Divisions of these Contract Documents. The requirements of this Division, which are more stringent than those covered under other parts of these Contract Documents, apply to the Work covered under this Division.

C. All incidental Work required but not specified under this Division shall comply with the Division in which it is specified.

D. Review the Drawings and Specifications of all other Divisions for additional Work under Division 20.

1.2 GENERAL REQUIREMENTS

A. Provide the Owner with complete, coordinated, operating, balanced, tested, and adjusted mechanical systems.

B. Place all equipment in operation and instruct the Owner's maintenance personnel as to the proper operation, periodic maintenance, and lubrication of new mechanical equipment and systems.

C. The Drawings are somewhat diagrammatic and do not attempt to show all offsets or fittings required for installation of the mechanical system. Furnish and install pipes and ducts with fittings required for complete and proper installation of mechanical systems specified or required under this Division.

D. Provide piping, equipment, and accessories indicated on the Drawings unless it is specifically indicated that the piping, equipment, or accessory is existing.

E. Install piping, and equipment in accordance with manufacturer's recommendations, with accessories recommended by the manufacturer for service intended, and with accessories indicated. Should recommendations conflict with Contract Documents, contact the Contracting Officer for clarification before proceeding.

F. Coordinate the installation of the mechanical systems with the Work of other trades and existing conditions. Route mechanical systems as required to avoid interference with the Work of other trades and existing conditions.

G. Provide access to concealed piping accessories, and equipment requiring access for periodic maintenance, inspection, replacement, or adjustment. Furnish access panels/doors of the proper type and size for the application. See Division 08.

H. Do not scale the Mechanical Drawings. Verify dimensions as construction progresses.

I. Refer to the Architectural and Structural Drawings in regards to partition thicknesses, dimensions and other details of the building construction.

J. Report any errors, discrepancies, or ambiguities to the Contracting Officer, who will answer all questions and interpret the intended meaning of these Contract Documents. Accept Contracting Officer's interpretation as final.

K. Perform Work in a neat and workmanlike manner with skilled craftsmen specializing in said Work.

L. Provide new equipment and materials direct from the manufacturer unless specifically indicated otherwise. Remanufactured equipment and materials are specifically not acceptable.

M. Provide the product of only one manufacturer for each item or type of item provided in quantity.

N. Where the selection of materials or methods is left to the discretion of the Contractor, faithfully pursue the use of the best available materials or methods suitable for the purpose intended.

O. Install Owner furnished fixtures, appliances, and equipment indicated to be Contractor installed, and furnish and install all piping required to connect Owner furnished fixtures, appliances, and equipment to the Mechanical systems, in accordance with the fixture, appliance, or equipment manufacturer's recommendations and as indicated.

1.3 LOCAL CONDITIONS

A. Bidders shall familiarize themselves with the Contract Documents and existing conditions which affect Work required by the Contract Documents. It will be assumed that bidders have made a personal examination of the jobsite and existing conditions.

B. Failure to visit the jobsite will in no way relieve the successful bidder from the necessity of furnishing any materials or performing any Work that may be required to complete the Work in accordance with the Contract Documents with no additional cost to the Owner.

1.4 PERMITS, TESTING, AND INSPECTIONS

A. Apply, obtain, pay for, and comply with the requirements of all permits, fees and inspections by public authorities required for the Work covered under this Division of the Specifications.

B. Transmit copies of permit applications, permits received, and public authority inspection reports to the Contracting Officer.

C. Test mechanical systems in accordance with the most restrictive procedures as defined under applicable codes or as specified elsewhere under this Division.

1. Provide notice to Contracting Officer and public authorities prior to performance of test.

2. Test Work prior to insulating or concealing. If less than required notice is given prior to insulating or concealing, the Contracting Officer may require the Contractor to uncover such Work for inspection and recover same at no additional cost to the Owner.

3. Submit certificate of compliance for all tests indicating system tested, results of tests, witnesses and dates prior to calling for Substantial Completion and final inspections.

4. During testing, isolate piping system equipment and accessories that are not rated to withstand test pressures or perform test prior to connection of such equipment and accessories to the piping system.

D. Substantial Completion and Final Inspections:

1. Provide minimum of 14 calendar days' notice to Contracting Officer and public authorities with intent to have Work ready for inspection. Confirm that Work will be ready for inspection with a minimum of 3 working days' notice prior to requested inspection.

2. Prior to inspection:

a. Deliver to the Contracting Officer required equipment, Drawings, and records.

b. Clean fixtures and equipment. Remove manufacturer's stickers and leave them free of dust and dirt.

c. Remove boxes, scrap, and other debris.

d. Touch up holidays or damaged painted surfaces.

e. Contractor's Mechanical Administrator, licensed by the State of Alaska, shall review mechanical systems installation for conformance with Contract Documents. With request for inspection, Contractor's Mechanical Administrator shall verify in writing that this review has been performed and note anything not conforming to Contract Documents.

f. With request for re-inspection of Work previously inspected, provide the Owner's previous inspection's deficiency list accompanied by an item-by-item statement of measures taken to correct the previously listed deficiencies.

g. Deliver to Owner personnel all special tools and devices furnished by the manufacturer with items, specialties or equipment to allow installation, disassembly, adjustment, repair or maintenance. Identify special tools or devices as to items to which it is applicable.

h. Provide mechanical receivables that the Owner is to receive upon completion of the Project. Turn over an inventory list of materials provided for the Owner's use to the Contracting Officer prior to scheduling substantial completion and final inspections.

i. Deliver to the Contracting Officer a Certificate of Instruction signed by all Owner personnel receiving instruction, all Contractor personnel providing instruction, and indicating dates of instruction.

3. During inspection:

a. Provide a complete and up-to-date set of current record drawings for use during inspection.

b. Provide complete operating systems suitable for the season.

c. Demonstrate that the mechanical system performs in accordance with the Contract Documents. Provide material and personnel required to perform the demonstration.

d. Provide assistance to inspection personnel required for a complete and thorough inspection.

1.5 CODES, ORDINANCES, AND STANDARDS

A. Federal, State and local Codes and Ordinances take precedence over these Specifications and Drawings where conflicts occur unless the Drawings or Specifications call for more stringent requirements. Notify the Contracting Officer in writing of conflicts.

B. Follow latest adopted editions of Code of Federal Regulations, Alaska Administrative Code, International Building Code, International Mechanical Code, International Fuel Gas Code, Uniform Plumbing Code, International Fire Code, National Electrical Code, ADA Accessibility Guidelines, NFPA, ASME, NEMA, ASHRAE, SMACNA, etc. as applicable.

C. Comply with all applicable laws, building and construction codes, OSHA Safety and Health Regulations and applicable requirements of any governmental agency under whose jurisdiction this Work is being performed.

1.6 MECHANICAL COMPLIANCE RECORD

A. Record the performance of all tests, sterilization, cleaning, flushing and refilling of mechanical systems required under this Division.

B. Include date, time and time interval, test results, brief description of method of tests, and witnesses.

C. Submit this record to the Contracting Officer prior to scheduling Substantial Completion and final inspections.

1.7 INSTRUCTION OF OWNER'S PERSONNEL

A. Instruct designated Owner personnel in the proper operation, periodic maintenance and lubrication of the project's mechanical systems, equipment and accessories utilizing an accepted Operations and Maintenance Manual.

B. As instructors, include journeymen plumbers, pipe fitters, electricians, and control technicians, each fully knowledgeable of the project's mechanical systems and equipment.

C. Instruct only those Owner personnel specifically designated by the Contracting Officer. Instruction of other Owner personnel will not meet the requirements of this Section.

D. Include system operations; periodic maintenance including locations and techniques; periodic lubrication including materials, methods and locations; location of concealed valves, instruments, dampers, etc.; location of electrical breakers and disconnects associated with mechanical equipment; and location of control items.

E. Schedule the instruction period in the same manner as for system tests. The Contractor is obligated to only one instruction period. The instruction period may be divided into more than one period with the concurrence of the Contracting Officer.

1.8 RECORD DOCUMENTS

A. When submitting record documents required by Section 01 70 00 “Contract Closeout,” also submit reproducible As-built Drawings of Contractor designed systems.

B. Add the following to the list of items required by Section 01 70 00 “General Requirements” that be legibly marked on Contract Drawings:

1. Changes made to equipment identification assignments, replacing Contract Document assigned equipment designations, at each location that designation occurs.

2. Valve numbering for each valve assigned a number at each location shown on the Drawings.

C. Correct Record Documents as required and transfer project record information to a set of Mylar reproducible Drawings and submit to the Contracting Officer. Owner will provide Contractor with a Mylar reproducible set of Contract Drawings and deliver to the Contracting Officer. Documents shall bear a statement signed and dated by a legal representative of the Contractor indicating that the Record Documents reflect "As-built" conditions.

1.9 WARRANTY

A. All Manufacturer and Supplier standard equipment, item or accessory warranties covered under this Division shall be the Contractor's responsibility under Project warranty period.

B. Equipment, item, or accessory warranties shall commence upon the date of Final Acceptance by the Owner.

C. Transfer all manufacturer and supplier standard equipment, item or accessory warranties to the Owner upon expiration of Project warranty period.

D. Any warranties, more stringent than the manufacturer’s standard, specified, or indicated under this Division, remain the responsibility of the Contractor before and after expiration of Project warranty period.

E. Minimum manufacturer or supplier warranty is that of the manufacturer or supplier used as the basis of design.

1.10 MECHANICAL WORK IN EXISTING FACILITIES

A. Carefully lay out Work in advance.

B. Verify existing conditions affecting Work, including existing sizes and materials indicated prior to beginning Work or ordering materials that are affected by existing conditions. Beginning of Work means acceptance of existing conditions. Match existing products and Work unless otherwise noted. Notify Contracting Officer of conflicts in writing.

C. Verify locations and elevations of utilities that are crossed or connected to prior to installation of new Work.

D. When portions of existing mechanical, electrical, structural, etc. conditions are shown, it is not meant to indicate that all such systems are shown.

E. Where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings or other surfaces is necessary for the proper installation, support or anchorage of the mechanical equipment, piping, carefully perform this Work and patch to match existing conditions.

F. Repair any damage to building, piping, or equipment with skilled mechanics of the appropriate trade.

G. Coordinate connection of new services to existing building systems, including required systems shutdowns, with the Contracting Officer. Limit required shut down periods to a minimum. Isolate, drain, and refill existing systems as required to accommodate Work. Restore existing systems to full operational condition.

H. Cut, move, or remove existing items as necessary for installation of new Work and restore and replace at completion.

I. Remove from site removed materials unless otherwise indicated that the material is to be salvaged for the Owner.

J. Remove, cut, and patch in a manner to minimize damage and to provide means of restoring items to original conditions.

K. Replace existing mechanical insulation that is removed to accomplish Work with new insulation matching existing.

L. Remove piping and ductwork connected to or serving fixtures or equipment being removed and other piping and ductwork being removed, back to its main or connection to a still active branch and cap. Remove associated hangers and supports. Patch, to match existing, pipe or ductwork insulation on mains at removed branch lines. If such piping or ductwork is connected to mains or still active branches in areas that are not accessible or that are not being made accessible, then remove piping and ductwork into area of non-accessibility and cap. Patch, to match existing, openings in walls, ceilings, or floors left or created as a result of piping or ductwork removal.

M. Remove piping, other than waste and vent piping, that is being removed and that extends below slab-on-grade to below top of slab, cap pipe, and patch slab to match existing.

N. Remove slab-on-grade floor drains that are being removed to below slab, plug pipe with concrete, and patch slab to match existing.

1.11 EXPOSED PIPING, EQUIPMENT, AND ACCESSORIES

A. Fabricate and install exposed piping, ductwork, equipment, and accessories so that finished product exhibits a quality, craftsmanship, and appearance aesthetically acceptable to the Contracting Officer and suitable for final finishing.

1.12 ASBESTOS FREE MECHANICAL SYSTEMS

A. Provide mechanical systems that do not contain asbestos or asbestos-containing materials.

1.13 PROJECT COMPLETION DOCUMENTATION AND MATERIAL TURN OVER

A. See individual specification sections for required project completion documentation, and required maintenance or spare parts to be turned over to the Contracting Officer, including the following:

1. Record documents and reports:

a. Record documents – Section 20 05 00 “Common Work Results.”

b. Testing, Adjusting and Balancing Report – Section 23 05 93 “Testing, Adjusting and Balancing for HVAC.”

c. Sterilization testing certificate – Section 22 11 16 “Domestic Water Piping.”

d. Conformed O&M manuals – Section 20 01 00 “Operation and Maintenance for Mechanical.”

e. Test performance records for sterilization, cleaning, flushing and refilling of mechanical systems – Section 20 05 00 “Common Work Results.”

2. Equipment and Devices:

a. Glycol testing devices – Section 23 21 13 “Hydronic Piping.”

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 20 05 11 - COMMON SUBMITTAL REQUIREMENTS FOR MECHANICAL

A. This Section covers required mechanical equipment review submittals of material, equipment, items and accessories covered under this Division for review by the Contracting Officer to determine conformance with the Project design concepts and Contract documents prior to commencement of Work under this Division.

PART 2 PRODUCTS

2.1 FORM

A. Each equipment review submittal or resubmittal shall be indexed, tabbed, and bound copies of data, Drawings, and materials lists. Alphabetize the index by item name and list the Specification Section and item number under which each item is submitted.

B. Submittal information is required for all material and equipment specified or indicated in the Drawings.

C. Organize submittals by Specification Section. Separate each Section by a heavy stock divider sheet with plastic index tab. Type Specification Section numbers on both sides of paper inserts.

D. Identify each item of the submittal with an item number. Number the first item within a Specification Section “1", the second item within a Specification Section "#2", and so forth. Restart numbering sequence with each Specification Section.

E. Include equipment indicated on the Drawings, but not covered by a Specification Section, with the appropriate volume under a tab marked "Drawings." Rules for item numbering and item data sheets apply.

F. Precede each item with a completed Item Data Sheet. See required format attached to the end of this Specification Section.

G. Material submitted shall indicate the specific item(s) proposed for this Project. Delete or cross out all other items.

H. The mechanical equipment review submittal may be divided and submitted in the following volumes. Simultaneous submittal of all volumes is not required. Further division of the submittal into separate volumes is not permitted.

1. Section 20.

2. Section 22.

3. Section 23

I. Include application, hanger, insulation, piping, valve, and damper schedules as indicated in submittal requirements, example schedule format attached indicating “Application Schedule.”

J. Long lead mechanical equipment may be submitted for review in a separate volume. Include all long lead items in a single volume that is indexed, tabbed and bound as required for regular mechanical equipment review submittals. Maintain the long lead item submittal as a separate volume throughout the submittal review process; do not incorporate into the regular mechanical equipment review volumes.

K. Each submittal or resubmittal of each volume shall be complete and shall contain all previously submitted material except those being replaced by new or revised material which shall be removed. Partial or improperly indexed or tabbed submittals or resubmittals shall be rejected without review or comment.

L. With each resubmittal, include a complete summary of all changes and additions made to the equipment review submittal since the previous submittal. Only those items included in the summary will be reviewed with the resubmitted package.

M. Do not submit "updates" for previous submittal packages with resubmittals. Previous submittals will not be updated.

2.2 DATA

A. Include the following data for each item as applicable:

1. Manufacturer and model number.

2. Drawing equipment number.

3. Catalog literature.

4. Operating characteristics including capacity data, performance curves, flow rates, pressure drops, etc.

5. Electrical characteristics and wiring diagrams.

6. Dimensions and connection sizes.

7. Installation and adjustment instructions, requirements and recommendations.

8. Warranty data.

B. A list of minimum submittals required is provided in each Section. These lists are not necessarily complete or all-inclusive and the Contractor is responsible for complete submittal.

2.3 BINDING

A. Bind the mechanical equipment review submittals in three ring, D-ring style binders with page lifters and vinyl covers. Expandable catalog type two-hole binders with soft board covers and metal prong fasteners will not be accepted.

B. Provide multiple binders as required to limit single binder thickness to three inches. Divide binders at logical points.

C. Label the front cover and end panel. Label to include Project title, Project number, date, and facility name.

PART 3 EXECUTION

3.1 REQUIRED COPIES AND TIMING

A. Submit one electronic copy (PDF format) of the Mechanical Equipment Review Submittal or resubmittal for review and acceptance by the Contracting Officer. Electronically Index (Bookmark) each section and item within the electronic submittal.

B. Materials submitted shall be reviewed and accepted by the Contracting Officer before Contractor releases material for fabrication or shipment.

END OF SECTION

ATTACHMENT: ITEM DATA SHEET
ATTACHMENT: APPLICATIONS SCHEDULE

ITEM DATA SHEET

1. Item number:

2. Item name/Drawing equipment number:

3. Specification section/Drawing number:

4. Manufacturer/model number:

5. Use and location: (1)

6. Spare parts source:

7. Providers of warranty service:

8. Proposed deviations from the Contract Documents: (2)

9. Other Contractor comments:

10. Contractor Certification: (3)

The undersigned Contractor Representative certifies that he has reviewed the attached information and has determined that the proposed material complies with the requirements of the Contract Documents; he has coordinated installation of the material with the work of other trades and existing conditions; he has determined and verified field measurements, field construction criteria, manufacturer's installation requirements affecting the proposed material; and has notified the Contracting Officer of conflicts.

_____

Contractor Representative's Signature

(1) Unless otherwise indicated, provide this information only when the product's use and location is not obvious. Provide this information for all items provided under Specification Sections 21 13 00 "Fire Suppression Sprinkler System" and 23 09 23 "Direct Digital Control Systems for HVAC."

(2) If this section is left blank, it will be assumed that the proposed equipment is exactly as specified and indicated on the Drawings.

(3) The Contractor referenced here is the General Contractor for the project. The signature of a subcontractor representative is not acceptable.

APPLICATION SCHEDULE (EXAMPLE)

APPLICATION	PRODUCT	MATERIAL	SIZE

Contractor Comments:

ATTACHMENT: APPLICATIONS SCHEDULE

****

APPLICATION SCHEDULE USE FOR ALL PROJECTS WITH SCHEDULE TYPE SUBMITTALS

****

APPLICATION SCHEDULE (EXAMPLE)

APPLICATION	**PRODUCT**	**MATERIAL**	**SIZE**

Contractor Comments:

PART 1 GENERAL

1.1 SCOPE: SECTION 20 05 13 - COMMON MOTOR REQUIREMENTS FOR MECHANICAL

A. This Section covers selection and installation of electric motors and starters provided under this Division as an integral part of specified equipment.

PART 2 PRODUCTS

2.1 ELECTRIC MOTORS

A. Provide electric motor driven equipment being furnished and installed under Division 22 and 23, complete with electric motors unless otherwise indicated. US Motors, TECO Westinghouse, ABB/Baldor, or equal.

B. Motor bearings: Ball type, permanently lubricated and sealed or greased with zerk type lubricating fittings extended to an easily accessible, single point location for field servicing. 100,000-hour, L-10 life.

C. Except for direct connected motors, provide motors complete with adjustable slide rails.

D. Single speed, 1750 RPM unless indicated otherwise.

E. Sized to meet the horsepower requirements of driven unit at design characteristics including all start-up, V-belt and/or drive and coupling losses, which are incurred without loading the motor beyond its nameplate horsepower rating. Minimum motor size shall be that scheduled or otherwise indicated.

F. Provide with motor horsepower nameplate ratings not less than 110 percent of the driven unit brake horsepower requirements where V-belt drives are employed.

G. Rated for continuous duty at 100 percent of rated capacity with temperature rise based on an ambient temperature of 40 degrees C.

H. Single phase electric motors: Thermally protected, open drip proof, unless otherwise required to meet UL listing for use to which it is put or location in which it is installed. Capacitor start-capacitor run type or of equal high efficiency design, when commercially available. When unavailable, manufacturer's standard. Designed for use with indicated voltage, 60 Hertz alternating current.

I. Three phase electric motors: Open drip proof, unless otherwise indicated or unless otherwise required to meet UL listing for use to which it is put or location in which it is installed. Squirrel cage induction type, designed for use with indicated voltage, 3-phase, 60 Hertz alternating current.

J. Provide premium efficiency rated motors with base mounted circulating pumps and air handling equipment requiring motors one horsepower and larger. Baldor, TECO Westinghouse, U.S. Motor, or equal.

K. Electronically commutated motors (ECM): Brushless permanent magnet design incorporating an integral electronic speed controller. Provide with Permanently lubricated with heavy duty bearings to match fan or pump load and pre-wired to the specific voltage and phase. Internal motor circuitry shall convert AC power supplied to the equipment to DC power to operate the motor.

L. Hostile Environment Motors: Corrosion resistant epoxy finish, extra-large cast iron conduit box, Forsheda shaft seal on frame size 254T and larger, copper windings, stainless steel shaft, Class F insulation.

M. Motors for equipment served by variable frequency drives:

1. NEMA rated, inverter compatible, premium efficiency suitable for VFD operation, 1750 RPM, squirrel cage-induction motors. Baldor, TECO Westinghouse, U.S. Motor or equal.

2. Compatible with variable frequency drive specified. Rated for minimum 10:1 turndown under variable torque conditions.

a. 1.15 service factor (sine wave), 1.0 service factor pulse width modulated power.

b. Moisture resistant, 200 degree C rated copper windings. Class F insulation materials with Class B rise meeting NEMA section MG1 part 31.4.4.2 for variable frequency drive operation.

c. Efficiency: Meet or Exceed NEMA minimum efficiencies listed in MG1-1993 12.58.2 efficiency tables as tested in accordance with MG-1993 12.58.1.

d. Motor bearings: Ball type, permanently lubricated and sealed or greased with zerk type lubricating fittings extended to an easily accessible, single point location for field servicing. Provide bearings with 100,000 hour, L-10 life.

e. Cast iron frame, end plates, and fan cover.

f. Oversized, gasketed, cast iron conduit box.

g. Polypropylene, bi-directional fan, keyed to motor shaft.

2.2 MAGNETIC STARTERS

A. Provided under Division 26, except where specifically described or indicated as being provided as a part of the equipment specified under this Division.

PART 3 EXECUTION

3.1 INSTALLATION

A. Conform to the requirements of Division 26 and the National Electric Code.

B. Mount motors driving vibration isolated equipment on the same rigid frame and isolated with associated equipment.

3.2 OPERATION

A. Motors shall draw less than nameplate amperage (not service factor amperage) when operating driven equipment within both mechanical and electrical design parameters for this Project.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 20 05 29 - HANGERS AND SUPPORTS FOR MECHANICAL

A. This Section covers selection, installation, and adjustment of equipment and material used to hang and/or support mechanical systems and equipment.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and Selections for equipment and accessory items.

2. Submit concrete anchors used in each application with installation instructions and ICC evaluation report or other third-party test report showing seismic rating (where applicable).

B. Application Schedule: Submit a schedule of hangers and supports listing the application, product, material, and size proposed for each application.

C. Shop Drawings for fabricated pipe or equipment hangers or supports including:

1. Dimensions.

2. Construction details.

3. Materials.

4. Deflection for spring hangers.

5. Rated or design load, actual load and safety factors.

6. Applications.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide factory standard hangers and supports complete with necessary inserts, bolts, nuts, rods, washers, and other accessories.

B. Acceptable manufacturers: B-Line, Anvil, Tolco, or equal.

2.2 PIPE HANGERS

A. Pipe hangers placed in direct contact with pipe:

1. Pipe hangers for 8 inches and smaller cast iron and steel pipe: Swivel loop style, galvanized carbon steel, similar to B-Line Figure 2.

2. Pipe hangers for 6 inches and smaller copper pipe: Swivel loop style, carbon steel, epoxy coated or felt lined, copper colored Similar to B-Line Figure 200F.

B. Pipe hanger placed around insulation:

1. Clevis ring style, electro-galvanized carbon steel similar to B-Line B3100.

2. J-Hanger, electro-plated steel, used with B-Line B3151 shield. B-Line B3690 or similar.

3. Adjustable band hanger, pre-galvanized steel, used with B-Line B3151 shield. B-Line 3170 or similar.

2.3 HANGER RODS

A. Electro-galvanized carbon steel similar to B-Line ATR.

B. Select equipment hanger rods as required to properly support the equipment in-service load. Select tank, coil, etc. supports assuming that they are full of water when in service.

C. Size equipment hangar rods as follows:

Load/rod	Hanger Rod
0 - 300 pounds	3/8 inch
301 - 600 pounds	1/2 inch

D. Size pipe hanger rods as follows:

Pipe Size	Hanger Rod
1/2 to 2 inches	3/8 inch
2-1/2 to 4 inches	1/2 inch

2.4 CHANNEL STRUTS

A. Fabricated from 0.105 inch thick rolled mild steel. Unistrut, Erico Caddy, Power Strut, or equal. Select as follows for spans up to seven feet. For longer spans or greater loads submit Shop Drawing for review.

Total Load	Unistrut	Power Strut
0 - 245 pounds	P1000	PS 200
246 - 680 pounds	P1001	PS 200 2T3
681 - 1360 pounds	P1001C41	------

B. Finish: Zinc plated electrostatically for interior applications and hot dipped galvanized after fabrication for exterior applications.

2.5 ARTICULATING HANGER SYSTEMS

A. Malleable iron eye socket fitting similar to B-Line B3222.

B. Carbon steel linked welded eye rod similar to B-Line B3211X.

2.6 STEEL STRUCTURE ATTACHMENTS

A. Beam clamps: Malleable/ductile iron with set screw and lock nut and with retainer strap. B-Line Figure 65 and B-Line Figure 66 or similar. Provide retainer strap listed with clamp or provide a steel strap of not less than 16-gauge thickness and not less than 1.0 inch wide for pipe diameters up to 8-inch.

B. Welded beam attachments: Carbon steel similar to B-Line 50, B3083 or B3083WO.

C. Channel strut beam or truss clamps: Carbon steel with retainer rod and hook similar to B-Line Figure 40.

D. Steel truss attachments: Carbon steel fittings compatible with truss.

2.7 STEEL WALL BRACKETS

A. Carbon steel is constructed so that hanger rod can be placed anywhere on horizontal member similar to B-Line B3066 for loads up to 1,000 pounds and similar to B-Line B3067 for loads up to 2,000 pounds.

2.8 CHAIR ANCHORS

A. Carbon steel chair and yolk bolts similar to B-Line B3147.

2.9 SLIDE PLATE ASSEMBLIES

A. Carbon steel support tee with stainless steel slide plate and carbon steel base with Teflon pad slide plate similar to B-Line B3891-B3897 or B3991-B3993.

PART 3 EXECUTION

3.1 GENERAL

A. Examine the Architectural and Structural Drawings and existing conditions and provide additional structural members or framing required to support the mechanical systems.

B. Make no attachment for support of mechanical equipment, piping, or ductwork to the roof deck.

C. Hanger spacing:

Metallic Pipe Size (Inches)	Steel Pipe Maximum Spacing Between Supports (Feet)	Copper Tube Maximum Spacing Between Supports (Feet)
1/2	7	5
3/4	7	5
1	7	6
1-1/4	7	7
1-1/2	9	8
2	10	8

D. Provide additional support at pump bodies, valves, elbows, bends, and other locations where concentrated loads occur.

E. Where groups of three or more pipes occur, they may be supported with trapeze hangers constructed from channel strut and hanger rods. Space trapeze hangers for smallest pipe supported.

F. Support hub and no-hub cast iron piping at each joint, in accordance with above hanger spacing table, or in accordance with coupling manufacturer's recommendations, whichever is more stringent.

G. Support piping with sleeved couplings and grooved end piping at each length of pipe and at each fitting, in accordance with above hanger spacing table, or in accordance with coupling manufacturer's recommendations, whichever is more stringent.

H. Provide floor mounted channel strut racks to support piping, ductwork, and equipment that cannot be otherwise supported from structure overhead or from walls.

I. At piping penetrating wood framing, cut hole with hole saw and center piping in hole so that piping does not contact wood framing. Provide plastic isolation bushings at distances called for in "Hanger Spacing" table.

J. Seal all penetrations of vapor retarder or membranes vapor tight.

K. Adjust hangers and supports and place grout for concrete supports to bring support to proper elevations.

L. When copper piping is placed in direct contact with channel strut supports, wrap piping at point of contact with two wraps of dielectric pipe wrap.

M. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.

3.2 HANGERS ON INSULATED PIPING

A. Place hanger or support in direct contact with the pipe unless specifically indicated that piping is to have continuous insulation. When placed in direct contact install fiberglass insulation around the hangers.

B. For suspended piping required to have continuous insulation, provide calcium silicate insulation segments between supported piping and hangers / supports. In addition, provide galvanized iron shields between the insulation segments and hangers / supports. Fabricate shields for four inches and larger pipes of 16-gauge iron, 18 inches long. Shields for three inches and smaller pipes of 18-gauge material, 12 inches long. Match the radius of curvature of the shields with the outside radius of the insulation.

3.3 WALL MOUNTED PIPING

A. Unless otherwise indicated, support piping that is installed exposed on walls with channel strut and compatible pipe clamps. Space supports in accordance with "Hanger Spacing" table.

B. Support vertical piping drops within one foot of top of drop and within one foot of bottom of drop and in accordance with "Hanger Spacing" table.

C. Where groups of two or more pipes occur support piping from common channel strut.

D. Secure channel strut to poured concrete walls with expansion anchors, to CMU walls with expansion anchors in grouted cells, and to stud walls with screws into studs or blocking.

E. Cut multiple channel strut supports for a piping run or drop to consistent lengths.

3.4 SEISMIC PROTECTION FOR MECHANICAL SYSTEMS

A. Mechanical equipment shall be installed in accordance with ASCE 7 as referenced by IBC. Section 20 05 48 “Seismic Controls for Mechanical” summarizes the requirements of ASCE 7 for this Project.

3.5 STEEL STRUCTURES

A. Secure to steel structures through use of beam clamps with retainer strap, channel strut with retainer rod and hook or with welded beam attachments.

B. Bolts and nuts shall conform to ASTM A307, and flat washers are required under all nuts.

C. Weld in accordance with American Welding Society Code AWS D1.1, latest edition, using E70xx electrodes.

D. Verify with steel truss and deck manufacturer's maximum allowable loads on single point support; provide additional steel supports as required to comply with maximum recommended values.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 20 05 48 - SEISMIC CONTROLS FOR MECHANICAL – DEFERRED DESIGN

A. This Section covers calculations, installation, and materials used to seismically restrain mechanical systems and equipment.

1.2 SUBMITTALS

A. Name and contact information of registered engineer providing seismic restraint design services.

B. Manufacturer's Data:

1. Catalog cuts and selections of components for packaged seismic restraint systems and equipment.

C. Seismic Restraint Schedule: Submit a schedule of restraint systems listing the application, product, material, and size proposed for each application.

D. Test Reports and Certificates: Third party reports or certifications for concrete anchor bolts and where indicated.

E. Submit plan with location of seismic restraints for distribution systems or submit letter verifying that seismic restraint locations will be field located under the supervision of registered engineer providing seismic restraint design services.

F. Shop Drawings and calculations. Calculations for seismic restraints shall be in accordance with ASCE 7.

1. Each equipment anchorage submittal and each submittal for piping and ductwork supports not in accordance with referenced standards shall include the following data unless otherwise indicated:

a. Force calculations. Include equipment tag, equipment weight, center of gravity, seismic constants, and height within structure in calculations.

b. Catalog data indicating operating weight, dimensions, materials and construction details with anchors adequate to resist calculated forces.

G. Restraint Detail Index: Submit an index for equipment weighing over 20 pounds similar to the following example. Where equipment is rigidly mounted to the structure or plenum wall, such as cabinet unit heaters or propeller fans indicate as N/A. Where a detail provided as part of the Contract Documents is used, indicate detail reference. For each piece of equipment, indicate anchor diameter and embed depth where post installed concrete anchors are used.

H. Index Example:

Equipment Symbol	Equipment Type	Detail Tab or Reference	Anchor Diameter	Anchor Embed Depth
AHU-1	Air Handling Unit	2/M5 & 3/M5	1 /2 inch	4 inches
EF-1	Utility Fan	Tab 1	3/8 inch	N/A
RF-1	Propeller Fan	N/A	N/A	N/A
WH-1	Water Heater	6/M5	3/8 inch	N/A

1.3 SEISMIC DESIGN

A. Project is designed in accordance with the adopted edition of IBC. Chapter 16 structural provisions reference ASCE 7 which cover the design of the structural system and the installation of mechanical equipment within the structure. See IBC Reference Standards for the appropriate year for ASCE 7.

B. Provide shop drawings signed by registered engineer in the State of Alaska for equipment, piping, and ductwork connections to building structure.

C. Restrain sprinkler systems in accordance with latest edition of NFPA 13. Attachment of restraint systems for sprinkler piping in accordance with NFPA 13 does not require oversight by a registered engineer.

D. Install mechanical equipment in accordance with ASCE 7. This section summarizes the requirements in Chapter 13 for this Project. The design constants for this Project include:

1. The Risk Category for this Project is II.

2. The Seismic Design Category for this Project is D.

3. Use value of SDS = 1.2 for seismic force calculations.

4. All systems that are not related to life safety or for continued operation are Ip=1.0.

1.4 SYSTEMS NOT REQUIRING SEISMIC RESTRAINT

A. Highly expanding systems: Refer to plan drawings for pipe anchor details and locations. Provided details and anchor sizing are designed to take into account both seismic forces and thermal expansion forces as part of an engineered system. The contractor is to provide additional thermal and seismic anchors and calculations for the below piping systems within the mechanical room. Additional anchors for thermal and seismic forces are not required or intended outside of the mechanical rooms.

1. Hydronic heating piping.

B. Equipment exempted from seismic restraint by ASCE 7: Chapter 13:

1. All equipment with an Ip = 1.0 weighing 400 pounds or less, mounted at four foot or less above floor level and flexible connectors between the components and associated ductwork, piping and conduit are provided.

2. All equipment with an Ip = 1.0 weighing 20 pounds or less or, for distribution systems, weighing 5 pounds per foot or less and flexible connectors between the components and associated ductwork, piping and conduit are provided.

C. Piping exempted from seismic restraint by ASCE 7: Chapter 13:

1. All mechanical components with an Ip = 1.0 weighing less than 20 pounds with flexible connectors between the components and associated piping are provided.

2. Non-ductile piping systems with Ip = 1.0 weighing 5 pounds/foot or less (includes filled water weight):

a. 2-inch or less diameter cast iron piping.

b. 3-inch or less diameter Plastic piping (PVC, CPVC, etc).

c. 3-inch or less diameter glass piping.

3. High-deformability piping (Steel and Copper) is used with an Ip = 1.0; provisions are made to avoid impact with larger piping or mechanical components or to protect the piping in the event of such impact:

a. Nominal pipe size shall be 3-inch diameter or less.

1.5 EQUIPMENT SEISMIC RESTRAINT

A. Equipment shall be supported and attached to withstand seismic forces. Shop Drawings and calculation details for anchorage of equipment shall be submitted in accordance with this section. Shop drawings for restraint within or upon equipment base may be provided by a specialty equipment consultant or equipment manufacturer.

B. Special Certification Requirements for Designated Seismic Systems:

1. In accordance with ASCE 7 section 13.2.2 Certifications shall be provided for designated seismic systems assigned to Seismic Design Categories C through F or system is assigned an Ip = 1.5.

1.6 PIPING SEISMIC RESTRAINT

A. General:

1. Verify that the hanger support system and its attachment to the structure are adequate for the gravity load plus the vertical seismic force equal to the maximum horizontal seismic force.

2. Piping that crosses a building isolation joint shall be provided with flexible connections to accommodate the displacement as calculated in ASCE 7 Chapter 13 or as indicated.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 GENERAL

A. Obtain, pay for, and coordinate special inspection of anchor bolts used for seismic restraint.

B. Submit results of special inspection, indicating date, and anchors inspected, prior to calling for Substantial Completion and final inspections.

C. Examine the Architectural and Structural Drawings and existing conditions and provide additional structural members or framing required to support the mechanical systems.

D. Make no attachment for support of mechanical equipment, piping, or ductwork to the roof deck.

E. Install anchor bolts in accordance with manufacturers' instructions and third-party evaluation report including special inspection as required.

F. Friction clips shall not be used for anchorage.

G. Power driven fasteners shall not be used in tension load applications.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 20 05 53 - IDENTIFICATION FOR MECHANICAL

A. This Section covers the identification of mechanical systems and components.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and selections for identification products and accessory items.

B. Valve Tag Schedule: Submit a schedule of valve tags listing the valve number, service, location, and valve size for each tagged valve.

PART 2 PRODUCTS

2.1 PIPE MARKERS

A. Pressure-sensitive identification markers banded in place with color-coded tape incorporating direction of flow arrows similar to "Opti-Code" markers and "Arrows On a Roll," Seton Name Plate Corp., Brady, Brimar, or equal. Painted stencil markers are not acceptable.

B. Provide markers of length and with letter size indicated below. Diameter listed is outer diameter of insulation if piping is insulated.

Nominal Diameter	Marker Length	Letter Height
3/4 to 1-1/4 inch	8 inches	1/2 inch
1-1/2 to 2 inches	8 inches	3/4 inch

C. Provide a marker with appropriately color-coded background and with a clearly printed legend to identify the contents of the pipe in conformance with the "Scheme for the Identification of Piping Systems" (ANSI A13.1).

2.2 VALVE TAGS AND COLD PIPING ACCESSORY TAGS

A. Laminated plastic with subsurface printing, heavy duty, brass bead chain, and appropriately colored border. Craftmark, Seton, Brimar, or equal.

B. Minimum of 2-inch diameter round tag or 2-inch square tag with maximum three text lines, 0.2-inch-high characters, 8 characters per line.

C. On each tag, print valve number and message describing system, function, and equipment and/or area/room served. Message shall be as complete as possible within space available.

D. Number valves sequentially.

2.3 EQUIPMENT LABELS

A. Minimum 1-inch high by 1/16-inch thick, black, laminated plastic with white core. "Setonply" by Seton Nameplate Corp., Craftmark, Brimar, or equal.

B. Engraved with 3/8-inch-high characters identifying the item or equipment by symbol and description indicated on the Drawings.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION

A. Identify new piping, valves, balancing cocks, and equipment in the facility whether concealed within accessible spaces or exposed.

B. Do not label piping exposed to view in offices or in public access areas.

C. Identify insulated and uninsulated piping.

D. Locate identification so that it is readable by a person standing on the floor for exposed items or at point of access for concealed items.

3.2 PIPING

A. Provide identification at both sides of partitions and floors, at all branch takeoffs, at connections to equipment and at intermediate intervals not in excess of fifty feet.

B. Provide identification at both sides of partitions and floors, at all branch takeoffs, at connections to equipment and at intermediate intervals not in excess of twenty-five feet.

C. Secure pipe pressure-sensitive vinyl markers in place with pressure-sensitive tape incorporating direction of flow arrows on both ends of label. At each end make two complete wraps around the pipe with tape so that tape is wrapped back on itself to assure attachment.

3.3 VALVES

A. Identify normally open valves and balancing cocks with valve identification tags. Unless otherwise noted, equipment isolation valves and balancing cocks that are located adjacent to equipment isolated are exempted from this requirement.

B. Identify equipment isolation valves located in ceiling plenums and raised floor plenums unless the equipment isolated is also located in the ceiling plenum or raised floor plenum and is adjacent to isolation valve.

C. Identify normally closed valves with valve identification tags and with a second valve tag reading "NORMALLY CLOSED" in 1/2-inch-high letters.

D. Permanently mark, etched or stamped, balancing cock setpoint readings on one and one-half inches diameter brass valve tags attached to balancing cocks with No. 6 bead chain.

3.4 EQUIPMENT

A. Identify equipment, i.e. fans, pumps, coils, tanks, control panels, etc., with equipment labels mounted in a readily accessible and readable location.

B. Mechanically secure labels with a minimum of two screws, bolts, or rivets. Adhesive backing does not provide secure mounting.

3.5 COLD PIPING ACCESSORIES

A. Identify all chilled water and cold water accessories located underneath insulation with identification tags connected to accessory with number 6 bead chain or equivalent strength connection. Unless otherwise noted, all chilled water piping accessory tags are to be visible without removal of insulation.

3.6 PIPING AND VALVE TAG LABELS

A. Label piping in accordance with ASME A13.1 requirements as specified by the following schedule.

SERVICE	MARKER LABEL	LABEL/LETTER COLOR	BAND COLOR
Water:			
Cold Water	Cold Water	Green/White	Blue
Hot Water	Hot Water	Green/White	Red
Hot Water (---F)	Hot Water (---F)	Green/White	Red
Waste:			
Waste or Soil	Waste	Green/White	Brown
Air:			
Compressed Air	Compressed Air	Blue/White	
Vent	Vent	Green/White	White
Gas:			
Natural Gas	Natural Gas	Yellow/Black	
Other:			
Glycol Heating Water Supply	Glycol Htg. Supply	Green/White	Gold
Glycol Heating Water Return	Glycol Htg. Return	Green/White	Gold

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 20 07 00 - INSULATION FOR MECHANICAL

A. This Section covers selection and installation of insulation used in the mechanical systems.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections of insulation products and accessory items.

B. Application Schedule: Submit a schedule of insulation types listing the application, product, material, and thickness proposed for each application.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide interior insulation having UL listed composite fire and smoke hazard rating not exceeding:

1. Flame Spread: 25.

2. Smoke Developed: 50.

B. Provide accessories such as adhesives, mastics, cement, tapes, and jackets having the same component rating as listed above.

C. Lagging fabric: 100 percent textured silica yarn or 100 percent cotton fabric, eight ounce per square yard, with or without pre-applied rewettable adhesive finish. Fattal's Thermocanvas, Zetex 300, Newtex, or equal.

D. Thermal Insulation Coatings: Washable, abrasion resistant coating for thermal insulation. Minimum continuous service rating of 180 degrees F. Maximum dry basis VOC level of 80 grams per liter. Used to adhere lagging fabric without pre-applied rewettable adhesive finish to pipe and duct insulation. Foster #30-36 Sealfas, MEI, Fiberlock, or equal.

E. Insulating cements: Mineral fiber base with maximum 0.90 (BTU-inch)/(square foot-hour-Fahrenheit) conductivity at 200 degrees F mean temperature.

F. Vapor barrier coatings: Water based, fire resistive, flexible, maximum 0.08 perm water vapor permeability. Foster #30-80, MEI, Fiberlock, or equal.

G. Preformed plastic insulation covers and inserts: PVC with fiberglass inserts provided by cover manufacturer. Johns-Manville Zeston, Fuller Speedline, Proto, or equal.

2.2 INTERIOR, ABOVE GRADE, PIPING SYSTEM INSULATION

A. Fiberglass preformed by the manufacturer specifically for the size pipe or tubing on which it is to be installed unless otherwise indicated. Owens/Corning Fiberglass 25 ASJ, Johns-Manville Micro-Lok 650 with AP-T self-sealing jacket, Knauf ASJ, or equal.

B. Continuous service rating: 500 degrees F minimum.

C. Provide with vapor barrier jacket with maximum water vapor permeability of 0.02 perm and minimum beach puncture resistance rating of 50 units and a white kraft paper facing.

D. Conductivity: 0.28 (BTU-inch)/ (square foot-hour-Fahrenheit) maximum at 100 degrees F mean temperature.

2.3 OUTSIDE AND COMBUSTION AIR DUCT INSULATION

A. Insulation:

1. Rectangular ductwork: Two inches thick, minimum three-pound density, semi-rigid or rigid fiberglass insulation. Johns-Manville 800-Series Spin-Glas/AP, Owens/Corning 700-Series/ASJ, Knauf Insulation Board/ASJ, or equal.

B. Provide with vapor barrier jacket with a maximum water vapor permeability of 0.02 perms, a minimum beach puncture resistance rating of 50, and a white kraft paper facing.

C. Conductivity: 0.30 (BTU-inch)/ (square foot-hour-Fahrenheit) maximum at 100 degrees F mean temperature.

D. Continuous service rating: 250 degrees F minimum.

E. Provide pressure sensitive tape, used to seal seams and penetrations, constructed from same material as the vapor barrier jacket.

PART 3 EXECUTION

3.1 GENERAL

A. Provide insulation for new piping for the systems indicated below unless otherwise indicated.

B. Replace existing insulation that is removed to accomplish Work with new insulation as specified in Part 2 of this Section or to match existing if not specified. Match existing thickness unless otherwise indicated.

C. Surface Preparation: Prior to insulation installation, clean and dry exterior surfaces of pipe and ductwork.

D. Patch insulation on existing pipe and ductwork mains at removed branches. Match existing insulation and finish.

E. Do not cover or obscure manufacturer or field applied identification tags, nameplates, information labels, etc.

F. Seal exposed ends and face of cuts in fiberglass insulation with thermal insulation coating.

3.2 INTERIOR, ABOVE GRADE PIPING SYSTEMS INSULATION, GENERAL

A. Unless otherwise indicated insulate the following piping systems with insulation thickness, additional insulation covering and insulation with a continuous vapor barrier in accordance with ASHRAE 90.1. Details used by this standard are included in the following schedule:

1. Interior domestic cold water, plumbing vent through roof, and rainwater leader cold piping:

Pipe Size	Insulation Thickness {2}{3}	Lagging Fabric Required	Continuous Vapor Barrier Required
<1-1/2 inches	1/2 inch	{1}	No

{1} Lagging required at exposed installations, including mechanical spaces
{2} Provide continuous insulation
{3} Provide 2” thickness for plumbing vent through roof.

2. Interior domestic hot water, recirculated domestic hot water, and hot water heating systems with design operating temperatures from 105 degrees F to 140 degrees F hot piping:

Pipe Size	Insulation Thickness	Lagging Fabric Required	Continuous Vapor Barrier Required
<1-1/2 inches	1 inch	{1}	No

{1} Lagging required at exposed installations, including mechanical spaces
{2} Provide continuous insulation.

3. Hot Water heating systems with design operating temperatures from 141 degrees F to 200 degrees F hot piping:

Pipe Size	Insulation Thickness	Lagging Fabric Required	Continuous Vapor Barrier Required
<2 inches	1-1/2 inch	{1}	No
2 inches and larger	2 inches	{1}	No

{1} Lagging required at exposed installations, including mechanical spaces
{2} Provide continuous insulation.

B. Where pipes are insulated with two layers, stagger the insulation joints.

C. Where insulation terminates, continue insulation jacketing to cover exposed insulating material and seal to adjoining pipe with vapor barrier coating for cold piping and thermal insulation coating for hot piping.

D. Insulate equipment and accessories with the same thickness as is called for on adjoining piping unless otherwise indicated.

E. Insulate pipe fittings to the same thickness as adjoining pipe insulation. Insulate fittings with preformed plastic insulation covers packed full with fitting manufacturer provided fiberglass insulation or with segmented sections of pipe insulation and 1/4-inch coat of insulating cement.

F. Insulate solder and threaded end gate, globe, and ball valve bodies with pipe insulation. Do not insulate valve bonnets or bonnet rings. Fill voids between cutouts and valve body with insulating cement.

G. Insulate flanged end gate and globe valve bodies with insulating cement. Do not insulate valve bonnets.

H. Insulate thermometer and aquastat wells with pipe insulation. Terminate insulation at the socket.

I. Place hanger or support in direct contact with the pipe and install fiberglass insulation around the hangers when continuous insulation is not required.

J. To provide continuous insulation on piping systems, place support or hanger around piping insulation, provide calcium silicate insulation segments between the pipes supported and the support. In addition, provide galvanized iron shields between the insulation segments and the supports, see Specification 20 05 29 “Hangers and Supports for Mechanical”.

3.3 INTERIOR, ABOVE GRADE PIPING SYSTEMS INSULATION, HOT PIPING

A. Insulate domestic hot water piping in which hot water is being recirculated. Insulation is not required on branch piping to fixtures through which hot water is not being recirculated.

B. Insulate heating water (glycol) supply and return piping. Insulation is not required on concealed branch line piping serving finned tube radiation.

C. Terminate insulation at wall and floor penetrations. Maintain minimum one-inch clearance to combustible construction. At exposed locations, size penetration so that butting insulation to wall trims out penetration.

D. Seal and secure seams and joints to provide a neat and evenly rounded finished surface. It is not necessary to seal penetrations if holes are neatly cut in the insulation and there is a tight fit between the insulation and the penetrating equipment. A complete vapor barrier envelope is not required.

E. At exposed installations, including mechanical spaces, cover piping insulation and ends with lagging fabric, which has been dipped in a thermal insulation coating. Lap lagging fabric over ends of preformed plastic insulation covers. In office areas and in areas exposed to public view, install lagging fabric neatly, with cut rather than torn edges, to give a clean architectural appearance.

F. Secure self-sealing lap on concealed piping insulation with outward clinching staples at a maximum spacing of one foot on center.

G. Insulation is not required on flexible connectors, check valves, pipe guides, anchors, strainers, traps, meters, and pump bodies and any section of pipe between them less than 6 inches in length.

H. When pipe insulation is installed around ring, clamp, and clevis type hangers place the seam at the hanger rod and slit the sealing lap to pass around the rod.

I. Notch pipe insulation at trapeze hangers and at angle iron floor and wall supports. Seal insulation exposed to atmosphere with a thermal insulation coating.

3.4 INTERIOR, ABOVE GRADE PIPING SYSTEMS INSULATION, COLD PIPING

A. Domestic cold water: Only that piping serving more than one plumbing fixture. Insulation is not required on cold water branch line piping serving a single fixture, except that piping serving hose bibbs and drinking fountains. Insulate cold water piping serving hose bibbs and drinking fountains full length. Insulation is not required on piping serving only trap primers or on piping from trap primers to floor drains.

B. Insulate Plumbing VTRs from top of vent pipe to a point 3 feet beyond cold ceiling space.

1. Insulation in cold ceiling space: 2 inches thick.

2. Insulation below cold ceiling space: 1/2-inch thick.

C. Continuous through walls, floors, and ceilings unless otherwise indicated.

D. Seal and secure seams, joints, and penetrations in order to provide a neat and evenly rounded finished surface and complete vapor barrier envelope. Fill gaps between insulation and penetrating equipment with insulating cement and coat with vapor barrier coating.

E. Cover piping insulation and ends with lagging fabric, which has been dipped in a thermal insulation coating. Lap lagging fabric over ends of preformed plastic insulation covers. In areas exposed to public view, install lagging fabric neatly, with cut rather than torn edges, to give a clean architectural appearance.

F. When pipe insulation is installed around ring, clamp, and clevis type hangers place the seam at the hanger rod and slit the sealing lap to pass around the rod. After installation, seal these slits with a vapor barrier coating. If notching of the insulation is required to accommodate the hanger, fill the notches with insulating cement and vapor barrier coating.

G. When trapeze hangers and angle iron wall or floor supports are used on piping systems place the pipes supported in direct contact with the hanger. Notch fiberglass insulation at these hangers and supports. Fill the notches with insulating cement and vapor barrier coating.

H. Support well water piping using continuous vapor barrier through piping hangers and supports.

I. Insulate check valves with insulating cement or with an oversized section of pipe insulation. If pipe insulation is used, the inside diameter shall equal the outside diameter of the adjoining pipe insulation. If insulating cement is used, do not insulate the cap, flanges, and the side plug provided for access to the hinge pin.

J. Insulate balancing cock and flow control valve bodies with pipe insulation. Insulation shall not interfere with use of the pressure sensing taps or the volume regulating mechanism. Fill voids between cutouts and valve body with insulating cement and vapor barrier coating.

K. Insulate control valves and isolation valves with an oversized section of insulation. The inside diameter shall equal the outside diameter of the adjoining pipe insulation. Fill any voids between insulation sections with insulating cement and vapor barrier coating to provide a continuous vapor barrier.

L. Insulate water meter and pressure reducing valve bodies with insulating cement. Insulation shall terminate at the bonnet flange and shall not interfere with removal of the flange.

M. Where inline piping equipment are covered by insulation and cannot be identified by an exposed item such as a valve handle or pressure taps, install a chain as indicated in Section 20 05 53 “Identification for Mechanical” for a connection of a tag outside the insulation. Seal chain where it penetrates the vapor barrier.

3.5 OUTSIDE, RELIEF, EXHAUST, AND COMBUSTION AIR DUCT INSULATION

A. Insulate outside air intake ductwork from exterior wall/roof penetration to its associated air handling equipment mixing box, to its associated air handling equipment heating coil casing on units without a mixing box, or as indicated.

B. Insulate exhaust and relief air ductwork from exterior wall/roof penetration to 3 feet upstream of its associated exhaust/relief air damper, back to its associated exhaust/relief fan casing if no exhaust/relief damper is indicated, or as indicated.

C. Adhere insulation to ducts with noncombustible adhesive in accordance with manufacturer's recommendations for 50 percent coverage.

D. Seal and secure seams, joints, and penetrations in order to provide a neat and evenly rounded finished surface and complete vapor barrier envelope.

E. Where ducts are insulated with two layers, stagger the insulation joints.

F. On rectangular ducts, additionally secure insulation to bottoms and sides over 24 inches across with mechanical fasteners spaced at 12 inches on center and within 3 inches of all edges and corners.

G. Continuous through walls, floors, and ceilings.

H. Clip pins on mechanical fasteners flush at the washer and cover pin and washer with vapor proof pressure sensitive tape.

I. Apply insulation with joints tightly butted and sealed with vapor proof pressure sensitive tape.

J. Seal penetrations with pressure sensitive tape.

K. Seal insulation ends to adjoining exterior air inlets and outlets, roofs, walls, floors, ceilings, ducts, equipment, and building vapor retarder or membrane with vapor retarder pressure sensitive tape and lagging fabric to provide a complete vapor barrier envelope.

L. Provide metal corner beads, USG or equal, at all corners and hold in place with vapor proof pressure sensitive tape.

M. After insulation, corner beads, and vapor barrier have been installed cover all work with a lagging fabric, which has been dipped in a thermal insulation coating. In areas exposed to public view, install lagging fabric neatly, with cut rather than torn edges, to give a clean architectural appearance.

END OF SECTION

K. Seal insulation ends to adjoining exterior air inlets and outlets, roofs, walls, floors, ceilings, ducts, equipment, and building vapor retarder or membrane with vapor retarder pressure sensitive tape and lagging fabric to provide a complete vapor barrier envelope.

L. Provide metal corner beads, USG or equal, at all corners and hold in place with vapor proof pressure sensitive tape.

M. After insulation, corner beads, and vapor barrier have been installed cover all work with a lagging fabric, which has been dipped in a thermal insulation coating. In areas exposed to public view, install lagging fabric neatly, with cut rather than torn edges, to give a clean architectural appearance.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 05 00 - COMMON WORK RESULTS FOR PLUMBING

A. This Section covers selection and installation of basic pipe materials and specialties.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and selections for equipment and accessory items.

B. Balancing Cock Schedule: Submit a schedule of balancing valves listing the service, location, valve size, and flow setting (GPM) for each balancing valve.

C. Substantial deviations:

1. Submit to the Contracting Officer Shop Drawings of any proposed substantial deviations in the piping systems for this facility from these documents for review and acceptance. Include four, plus the number required by the Contractor, copies of each Shop Drawing submitted.

2. Any substantial deviations from these documents installed prior to Contracting Officer review and acceptance of submittal may be required by the Contracting Officer to be removed and the indicated system be installed at no additional cost to the Owner.

3. The Contracting Officer is the sole judge of what constitutes a substantial deviation and what is an acceptable alternate technique or method.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide all pipes, fittings, and accessories required for complete functioning installation of all piping systems specified and required under this Division.

B. Miscellaneous items specified and required under this Division are not necessarily indicated on the Drawings.

2.2 THERMOMETERS

A. Solar or light powered 1/2-inch LCD digital display, -40 to 300 degrees F range, adjustable position face. Weiss, Trerice, Miljoco or equal.

B. Pipe mounted with stainless steel separable socket or provide NSF 61 or equivalent lead free certified brass separable socket such as a Weiss E35-75BSLF. Stainless steel is considered to meet NSF requirements on a material basis and does not require certification.

C. Provide insulation extensions as required.

2.3 PRESSURE GAUGES

A. 2-1/2-inch diameter dial, bourdon tube type. Trerice, Weiss, Miljoco, or equal.

B. Provide NSF 61 or equivalent lead-free certified gauge or provide gauge with stainless steel wetted parts. Stainless steel is considered to meet NSF requirements on a material basis and does not require certification.

C. Phosphor-bronze bourdon tube.

D. Movement: Brass rotary type with bronze bushings.

E. Case: Cast aluminum, style to suit application.

F. Provide combination pressure/vacuum gauges where gauges are called for, at suction side of pumps.

G. Select range so normal operating pressure falls near mid-range.

H. Provide impulse dampeners where gauges are called for at the suction and discharge side of pumps and similar locations.

I. Provide insulation extensions as required.

J. Provide with brass siphon, 250 psig rated, on steam service.

2.4 DRAIN VALVES

A. Unless otherwise indicated, provide 3/4-inch ball valve or 1/2-inch ball valve if line size is less than 3/4 inch. Provide with brass hose end fitting and cap.

2.5 BALANCING COCKS

A. Combination balancing cock and positive shutoff valve with check valved pressure sensing taps, drain tap, memory stop, and certified to ANSI/NSF-61 or ANSI/NSF-372 low-lead requirements. B & G Circuit Setter Plus, TA, Nibco, or equal.

B. Teflon seats, EPT checks, EPDM stem "O" ring.

C. 200 psig, 250 degrees F rated.

D. At time of instruction, provide differential pressure meter by the same manufacturer as balancing cock and with sensing connections to suit balancing cocks. Complete with calibrated curves and carrying case, capable of plus or minus 3 percent accuracy, and with reading range of 0 to 25 feet B & G Model R0-5 or equal.

2.6 FLEXIBLE CONNECTORS

A. Corrugated hose and single braid fabricated from carbon steel for iron or steel systems. Flexonics Series 100, Metraflex, Twin City Hose, or equal.

B. Corrugated hose and single braid fabricated from bronze for copper systems. Flexonics Series 300, Metraflex, Twin City, or equal.

C. Rated for 200 psig at 200 degrees F.

D. End fittings to suit installation.

E. Minimum live length is manufacturer's recommended length to allow 3/4-inch offset distance from centerline.

2.7 MECHANICAL PIPE SEALS

A. Watertight, modular mechanical type, consisting of interlocking links shaped to continuously fill the annular space between the pipe and wall opening. Thunderline Link-Seal, Metraflex, Flexicraft, or equal.

B. Loosely assembled links with carbon steel, galvanized plated bolts and nuts forming a continuous rubber belt around the pipe with a glass reinforced, nylon plastic pressure plate under each bolt head and nut.

C. Provide seal elements constructed from materials recommended by the manufacturer for the installed application.

D. Primer coated steel wall sleeve with continuously welded water stop plate of same manufacturer as links to assure proper size selection

2.8 DIELECTRIC PIPE PROTECTION

A. Polyvinyl, 20 mil, self-adhesive. Westape, Calpico, 3M, or equal.

B. Dielectric nipples and flanges only. Dielectric unions are specifically not allowed.

2.9 ESCUTCHEONS

A. Chrome plated brass or stainless steel, spring clip. Dearborne Brass Series 5300, Brasscraft, Viking, or equal.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION AND APPEARANCE

A. Conceal piping above ceilings or in walls unless otherwise noted. Expose piping in spaces without ceiling or furred-in enclosures.

B. Install piping in truss space in areas with exposed trusses unless otherwise noted.

C. Route piping within the facility vapor retarder and insulation boundary.

D. Ream pipes thoroughly and clean before installation.

E. Flush lines clear of debris, scale and discoloration prior to startup. Clean out all strainers and drip pockets after flushing.

F. Run pipes with proper grade to provide for easy drainage and venting.

G. Support piping to provide an installation that is without sag or droops.

H. Provide pipe supports and offsets, loops or accessories at equipment connections to minimize connection stress caused by normal system warm-up, cool-down and equipment operation.

I. Install parallel runs of non-insulated piping as required to provide a minimum of 6-inch clearance between piping.

J. Install parallel runs of insulated piping as required to provide a minimum of 4-inch clearance between insulation surfaces.

K. Install piping and equipment as required to provide minimum 6 feet 8 inches of headroom in mechanical rooms, piping within 12 inches of the ceiling in other spaces with exposed piping, and as required to not interfere with other items or access to equipment.

L. At piping penetrating wood or metal framing, cut hole with hole saw and center piping in hole so that piping does not contact wood framing. Provide plastic isolation bushings as required to adequately support piping.

M. At floor penetrations of mechanical rooms or other rooms containing floor drains, except slab on grade floors, seal piping floor penetrations watertight with waterproof fire stop sealant.

N. Provide escutcheons around pipes at finished floor, ceiling or wall penetrations. Slip steel escutcheons onto piping prior to joining pipe. Set steel escutcheons with bead of paintable silicon sealant at perimeter, press tight to wall or floor, and remove excess sealant.

O. Coordinate building envelope penetrations with Architectural drawing and Division 07 Specifications.

3.2 FITTINGS, VALVES, AND ACCESSORIES

A. Make changes of direction, branches, and reductions in pipe size with fittings. Bushings are allowed only in non-pressurized tanks and similar equipment.

B. Provide isolation valves at pressure gauges.

C. At pressure reducing valves, control valves, and other devices whose size is less than adjoining pipe size, provide reducers immediately adjacent to the device.

D. Provide isolation valves in piping adjacent to equipment, including terminal units, and where indicated. Locate valves on system side of unions or flanges.

E. Provide unions or flanges at connections to equipment and control valves to allow maintenance. Locate unions or flanges to allow maintenance without removal of any additional piping other than that between the union or flange and the equipment. Use of dielectric unions is prohibited.

F. Provide drains valves at all low points in piping systems for drainage unless otherwise indicated.

1. Drains are not required at plumbing fixtures if stop valve forms the low point of the branch.

2. Provide threaded plug where space is not available to install a drain valve.

G. Install balancing cocks with test ports at or above the horizontal position. Permanently mark, etched or stamped, balancing cock setpoint scale readings and balanced flow in GPM on 1-1/2 inches diameter brass valve tags attached to balancing cock with No. 6 bead chain. This tag is in addition to valve identification tag called for elsewhere.

H. Provide flexible connectors where indicated and on all connections to vibration isolated equipment.

I. Provide mechanical pipe seals where indicated. Provide steel wall sleeves at wall penetrations where mechanical pipe seals are installed except penetrations of existing poured concrete walls which may be core drilled to manufacturers recommended diameter.

J. Install thermometers, gauges, and plugs above the horizontal axis on horizontal pipe and orientated such that they are easily readable by a person standing on the floor for exposed equipment or from point of access for concealed equipment. Provide insulation extensions where thermometers, gauges, and plugs are installed on insulated piping.

K. At 1-1/2 inches and smaller piping install thermometers in pipe tees one size larger than line size.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 05 23 - GENERAL DUTY VALVES FOR PLUMBING

A. This Section covers the selection and installation of manual valves.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and selections for valves and accessory items.

2. Data showing parts in contact with domestic water are ANSI/NSF 61 certified to current lead-free requirements.

B. Application Schedule: Submit a schedule of valves listing the application, product, material, and size proposed for each application.

PART 2 PRODUCTS

2.1 GENERAL

A. Standardize on one make as much as possible but not to the extent of sacrificing quality listed. Apollo, Grinnell, Milwaukee, Nibco, Stockham, Vogt, Watts, or equal.

B. Provide ball valves where indicated, in lieu of gate valves for domestic water systems in piping two-inch and less in size. All valves, two inches and smaller, shall be of same type. Provide ball valves installed in insulated piping systems with extended stems to bring the handle clear of the insulation.

C. ASME Class 125 unless otherwise indicated.

D. Gate and globe valves: Repackable under pressure with valve fully open.

2.2 DOMESTIC WATER SYSTEM VALVES

A. Valves two inches and smaller:

1. Isolation valves: ANSI/NSF-61 or ANSI/NSF-372 certified, full port ball valve, two piece, bronze body with brass internals, chrome plated or stainless steel ball, reinforced Teflon seats and seals, non-blowout stem similar to Nibco S-585-66-LF/T585-66-LF.

2. Check valves installed in horizontal lines and vertical lines with upward flow: Bronze body and cap, renewable seat and disc, teflon disc. ANSI/NSF -61 certified, swing check, Y-Pattern, with threaded cap that allows for removal of entire disc assembly through top of valve body similar to Nibco S-413-Y-LF/T-413-Y-LF.

2.3 COMPRESSED AIR VALVES

A. Isolation Valves:

1. Gate valves: Rising stem, union bonnet, solid wedge disc. Bronze body, bonnet, stem, and disc. Malleable iron hand wheel. Teflon or graphite impregnated fiber packing similar to Nibco S-134/T-134.

2. Ball valves: Full port, two piece, bronze body with brass internals, chrome plated or stainless steel ball, reinforced Teflon seats and seals, non-blowout stem similar to Nibco S585-70/T585-70.

B. Globe valves: Rising stem, union bonnet, renewable seat and disc. Bronze body, bonnet, stem, and disc holder. Teflon disc. Malleable iron hand wheel. Teflon or graphite impregnated fiber packing similar to Nibco S-235-Y/T-235-Y.

C. Check valves installed in horizontal lines and vertical lines with upward flow: Bronze body and cap, renewable seat and disc, Teflon disc. Swing check, Y-Pattern, with threaded cap that allows for removal of entire disc assembly through top of valve body similar to Nibco S-413-Y/T-413-Y.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide isolation valves in piping adjacent to equipment and where indicated. Locate valves on system side of unions or flanges.

B. Do not install valve stems below horizontal.

C. Install globe valves in domestic water systems such that valve closes in direction of normal flow.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 11 16 - DOMESTIC WATER PIPING

A. This Section covers selection, installation, testing, and sterilization of domestic water systems and storage tanks.

1.2 SUBMITTALS

A. Manufacturer's Data, catalog cuts, and selections of pipe and fittings are not required unless otherwise indicated.

B. Submit certification documentation showing that pipe and fittings in contact with domestic water are ANSI/NSF 61 rated to current lead-free requirements.

C. Submit certificate of conformance with bacteriological quantity standards.

PART 2 PRODUCTS

2.1 PIPE, FITTINGS, AND JOINTS

A. Interior, above ground, three inches and smaller:

1. ANSI/NSF-61 certified type L hard copper tubing with wrought copper solder fittings with lead free solder.

B. Buried, two inches and smaller: ANSI/NSF-61 certified type K soft copper tubing without joints. Where joints cannot be avoided because length of run exceeds manufactured lengths of tubing rolls or where fittings are specifically indicated use flare fittings.

PART 3 EXECUTION

3.1 TESTING

A. Hydrostatically test at 100 psig for one hour with no noticeable pressure drop or water leaks.

B. Firmly tap soldered fittings with a leather or rubber mallet during the pressure test to demonstrate the soundness of soldered joints.

3.2 STERILIZATION

A. Flush piping clear of debris or discoloration prior to sterilization.

B. Thoroughly sterilize the domestic water system with sodium hypochlorite mixed in solution with water as required to achieve not less than 50 parts per million of available chlorine for a minimum of 24 hours.

C. Introduce the sterilizing solution into the system in a manner that will cause all parts of the system to come into contact with the solution. Operate all valves at least twice during the contact period.

D. After sterilization, flush the solution from the system with clean water until the residual chlorine content is less than 0.2 PPM throughout the system. During the flushing period, open and close all valves several times.

E. 24 hours after flushing the system, sample the water at each domestic water storage tank, at one lavatory in each bathroom, at each drinking fountain, at each breakroom or coffee sink, and at the kitchen pot sink and submit samples to an independent testing laboratory for bacteriological testing. Submit certificate of conformance with bacteriological quantity standards, by State of Alaska, Department of Environmental Conservation Drinking Water Regulations (18AAC80), to the Contracting Officer.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 11 19 - DOMESTIC WATER SPECIALTIES

A. This Section covers selection and installation of domestic water specialties.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and selections for equipment and accessory items.

B. Submit data showing that specialties and accessories in contact with domestic water are ANSI/NSF 61 or ANSI/NSF-372 certified for contact with potable water.

PART 2 PRODUCTS

2.1 SPECIALTIES

2.2 HOSE BIBBS

A. HB- 1: Cast brass/copper alloy body, renewable Buna-N or PTFE seat, hose end. Nibco-Scott No. QT63X, QT763X, 73, 74 or equal. Provide with vacuum breaker with breakaway set screw to allow permanent installation, Watts 8B, Zurn, Woodford, or equal.

2.3 DIELECTRIC NIPPLES

A. Nipples specifically designed to dielectrically isolate dissimilar metal piping systems. Watts, Epco, Capitol, or equal.

2.4 DOMESTIC WATER THERMAL EXPANSION TANK

A. Steel shell with baked enamel finish, Amtrol Therm-X-Trol, Watts, Eastman, or equal.

C. Rated for 125 psig working pressure.

D. Pre-charged air chamber.

E. Heavy-duty butyl diaphragm.

F. Rigid polypropylene liner.

G. Standard tire valve charging connection.

PART 3 EXECUTION

3.1 SPECIALTIES

A. Provide fixture supply tubes, fixture stops, and fixture traps, tailpieces, and trap arms at all fixtures requiring same.

B. Install traps with no more than one slip or compression fitting between trap and rough-in.

C. Provide escutcheons over all fixture supply and trap tailpiece wall penetrations. Inside cabinet escutcheons may be primed and painted steel instead of chrome plated.

D. Provide dielectric nipples or flanges with dielectric gaskets at flange faces, bolt heads, and nut faces at connections of dissimilar piping materials in the domestic water system including connections

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

A. This Section covers the selection, installation, and testing of waste piping systems.

1.2 SUBMITTALS

A. Manufacturer's Data, catalog cuts and selections of pipe and fittings are not required.

B. Application Schedule: Submit a schedule of piping and fittings listing the application, product, material, and size proposed for each application.

PART 2 PRODUCTS

2.1 WASTE AND VENT PIPING

A. Above ground:

1. Service weight cast iron soil pipe and fittings. "No hub" pipe and fittings with compression type couplings.

2. Where seismic restraint of piping is required join piping with heavy-duty compression type fittings, Mission C – HW Fernco, Ideal Tridon, or equal.

3. Copper DWV pipe and fittings with lead free solder.

4. Acrylonitrile-Butadiene-Styrene (ABS) DWV pipe and fittings with solvent welded joints conforming with ASTM D 2661.

B. Underground within the building: Service weight cast iron soil pipe and fittings. Bell and spigot pipe and fittings with double seal compression joints or "no-hub" pipe and fittings with heavy duty compression type couplings. Provide continuous machine applied corrosion protective coating. Galvanizing is not acceptable.

2.2 SEWER PIPING

A. Underground building sewer beyond five feet from building:

1. Ductile iron, bell and spigot pipe and fittings with double seal compression joints.

2.3 VENT THROUGH ROOF FLASHING

A. EPDM Boot: EPDM pipe flashing to seal pipe to standing seam roof. Rated to minus 35 degrees F continuous service. Resistant to UV and Ozone similar to ITW Buildex Dektite.

PART 3 EXECUTION

3.1 INSTALLATION

A. Pitch drainage piping down 1/4-inch per foot in direction of flow unless otherwise indicated.

B. Provide cleanouts where indicated, at the base of every stack, every 75 feet along buried interior runs, at every 200 feet along exterior runs, for each aggregate change of direction greater than 135 degrees, and where otherwise required by code. Provide access panels or grade cover boxes where required and as indicated.

C. Terminate vent ten inches above roof surface unless otherwise noted. For a pitched roof, measure the ten inches from the short side. Provide each vent through roof with flashing that extends full height of vent. Terminate with counter flashing cap set in mastic.

D. Provide a four-inch layer of sand or pea gravel bedding below buried piping.

3.2 TESTING

A. Test waste and vent system by plugging all openings and filling system with water. Test with a minimum of ten feet of water head on all joints with no level drop in one half hour period.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

A. This Section covers the selection and installation of sanitary waste piping equipment, drains, cleanouts and their connection to the domestic waste and vent piping system.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections for equipment and accessory items.

a. Rough-in data

PART 2 PRODUCTS

2.1 FLOOR DRAINS

A. Mechanical Rooms: 12 inches round. Cast iron body and flashing collar with cast iron medium duty grate and "safety-set" slotted sediment bucket. Trap primer connection. J. R. Smith 2230-P, MIFAB, Josam or equal.

2.2 CLEANOUTS

A. Concrete floors: Cast iron body and frame with round adjustable scoriated secured cast iron top. Spigot outlet with taper thread, bronze closure plug. J. R. Smith 4223, MIFAB, Josam or equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Connect waste to all items requiring the same.

B. Refer to the Architectural Drawings for fixture locations and mounting heights.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 15 00 - GENERAL SERVICE COMPRESSED AIR SYSTEMS

A. This Section covers selection, installation, and testing of compressed air piping, fittings, air compressors, and accessories.

1.2 SUBMITTALS

A. None

PART 2 PRODUCTS

2.1 PIPE, FITTINGS, AND JOINTS

A. Schedule 40, black steel pipe with 300 psig malleable iron screwed fittings for two inches and smaller pipe and butt welded steel joints and fittings for piping larger than two inches.

PART 3 EXECUTION

3.1 GENERAL

A. Provide ball valves at low points in piping system to allow blow-off of accumulated water.

B. Install compressor/receiver in accordance with manufacturer's recommendations.

C. Install compressor/receiver on vibration isolators. Provide flexible connectors at piping connections.

3.2 TESTING

A. Air test piping at a minimum of 100 psig or 1-1/2 times the working pressure, whichever is higher, for a period of one half hour with no noticeable pressure drop or air leaks.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 33 36 - ELECTRIC DOMESTIC WATER HEATERS

A. This Section covers selection and installation of electric water heaters.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and selections for equipment and accessory items.
2. Operating characteristics.
3. Dimensions.
4. Materials of construction.
5. Connection sizes and locations.
6. Relief valve size and capacity.
7. Electrical data.
8. Wiring diagrams.
9. Submit data showing that water storage tanks and accessories in contact with domestic water are third party rated to current lead free requirements.

PART 2 PRODUCTS

2.1 GENERAL

A. Residential grade, UL listed. A.O. Smith, State Proline XE, Rheem, PVI, or equal.

2.2 TANK

A. Solid steel shell with porcelainized glass lining.

B. Rated for 150 psi hydrostatic working pressure.

C. Equipped with magnesium anode.

D. Insulated with fiberglass blanket or foam insulation and covered with steel jacket with baked enamel finish.

E. Provided with tapping to receive pressure and temperature relief valve.

2.3 CONTROLS

A. Provide automatic temperature control to maintain water temperature at setpoint temperature.

B. Provide over temperature protector that cuts power in the event that tank water temperature exceeds setpoint.

C. Wire multiple element heaters to prevent simultaneous operation.

PART 3 EXECUTION

3.1 INSTALLATION

A. Pipe pressure and temperature relief valve discharge to within six inches of the floor or to adjacent floor drain or slop sink as indicated. Cut end of discharge at 45 degree angle.

3.2 TANK AND LINING WARRANTY

A. Unlimited Warranty:

1. Tank and lining integrity shall be warranted for a period of one year from date of acceptance of Substantial Completion by Owner against manufacturing defects and shipping or installation damage. Warranty to include all labor, material, and other costs associated with tank replacement or repair. Repairs shall be performed by manufacturer's authorized representatives. One year warrantee period on repairs of original lining and tank or replaced tank shall commence at day one upon resumption of beneficial use by the Owner.

B. Limited Warranty:

1. Tank and lining integrity shall be warranted for a period of five years from date of acceptance of Substantial Completion by Owner against manufacturing defects and shipping or installation damage. Warranty shall include prorated tank replacement only.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 42 13 - COMMERCIAL WATER CLOSETS

A. This Section covers the selection and installation of water closet fixtures, accessories, and their connection to the domestic water and waste piping system.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections for fixtures and accessory items.

a. Provide a separate complete submittal for each fixture type even though some trim items may be repeated in several fixtures.

b. Rough-in data for each fixture.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide IAPMO and ADA complying products and installations.

B. Fixtures: Vitreous china and enameled cast iron fixtures shall be white and stainless steel fixtures natural polished satin finish without discoloration unless otherwise indicated.

2.2 FLOOR MOUNTED WATER CLOSETS

A. WC-1: ADA complying, flush tank water closet.

1. Configure and install to conform to ADA.

2. Close coupled, elongated bowl, vitreous china, water saver 1.6 gallons per flush, 1,000 gram MaP third party rated, 2-1/8-inch minimum trapway, three-inch minimum flush valve, aquaguard tank liner. Provide with trip lever on complying side. American Standard Champion, Kohler Devonshire EL ADA, Sloan, or equal.

2.3 ACCESSORIES

B. Seat: White plastic, injection molded, open front, less cover, stainless steel self-sustaining check hinge, for elongated bowl. Church 9400C, Bemis, Kohler, or equal to suit.

PART 3 EXECUTION

3.1 INSTALLATION

A. Connect water and waste to all items requiring same.

B. Refer to the Architectural Drawings for fixture locations and mounting heights.

C. Install fixtures tight to adjacent walls and/or floors. Wall hung fixtures shall not exhibit noticeable deflection when supporting 175 pounds weight on furthermost projection.

D. Provide tight fitting sleeves over all exposed water rough-in nipples.

E. Caulk joints between fixtures and walls with non-hardening silicon caulking. Provide caulking with color matching fixture or wall finish.

F. Securely anchor fixture supports to adjacent floors and/or walls, and install in accordance with manufacturer's instructions. Secure floor mounted fixture supports to floor with 1/2-inch diameter bolts.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 42 16 - COMMERCIAL LAVATORIES AND SINKS

A. This Section covers the selection and installation of lavatory and sink fixtures, accessories, and their connection to the domestic water and waste piping system.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections for fixtures and accessory items.

a. Provide a separate complete submittal for each fixture type even though some trim items may be repeated in several fixtures.

b. Rough-in data for each fixture.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide IAPMO and ADA complying products and installations.

B. Fixtures: Vitreous china and enameled cast iron fixtures shall be white and stainless steel fixtures natural polished satin finish without discoloration unless otherwise indicated.

C. Rough-in sleeves: Polished chromium plated drawn brass tubing.

D. Wall mounted lavatory fixture supports: Floor mounted, concealed arms with positive mechanical locking device, four-by-four inch base supports with welded high strength steel uprights, adjustable sleeve. Arms fully adjustable after installation of wall finish. J.R. Smith, Josam, or equal.

2.2 WALL MOUNTED LAVATORIES

A. L-1: Concealed arm lavatory with concealed floor mounted support (ADA complying).

1. Vitreous china, 20 by 18-inch lavatory with front overflow and integral back. American Standard Lucerne, Kohler Greenwich, or Mansfield equal.

2.3 FLOOR OR WALL MOUNTED SINKS

A. S-1: Enameled cast iron utility sink:

1. Single compartment, 24 by 20 inches overall, integral back splash, wall hanger, through back faucet, rim guard. Kohler Bannon or equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Connect water and waste to all items requiring same.

B. Refer to the Architectural Drawings for fixture locations and mounting heights.

C. Install fixtures tight to adjacent walls and/or floors. Wall hung fixtures shall not exhibit noticeable deflection when supporting 175 pounds weight on furthermost projection.

D. Provide tight fitting sleeves over all exposed water rough-in nipples.

E. Caulk joints between fixtures and walls with non-hardening silicon caulking. Provide caulking with color matching fixture or wall finish.

F. Securely anchor fixture supports to adjacent floors and/or walls, and install in accordance with manufacturer's instructions. Secure floor mounted fixture supports to floor with 1/2-inch diameter bolts.

G. In addition to floor connections, brace wall mounted lavatory fixture supports with channel strut or other framing member so that support is rigidly connected to adjacent wall framing studs.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 22 42 39 - COMMERCIAL FAUCETS, SUPPLIES, AND TRIM

A. This Section covers the selection and installation of commercial faucets, supplies, trim, accessories, and their connection to the domestic water piping system.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections for fixtures and accessory items.

a. Provide a separate complete submittal for each fixture type even though some trim items may be repeated in several fixtures.

b. Rough-in data for each fixture.

c. Data showing parts in contact with domestic water are ANSI/NSF 61 rated to current lead free requirements.

PART 2 PRODUCTS

2.1 SUPPLIES AND TRIM

A. Fixture supply tubes: Polished chrome plated flexible tubes with end connections to suit fixture trim and supply stop valves. Style and length to suit fixture and rough-in. Brasscraft, Speedway, Caitlin, or equal.

B. Fixture supply tubes – concealed applications: Braided stainless steel outer sheath, inner PVC tubing, ANSI/NSF-61 certified, rated to 125 psi from 40 to 140 degrees F. Brasscraft, Speedway, Eastman, or equal.

C. Fixture stops: Polished chromium plated, brass, compression disc, quarter turn, ANSI/NSF-61 or ANSI/NSF-372 certified, angle stop valves with inlet end connections to suit piping system. Fixed handle operated unless indicated otherwise. Brasscraft, Speedway, Eastman, or equal.

D. Fixture traps, tailpieces, and trap arms: Unless otherwise indicated provide polished, chromium plated, drawn brass tubing not less than 17 gauge. Dearborne Brass 701/704, Brasscraft, Eastman, or equal.

E. Fixture traps, tailpieces, and trap arms from freestanding floor mounted sink to floor sink or grease trap may be provided as DWV copper piping at Contractor's option.

F. Tailpiece, trap, trap arm, stop valves, and supplies covers: ADA complying, molded closed cell vinyl, white, paintable, hidden fasteners. Truebro, Oatey, Zurn,or equal.

2.2 LAVATORY FAUCETS

A. F-1: Lavatory faucets:

1. Single faucet and single lever, ASSE 1070 complying, aerator, chrome plated brass construction, ANSI/NSF-61 certified, Chicago 410-T, Powers TempTAP, T&S Brass, or equal.

2.3 SINK FAUCETS

A. F-2: Service sink faucets:

1. Chrome plated with vacuum breaker, integral stops, adjustable wall brace, four arm handles, pail hook, and 3/4-inch hose end spout. Powers-Fiat 830-AA T&S Brass, Zurn or equal.

a. Strainer: Type 302, 16-gauge, stainless steel combination dome strainer and lint basket. Attach with stainless steel screws.

b. Drain: Type 316 stainless steel crumb cup strainer, removable basket, rubber seat stopper, type 316 stainless steel 1-1/2-inch OD tailpiece similar to Just J35-316.

PART 3 EXECUTION

3.1 SPECIALTIES

A. Provide fixture supply tubes, fixture stops, and fixture traps, tailpieces, and trap arms at all fixtures requiring same.

B. For fixtures with exposed supply tubes, provide polished brass. For concealed applications, braided stainless steel supply tubes may be used at Contractor's option.

C. Install traps with no more than one slip or compression fitting between trap and rough-in.

D. Provide escutcheons over all fixture supply and trap tailpiece wall penetrations. Inside cabinet escutcheons may be primed and painted steel instead of chrome plated.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

A. This Section covers selection and installation of basic pipe materials and specialties.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and selections for equipment and accessory items.

B. Balancing Cock Schedule: Submit a schedule of balancing valves listing the service, location, valve size, and flow setting (GPM) for each balancing valve.

C. Substantial deviations:

1. Submit to the Contracting Officer Shop Drawings of any proposed substantial deviations in the piping systems for this facility from these documents for review and acceptance. Include four, plus the number required by the Contractor, copies of each Shop Drawing submitted.

2. Any substantial deviations from these documents installed prior to Contracting Officer review and acceptance of submittal may be required by the Contracting Officer to be removed and the indicated system be installed at no additional cost to the Owner.

3. The Contracting Officer is the sole judge of what constitutes a substantial deviation and what is an acceptable alternate technique or method.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide all pipes, fittings, and accessories required for complete functioning installation of all piping systems specified and required under this Division.

B. Miscellaneous items specified and required under this Division are not necessarily indicated on the Drawings.

2.2 THERMOMETERS

A. Solar or light powered 1/2-inch LCD digital display, -40 to 300 degrees F range, adjustable position face. Weiss, Miljoco, Trerice, or equal.

B. Pipe mounted with brass separable socket.

C. Provide insulation extensions as required.

2.3 PRESSURE GAUGES

A. 2-1/2 inch diameter dial, bourdon tube type. Trerice, Weiss, Miljoco, or equal.

B. Phosphor-bronze bourdon tube.

C. Movement: Brass rotary type with bronze bushings.

D. Case: Cast aluminum, style to suit application.

E. Provide combination pressure/vacuum gauges where gauges are called for, at suction side of pumps.

F. Select range so normal operating pressure falls near mid-range.

G. Provide impulse dampeners where gauges are called for at the suction and discharge side of pumps and similar locations.

H. Provide insulation extensions as required.

I. Provide with brass siphon, 250 psig rated, on steam service.

2.4 PRESSURE AND TEMPERATURE TEST PORTS

A. Solid brass plug with Nordel or EPDM core rated for zero leakage to 500 psig and 275 degrees F. Sisco P/T Plugs, Pete's Plug, Caleffi, or equal.

B. Provide insulation extensions as required.

2.5 DRAIN VALVES

A. Unless otherwise indicated, provide 3/4-inch ball valve or 1/2-inch ball valve if line size is less than 3/4-inch. Provide with brass hose end fitting and cap.

2.6 BALANCING COCKS

A. Balancing cock with check valved pressure sensing taps, drain tap, and memory stop. B & G Circuit Setter Plus, Armstrong CBV, Taco Accu-Flow, TA Hydronics, or equal.

B. Teflon seats, EPT checks, EPDM stem "O" ring.

C. 200 psig, 250 degrees F rated.

2.7 FLEXIBLE CONNECTORS

A. Corrugated hose and single braid fabricated from carbon steel for iron or steel systems. Flexonics Series 100, Metraflex, Twin City Hose, or equal.

B. Corrugated hose and single braid fabricated from bronze for copper systems. Flexonics Series 200, Metraflex, Twin City, or equal.

C. Rated for 200 psig at 200 degrees F.

D. End fittings to suit installation.

E. Minimum live length is manufacturer's recommended length to allow 3/8-inch minimum offset distance from centerline.

2.8 AIR VENTS

A. Automatic air vents: Non-ferrous, rated for 150 psig operating pressure at 240 degrees F. Spirotherm Spirotop VTP-38, Taco Hy Vent No 426, Bell and Gossett No. 87, or equal.

B. High capacity automatic air vents: Iron body and bonnet with stainless steel, brass, and EPDM internal components, rated for 150 psig at 240 degrees F. Bell and Gossett No. 107A, Sarco, or equal.

C. Manual air vents: "Coin-operated" air vent. B & G No. 4V or equal.

2.9 DIELECTRIC PIPE PROTECTION

A. Polyvinyl, 20 millimeter, self-adhesive. Westape, Calpico, 3M, or equal.

B. Dielectric nipples and flanges only. Dielectric unions are specifically not allowed.

2.10 ESCUTCHEONS

A. Chrome plated brass or stainless steel, spring clip. Dearborne Brass Series 5300, Brasscraft, Viking, or equal.

2.11 FLOW TEST KIT

A. At time of instruction of Owner personnel, provide a test kit of same manufacturer as balancing cocks or flow control valve provided with carrying case containing two each 2-1/2 inches dial face pressure gauges, with recalibrtator, range 0 - 60 psig: two each gauge adapters; and two each one-inch dial face, five inches stem thermometers, 0 to 220 degrees F.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION AND APPEARANCE

A. Conceal piping above ceilings or in walls unless otherwise noted. Expose piping in spaces without ceiling or furred-in enclosures.

B. Install piping in truss space in areas with exposed trusses unless otherwise noted.

C. Route piping within the facility vapor retarder and insulation boundary.

D. Ream pipes thoroughly and clean before installation.

E. Flush lines clear of debris, scale and discoloration prior to startup. Clean out all strainers and drip pockets after flushing.

F. Run pipes with proper grade to provide for easy drainage and venting.

G. Support piping to provide an installation that is without sag or droops.

H. Provide pipe supports and offsets, loops or accessories at equipment connections to minimize connection stress caused by normal system warm-up, cool-down and equipment operation.

I. Install parallel runs of non-insulated piping as required to provide a minimum of six-inch clearance between piping.

J. Install parallel runs of insulated piping as required to provide a minimum of four-inch clearance between insulation surfaces.

K. Install piping and equipment as required to provide minimum 6 feet 8 inches of headroom in mechanical rooms, piping within 12 inches of the ceiling in other spaces with exposed piping, and as required to not interfere with other items or access to equipment.

L. At piping penetrating wood or metal framing, cut hole with hole saw and center piping in hole so that piping does not contact wood framing. Provide plastic isolation bushings as required to adequately support piping.

M. Provide escutcheons around pipes at finished floor, ceiling or wall penetrations. Slip steel escutcheons onto piping prior to joining pipe. Set steel escutcheons with bead of paintable silicon sealant at perimeter, press tight to wall or floor, and remove excess sealant.

N. Coordinate building envelope penetrations with Architectural drawing and Division 07 Specifications.

3.2 FITTINGS, VALVES, AND ACCESSORIES

A. Make changes of direction, branches, and reductions in pipe size with fittings. Bushings are allowed only in non-pressurized tanks and similar equipment.

B. Provide isolation valves at pressure gauges.

C. At pressure reducing valves, control valves, and other devices whose size is less than adjoining pipe size, provide reducers immediately adjacent to the device.

D. Provide isolation valves in piping adjacent to equipment, including terminal units, and where indicated. Locate valves on system side of unions or flanges.

E. Provide unions or flanges at connections to equipment and control valves to allow maintenance. Locate unions or flanges to allow maintenance without removal of any additional piping other than that between the union or flange and the equipment. Use of dielectric unions is prohibited.

F. Provide drains valves at all low points in piping systems for drainage unless otherwise indicated.

1. Drains are not required at plumbing fixtures if stop valve forms the low point of the branch.

2. Drains are not required where screwed cap dirt legs are indicated.

3. Provide threaded plug where space is not available to install a drain valve.

G. Provide metal-to-metal seated globe valves at strainer blow down connections. Valve size to match blow down connection size.

H. Provide air vents at high points in closed loop or recirculating piping systems. Install automatic air vents, with isolation valve, throughout the piping systems except where specifically indicated otherwise. Provide manual air vents, with valve, where air vents are required under finned tube radiation enclosures or where space will not allow installation of automatic air vent with isolation valve. Keep automatic air vent isolation valves closed except when purging air from system. Close isolation valves at end of Project.

I. Install balancing cocks with test ports at or above the horizontal position. Permanently mark, etched or stamped, balancing cock setpoint scale readings and balanced flow in GPM on 1-1/2 inches diameter brass valve tags attached to balancing cock with No. 6 bead chain. This tag is in addition to valve identification tag called for elsewhere.

J. Provide flexible connectors where indicated and on all connections to vibration isolated equipment.

K. Provide mechanical pipe seals where indicated. Provide steel wall sleeves at wall penetrations where mechanical pipe seals are installed except penetrations of existing poured concrete walls which may be core drilled to manufacturers recommended diameter.

L. Provide pressure and temperature test ports where indicated and at the following locations:

1. At inlets to and outlets from hydronic system equipment and terminal units except finned tube radiation, reheat coils, unit heaters, and cabinet unit heaters.

M. Install thermometers, gauges, and plugs above the horizontal axis on horizontal pipe and orientated such that they are easily readable by a person standing on the floor for exposed equipment or from point of access for concealed equipment. Provide insulation extensions where thermometers, gauges, and plugs are installed on insulated piping.

N. At 1-1/2 inches and smaller piping, install thermometers in pipe tees one size larger than line size.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 05 23 - GENERAL DUTY VALVES FOR HVAC

A. This Section covers the selection and installation of manual valves.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog Cuts and selections for valves and accessory items.

B. Application Schedule: Submit a schedule of valves listing the application, product, material, and size proposed for each application.

PART 2 PRODUCTS

2.1 GENERAL

A. Standardize on one make as much as possible but not to the extent of sacrificing quality listed. Apollo, Grinnell, Jomar, Milwaukee, Nibco, Stockham, Vogt, or equal.

B. Provide ball valves where indicate, in lieu of gate valves for heating systems in piping three-inch and less in size. All valves, three inches and smaller, shall be of same type. Provide ball valves installed in insulated piping systems with extended stems to bring the handle clear of the insulation.

C. ASME Class 125 unless otherwise indicated.

D. Gate and globe valves: Repackable under pressure with valve fully open.

2.2 HYDRONIC SYSTEM VALVES

A. Valves three inches and smaller:

1. Isolation Valves:

a. Ball valves for hydronic service: Full port, two piece, brass body with brass internals, chrome plated or stainless steel ball, reinforced Teflon seats and seals, non-blowout stem similar to Nibco S-FP-600A/T-FP-600A.

b. Automatic air vent, pressure gauge, pressure test port isolation valves, and finned tube element drain valves: Bronze body ball valve, Teflon seats, vitron O-ring stem seals, chrome plated brass ball, non-blow out stem. For finned tube element drains, provide with screw slot instead of handle similar to Jomar T-82 Mini.

2. Globe valves: Rising stem, union bonnet, renewable seat and disc. Bronze body, bonnet, stem, and disc holder. Teflon disc. Malleable iron hand wheel. Teflon or graphite impregnated fiber packing similar to Nibco S-235-Y/T-235-Y.

3. Check valves installed in horizontal lines and vertical lines with upward flow: Bronze body and cap, renewable seat and disc, teflon disc. Swing check, Y-Pattern, with threaded cap that allows for removal of entire disc assembly through top of valve body similar to Nibco S-413-Y/T-413-Y.

2.3 FUEL GAS VALVES

A. Isolation Valves: Two-piece, stainless steel body and trim, reinforced Teflon seats and seals, non-blowout stem similar to Nibco T-580-S6-R-66.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide isolation valves in piping adjacent to equipment, including terminal units, and where indicated. Locate valves on system side of unions or flanges.

B. Do not install valve stems below horizontal.

C. Install globe valves in heating systems such that valve closes against normal fluid flow.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 11 23 – FACILITY NATURAL GAS PIPING

A. This Section covers the selection, installation, and testing of the natural gas piping system and accessories.

1.2 SUBMITTALS

A. Manufacturer's Data, catalog cuts and selections of pipe and fittings are not required.

1. Catalog cuts and selections of equipment and accessory items.

B. Application Schedule: Submit a schedule of piping and fittings listing the application, product, material, and size proposed for each application.

1.3 QUALITY ASSURANCE

A. Conform to the requirements of the Uniform Plumbing Code, International Mechanical Code, and NFPA Standard 54.

B. UL listed components.

PART 2 PRODUCTS

2.1 PIPE, FITTINGS, AND JOINTS

A. Above ground:

1. Schedule 40, black steel pipe with 150 psig malleable iron screwed fittings for two inches and smaller pipe and butt-welded steel joints and fittings for piping larger than two inches. Provide pipe joint compound resistant to natural gas product within the pipe.

2. Corrugated Stainless Steel Tubing (CSST), conforming to ASTM A240, rated for use at 5 psi, UV resistant outer jacket meeting ASTM E-84 25/50 flame spread, smoke developed rating, with mechanical attachment fittings rated and listed by CSA International for concealed use. Similar to Omegaflex TracPipe.

B. Buried:

1. Schedule 40 black steel with welded joints.

2. CSST tubing sleeved with polyethylene conduit covering all portions of the gas piping system located underground. Similar to Omegaflex TracPipe PS.

2.2 NATURAL GAS REGULATING VALVE

A. Irradiated and painted aluminum body and bonnet. Built-in, tamper proof relief valve. Synthetic rubber diaphragm assembly rated to minus 40 degree F. Similar to Rego.

2.3 APPLIANCE GAS CONNECTOR

A. AGA certified gas appliance connector/shut off valve assembly. Factory tested before shipment. One piece corrugated seamless brass tubing with heavy protective coating. One piece solid brass valve. Similar to Brasscraft.

PART 3 EXECUTION

3.1 GENERAL

A. Install system as indicated and in accordance with component manufacturer installation instructions.

B. Wrap buried steel gas piping, fittings, and joints with one wrap of dielectric pipe wrap. Overlap wraps by 1/2-inch minimum.

C. Install gas piping electrically continuous and bonded to a grounding electrode as defined by the National Electric Code.

D. Make final connections to appliances. Connect each appliance to the system with an appliance gas connector.

3.2 TESTING

A. Steel piping: Air test at 50 psi for a period of one hour with no perceptible drop in pressure.

B. CSST piping: Air test at 7.5 psi for a period of one hour with no perceptible drop in pressure.

C. Upon final connection of appliances, perform leakage check using an electronic sensor or bubble indicating fluid.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 21 13 - HYDRONIC PIPING

A. This Section covers selection, installation, and testing of hydronic heating piping systems and accessories.

1.2 SUBMITTALS

A. Manufacturer's data, catalog cuts of pipe and fittings are not required.

B. Catalog cuts and selections for equipment and accessory items.

PART 2 PRODUCTS

2.1 ABOVE GRADE PIPE AND FITTINGS

A. 2 inches and smaller:

1. Type L hard copper tubing in accordance with ASTM B 42 with wrought copper solder fittings with lead free solder.

2. 3/4-inch and 1-inch branch piping may be connected to copper run piping using mechanically formed tee connections when run piping is minimum 1-1/2 inches and 2 inches respectively.

PART 2

2.1 PIPE AND FITTINGS FOR RADIANT SLAB HEATING SYSTEM

A. Crosslinked polyethylene pipe with oxygen diffusion barrier, PEXa construction, Rehau, RIIFO, Wirsbo-hePEX, MrPex, or equal. Piping meets ASTM F876 standard specification rated for 100 psi at 180 degrees F. Provide fittings meeting manufacturer's installation and warranty requirements.

B. Fittings incorporating gaskets are not acceptable.

2.2 HEATING SYSTEM FLUID

A. 65 percent deionized water/35 percent propylene glycol solution and corrosion inhibitors, as recommended by the glycol manufacturer. Corrosion inhibitors shall be of the phosphate based, pH buffered chemical, non-plating type. Dowfrost, ArcticTherm P-50, Hercules Cryo-Tek -100 or equal.

B. Glycol and corrosion inhibitors shall be packaged by a single manufacturer.

C. Free initial and annual testing of heating system fluid condition shall be a standard service of the glycol manufacturer.

2.3 HEATING SYSTEM CHEMICAL CLEANING COMPOUND

A. 1 percent-2 percent Tri-Sodium Phosphate and water solution or equal. Approximately 1pound per 50 gallons.

2.4 GLYCOL CONCENTRATION TESTING DEVICE

A. Optical, automatic temperature compensating, high impact vinyl housing. Leica or equal.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Install piping level or slightly sloped up in direction of flow.

B. Provide air vents with isolation at all high points and drain valves at all low points.

C. Drain existing system as required to accommodate new work. Check existing glycol concentration and type.

3.2 INSTALLATION – RADIANT SLAB HEATING SYSTEM

A. Provide HDPE bellows sleeves at radiant slab piping crossings of slab joints where concrete is discontinuous such as construction or expansion joints. No sleeve is required at control joints.

B. Install piping system in accordance with manufacturer’s installation instructions.

C. Install piping in Spiral pattern (tubing spirals inward to the center, then spirals back out) for even heat distribution.

3.3 TESTING

A. Hydrostatically test system at 100 psig for 1 hour with no noticeable pressure drop or water leaks.

B. Firmly tap soldered fittings with a leather or rubber mallet during the pressure test to demonstrate soundness of soldered joints.

C. Air test radiant slab heating system and snow melt heating system at 100 psig for 24 hours after installation but before concrete pour with no pressure drop or air leaks. Test each joint in the snow melt system piping for bubble tightness with soap and water. Maintain 30 psig pressure during concrete pour without pressure decay.

3.4 CLEANING

A. Drain system and refill and clean system with building domestic water treated with chemical cleaning compound using manufacturer's recommended concentrations.

B. Clean system by maintaining system temperature at 140 degrees Fahrenheit, operating all pumps with all control valves positioned to full heating, for a period of 8 hours. At Contractor's option room temperature water may be used but circulation time shall be increased to 24 hours.

C. Flush and drain the system with all strainers cleaned at least twice.

3.5 FILLING

A. Fill system, including glycol mixing tank to 75 percent full, with heating system fluid utilizing the glycol mixing tank and remove air from system. Check glycol concentration using glycol concentration testing device. Record amount of glycol utilized and final system concentration. At time of instruction of Owner personnel, turn device over to Owner.

3.6 RADIANT SLAB SYSTEM START-UP

A. Do not energize system until slab is cured and approval is given by the Contracting Officer.

B. Fill system with heating system fluid at 12 psi and circulate without heat for 24 hours.

C. Energize controls and increase water temperature 5 degrees Fahrenheit above that established in "B" above. Be sure that both the operating and high limit controls are set to prevent excessive temperatures.

D. Increase water temperature at a rate of 5 degrees Fahrenheit per day until maximum operating temperature is reached. Make temperature increases in the morning to ensure that Contractor's personnel will be available to monitor the system's operation.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 21 16 - HYDRONIC PIPING SPECIALTIES

A. This Section covers selection and installation of hydronic heat transfer system specialties.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections for equipment and accessory items including:

a. Materials of construction.

b. Dimensional diagrams.

2. Performance and capacity data including:

a. Capacity under specified conditions.

PART 2 PRODUCTS

2.1 PRESSURE RELIEF VALVES

A. Relieving capacity equal to heat input rate and setpoint equal to maximum rated working pressure, unless otherwise noted. ASME labeled. Bell & Gossett, Armstrong, Taco, or equal.

2.2 AIR SEPARATORS

A. Pipe mounted, ASME labeled for 125 psig. Taco 4900 Series, Bell and Gossett model CRSN, Spirotherm Spriovent VDT or equal.

B. Air elimination verified by third party agency showing unit is effective for removal of micro bubbles and fluid reaches saturation within 100 cycles so that at any cooler downstream location the fluid condition is below saturation so that any free air would be absorbed.

C. Rated for removal of air to 18 microns and dirt to 35 microns. Provide unit with dirt blow down valve.

2.3 DIAPHRAGM EXPANSION TANKS

A. Precharged and complete with integral heavy-duty butyl rubber diaphragm. Amtrol, Bell & Gossett, Wessels, or equal.

B. ASME rated and stamped for 125 PSIG working pressure.

C. Vertical tanks: Equipped with floor mounting skirt.

D. Equipped with schrader valve charging connection.

2.4 GLYCOL MIXING TANKS

A. 17 gallon plastic tank with integral 115V feed pump, with integral check valve, pressure gauge, and pressure switch. Pump rated for 5 to 55 psi. Axiom Model DMF300, Wessels, Armstrong, or equal.

B. Stencil, in minimum one-inch high letters, the following label on the glycol mix tank: REFILL WITH PROPYLENE GLYCOL AND DEIONIZED WATER ONLY

PART 3 EXECUTION

3.1 GENERAL

A. Install as indicated and in accordance with manufacturer's recommendations.

B. Provide pipe hangers on each side of air separators.

C. Size supports for compression and expansion tanks assuming that tank will be full of water. At expansion tanks, assume that diaphragm has failed.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 21 23 - HYDRONIC CIRCULATING PUMPS

A. This Section covers construction, selection, and installation of hydronic circulating pumps.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog cuts and selections for equipment and accessory items.

a. Materials of construction.

b. Dimensional diagrams with equipment clearances.

c. Control interface diagrams.

2. Performance and capacity data including:

a. Capacity, head, and brake horsepower under specified conditions.

b. Pump curves.

c. Pump efficiency.

d. Electrical data.

PART 2 PRODUCTS

2.1 GENERAL

A. Selected to provide capacity and head based on operating conditions and fluid indicated.

B. Rated for minimum of 230 degrees F, 125 psig service.

C. Factory operationally tested prior to shipping.

D. Components compatible with fluid pumped. Provide Viton, Tungsten Carbide, or Silicon Carbide seal for glycol fluids.

E. Provide with motors selected to operate within their nameplate amperage (not service factor amperage) at 110 percent design flow.

2.2 IN-LINE CIRCULATOR PUMPS

A. Single stage, sensor-less variable speed wet rotor, with integrally mounted direct drive, maintenance free, canned rotor, Grundfos Magna3, Taco, Bell & Gossett, or equal.

B. Designed and constructed to allow replacement of all parts except volute casing without disturbing piping connections.

C. Pump impellers: Composite, PES.

D. Pump rotor: PPS.

E. Pump/motor bearings: Aluminum oxide/carbon.

F. O-rings and gaskets: EDPM or Propylene rubber.

G. Motor: electronically commutated synchronous permanent-magnet motor with integral speed controller.

H. Provide with Integrated electronic controller with an algorithm that controls the pump setpoint to adjust the hydronic system characteristics, without use of external sensor input, by measuring pump operating characteristics including current, speed, and internal pressures to adjust pump speed to optimize hydronic system flow. Electronic controller shall come configured with user selectable algorithms to control the pump to include, proportional pressure, constant pressure, constant speed, and constant curve.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide supplementary pipe or pump supports as indicated and as required to prevent overstressing piping or pump casing.

B. Provide P&T plugs where indicated on Drawings for Testing and Balancing.

3.2 OPERATION

A. Pump motors shall draw less than nameplate amperage (not service factor amperage) when operating driven equipment within both mechanical and electrical design parameters for this Project.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 52 16 - CONDENSING BOILERS

A. This Section covers selection and installation of heating system condensing boilers.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Catalog data and selections for equipment and accessory items, including:

a. Materials of construction.

b. Dimensional drawings and details:

1) Dimensions of all components.

2) Connection sizes and locations.

3) Equipment clearances.

4) Piping diagrams.

5) Accessory details.

c. Electrical data.

d. Wiring diagrams.

e. Control interface diagram.

2. Performance and capacity data including:

a. Output under specified conditions.

b. Combustion efficiency.

c. Fuel consumption rate.

B. Manufacturer’s Diagram of fuel train and safety interlock.

C. Shop Drawing: If submitted boiler manufacturer’s instructions require a different piping arrangement then that indicated in design documents, submit a sketch showing boilers, piping tappings, pipe sizes, and location of pipe fittings and accessories.

PART 2 PRODUCTS

2.1 GENERAL

A. Natural gas fired, condensing combustion chamber, manufactured and marked in accordance with CSA and with ASME Code Section IV requirements, Lochinvar Knight, Aerco Modulex, Viessmann Vitodens, or equal.

B. Indicated capacity is gross I-B-R output required. If I-B-R capacity is not provided as part of catalog data, provide capacity to meet indicated requirements using a 140 degrees F return water temperature with capacity verified by third party testing.

C. Minimum 85 percent efficient at high fire with return water at 140 degrees F. Minimum 90 percent efficient at high fire with return water at 104 degrees F. Minimum 94 percent efficient at low fire with return water at 104 degrees F. Efficiency in this case is output divided by input in mbh units.

2.2 BOILER

A. Heat Exchanger/Combustion Chamber:

1. Stainless steel or Aluminum.

B. Water side rated for 45 psig minimum working pressure allowing a pressure relief valve setting of up to 45 psig and factory hydrostatically tested prior to shipping.

2.3 VENTING

A. Boiler to be convertible to sidewall or to vertical venting and for direct or indirect combustion air intake.

B. Provide materials for vent in accordance with manufacturer’s installation requirements unless otherwise noted. Where plastic piping systems are allowed by manufacturer, provide CPVC piping.

2.4 BURNER AND GAS TRAIN

A. Gas train fitted to accept 14-inch WC gas supply.

B. Modulating burner assembly with a minimum 1:5 turn down capacity modulation. Multiple boiler modules may be used to meet turn down requirements.

2.5 CONDENSATE NEUTRALIZATION

A. Condensate neutralization vessel and neutralizer to buffer condensate from slightly acidic pH to neutral pH.

2.6 BOILER CONTROL

A. Control boiler using integral controller and associated software. Provide with the following:

1. Hydronic system supply temperature sensor.

2. Boiler pump control.

3. Boiler firing rate modulation.

4. Outdoor air reset.

5. Outlet and flue temperature limiting.

6. Low water cutoff.

7. Gas pressure limit.

8. Dry Contacts for Boiler run-time and alarm outputs.

9. Cascade sequencing for multiple boiler operations.

2.7 BOILER TRIM

A. Pressure relief valve: ASME, factory set to match pressure rating of boiler.

B. Operating controls.

C. Manual reset low water cutout.

D. Combination pressure gauge and thermometer.

E. Auxiliary limit control: Manual reset, set at 210 degrees F.

PART 3 EXECUTION

3.1 INSTALLATION

A. In accordance with third party listings and ASME approvals.

B. Provide manufacturer recommended inlet and outlet piping sizes and configurations. Indicated piping configuration is for basis of design boiler. Submitted boiler manufacturer recommendations may require multiple supply and return connections differing from piping indicated or may require additional pumps.

C. Provide multiple combustion chambers for redundancy. Where basis of design indicates a single boiler unit, it is comprised of multiple, redundant sections, each with self-contained burner and safety systems. Provide system configured with at least two boilers or self-contained burner sections.

3.2 START UP AND TESTING

A. Have boiler started up and burner tested and adjusted for optimum efficiency by factory authorized representative.

B. Submit report of startup and test to Contracting Officer prior to Substantial Completion Inspection. Report to include start-up procedure and the following data:

1. Tag Number and location.

2. Appliance nameplate information.

3. Nameplate information.

4. Flue temperature, percent O2, percent CO2, and percent CO for each boiler or burner section.

5. Manifold pressure.

6. Overall combustion efficiency, return water temperature, and supply water temperature.

C. Call for inspection as required by Alaska Statues AS 18.60. Submit inspection report to owner.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 23 82 39 - UNIT HEATERS

A. This Section covers selection and installation of hydronic unit heaters.

1.2 SUBMITTALS

A. Manufacturer's Data:

1. Provide a separate complete submittal for each unit even though some accessory items may be repeated in several packages.

2. Catalog data and selections for equipment and accessory items.

3. Selection with drawings and details indicating dimensions and compliance with capacity/condition requirements indicated.

4. Coil Data.

5. Fan data indicating capacity.

6. Wiring diagram.

7. Electrical data.

PART 2 PRODUCTS

2.1 FIXED DISCHARGE UNIT HEATERS

A. Manufacturer's standard catalog item which most closely exceeds the design requirements indicated with fluid indicated. Trane , Modine, Beacon Morris, or equal.

B. Where indicate, provide unit with EMA explosion proof motor suitable for use in Class I & II and Div. 1 & 2 areas.

C. Casing:

1. Horizontal projection units: Two-piece with "picture frame" front formed into wrap around sides, top, and bottom. 20 gauge back panel.

2. Vertical projection units: Formed by two square steel plates with drawn orifice in bottom plate.

3. Phosphatized to prevent corrosion and finished with manufacturer's standard color baked enamel unless otherwise indicated.

D. Coil:

1. Aluminum fins mechanically bonded to seamless copper tubes.

2. Rated working pressure: Steam, 75 psig. Hot water, 225 psig.

3. Tested under water at 250 psig.

E. Fan and Motor:

1. Direct drive propeller type, factory balanced fan with aluminum blades.

2. Totally enclosed, permanently lubricated motor with integral overload protection.

3. Provide motors 1/6 horsepower and larger with ball bearings.

F. Discharge:

1. Louvered discharge on horizontal projection units.

2.2 VIBRATION ISOLATORS

A. Steel spring and 0.3-inch deflection neoprene element in series. Mason Industries Type 30 or equal.

B. Spring: Minimum additional travel to solid equal to 50 percent of the rated deflection.

C. Neoprene element: Molded with a rod isolation bushing that passes through the hanger box.

D. Spring diameters and hanger box lower hole sized large enough to permit the hanger rod to swing through a 30-degree arc before contacting the hole and short-circuiting the spring.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide flex connections at supply and return piping connections to units with motors 1/4 horsepower and larger.

B. Provide vibration isolators at supports for units with motors 3/4 horsepower and larger.

3.2 OPERATION

A. Units shall not have any detectable rattles, buzzes, or vibration. Sheet metal screws, adhesives, or other fastening devices or techniques shall not be used to correct shipping damage or for field modifications to eliminate rattles, buzzes, or vibrations.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 05 01 - GENERAL PROVISIONS

A. This Section covers general electrical requirements for Work covered under this Division.

B. All Work and Services specifically covered under this Division is supplementary to that covered under other Divisions of these Contract Documents. The requirements of this Division, which are more stringent than that covered under other parts of these Contract Documents, apply to Work covered under this Division.

C. All incidental Work required but not specified under this Division shall comply with the Division in which it is specified.

D. Review the Drawings and Specifications of all other Divisions for additional Work under Division 26.

1.2 DEFINITIONS

A. Furnish:Shall mean deliver to the project site.

B. Install: Shall mean build into the work, including connections and any parts commonly considered as incidental to a complete installation.

C. Provide: Shall mean furnish and install complete.

D. Work or Project: Shall mean all work required by the Contract Agreement.

1.3 ABBREVIATIONS AND INITIALS

A. Any or all of the following may appear in the Contract Documents, and shall be applied per the following explanations:

a.c. or AC	Alternating Current (60 Hz. unless otherwise noted)
AFF	Above Finished Floor
AFG	Above Finished Grade
AIC	Amperes Interrupting Capacity (RMS Symmetrical)
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge Size
d.c. or DC	Direct Current
EMT	Electrical Metallic Tubing

GND	Ground
GFCI	Ground Fault Circuit Interrupter
Hertz or Hz	Frequency in Cycles per Second
HP	Horsepower
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IMC	Intermediate Metal Conduit
LTG	Lighting
MSS	Motor Starting Switch
MCC	Motor Control Center
NEC	National Electrical Code
NESC	National Electrical Safety Code
NECA	National Electrical Contractors Association, Inc.
NEMA	National Electrical Manufacturers Association
NIC	Not in Contract
NIE	Not in Electrical
O.L.	Motor Overload Devices
OSHA	Occupational Safety and Health Administration
RSC	Rigid Steel Conduit
UL	Underwriter's Laboratories
VAC or VDC	Volts, AC or DC, respectively

B. Other abbreviations and initials, which may appear in the Contract Documents, are intended to have the meanings commonly accepted in the electrical construction industry, and the Owner shall be contacted for definition if any question arises concerning them.

1.4 DRAWINGS

A. Unless otherwise indicated, drawing symbols conform to the applicable standards of ANSI. The Drawings (or Contract Drawings) rely heavily upon symbolic representation of the features shown, and represent exact details only so far as indicated. The following should also be kept in mind:

1. The Drawings are, to some extent, diagrammatic and are not intended to show exact details.

2. Dimensions scaled from the Drawings may vary due to tracing tolerances, printing distortion, field conditions, field changes, and other factors. For these reasons, it shall be the Contractor's responsibility to field-verify dimensions that pertain to his work. The Contractor shall make minor relocations where necessary to resolve conflicts or present a uniform appearance. The Drawings show exact location of electrical features only where specifically dimensioned.

3. The Electrical Contractor shall review the Contract Documents of the other trades on the Project, and shall coordinate the installation of electrical features with the work of all other trades. In areas such as mechanical rooms where conflicts are likely with structural, mechanical, or other features, the electrical installation shall be performed after the other trades, and arranged to eliminate conflicts.

4. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by all. Discrepancies between any combination of Drawings, specification, and/or field conditions shall be promptly brought to the attention of the Owner for a decision. Failure to obtain such decision before proceeding shall automatically leave the Contractor liable for all expenses necessary to correct the situation to the satisfaction of the Owner.

5. Provide fixtures, devices, equipment, conduit, conductors and accessories indicated on the drawings unless it is specifically indicated that the fixture, device, equipment, conduit, conductor, or accessory is existing.

1.5 GENERAL REQUIREMENTS

A. Provide all work as shown on the Drawings and in these Specifications for a complete, safe, and functional installation.

B. The Contractor is responsible for providing a complete and operating facility. The intention of the Contract Documents is to include all labor and materials, equipment, and transportation necessary or reasonably inferable as being necessary for the execution of the work. Where minor adjustments of the work are necessary for purposes of fabrication or installation of items or resolution of conflicts between items within the intent of the Contract Documents, the Contractor shall make such adjustments at no added expense to the Owner. Where such adjustments affect functional or aesthetic design of the work, they shall first be submitted to the Owner’s Representative for review and approval.

C. Unless otherwise noted, all materials shall be of new manufacture and installed before expiration of their shelf life, if applicable.

D. Materials and equipment are to be those of major and reputable manufacturers with ability to render competent and thorough service through local and regional organizations capable of expeditiously providing service, parts, and assistance.

E. Materials of similar nature, style, function, purpose and/or appearance shall be like products from the standard product line of the same manufacturer.

F. All products shall be listed and labeled by an approved national testing laboratory for their intended use and location in all cases where such products are listed and labeled. Where no product listed by an approved national testing laboratory for the application is available, provide certification of performance, function and rating from an independent testing agency or laboratory approved by the Owner.

G. The omission of express reference to any parts, supplies, services, or facilities necessary for, or incidental to, a complete installation shall not be construed as a release from furnishing such items at no additional cost to the owner.

H. Any deviations from the installation shown in these Contract Documents, due to a particular manufacturer's requirements, shall be made without additional cost to the Owner.

I. Verification is required of all equipment sizes and locations prior to the ordering or installation of connection materials and disconnecting equipment to ensure that the power connections are of the proper size and type, and in the proper location. Verify all electrical loads (voltage, phase, full load amperes, number and point of connections, minimum circuit ampacity, etc.) for equipment furnished under all divisions of this specification, by reviewing respective shop drawings furnished under each division. Meet with each subcontractor furnishing equipment requiring electrical service and review electrical characteristics. Report any variances from electrical characteristics noted on the drawings with the Owner before proceeding with rough work. Obtain and review the equipment shop drawings to determine particular final connection requirements before rough-in begins for each equipment item.

J. All materials shall be installed in a neat, orderly, and secure fashion, as required by these specifications and commonly recognized standards of good workmanship. The norms for execution of the work shall be in conformity with NEC Chapter 3 and the National Electrical Contractors' Association "National Electrical Installation Standards", for which the Owner's judgment shall be final.

K. Electrical equipment shall be installed in spaces that are accessible and in a manner that allows for maintenance and replacement. Entries into spaces shall allow for the passage of equipment. Coordinate the final locations with piping, ducts, and equipment of other trades to ensure proper access for all trades. Coordinate location of concealed equipment, disconnects, and boxes with access panels and doors.

1.6 WIRING OF MECHANICAL EQUIPMENT, MOTORS, AND OTHER UTILIZATION EQUIPMENT

A. Where equipment arrangement varies from that shown on the Drawings, making necessary additional disconnect switches in order to comply with the NEC, such disconnects shall be provided at no additional cost to the Owner.

B. The Electrical Contractor shall provide connection of each motor to its respective controller. The final 18 inches to 36 inches of each connection to a motor shall be made through flexible metal conduit, per Section 26 05 33.

C. Where disconnects or controllers are furnished as part of the mechanical or other utilization equipment, such as in package units, the Electrical Contractor shall provide all power wiring to the equipment and associated disconnects and controllers.

1.7 REPAIR OF EXISTING FEATURES

A. Where existing or previously-completed building surfaces or other features must be cut, penetrated, or otherwise altered for the installation of electrical features, such work shall be carefully laid out and performed, and any subsequent patching or repairs that it necessitates shall be performed by skilled mechanics of the trades involved, at no additional cost to the Owner.

1.8 WORK INCIDENTAL TO SUBSTITUTIONS

A. When substitutions for specified Methods or materials alter the relationship between the Work actually required and that called for by the Contract Documents, the Contractor shall bear responsibility for all expenses incurred by any necessary revisions, including the Work of other trades.

1.9 REMOVAL OF ELECTRICAL WORK IN EXISTING FACILITIES

A. Where connected to or serving fixtures or equipment being removed, or incidental to the required removal of walls, ceilings, or other features, existing electrical features shall be removed as follows:

1. All abandoned wiring shall be removed back to its source of supply.

2. Exposed items shall be removed in their entirety.

a. All abandoned exposed conduit, including all abandoned conduit above accessible ceiling finishes shall be removed back to the source of supply, or back to the connection to a still active branch. Cap and properly close all openings in remaining conduits, boxes and enclosures.

3. Concealed items may be abandoned in place if they are completely concealed by the existing construction.

   a. Conduits concealed in areas not accessible or that are not being made accessible shall be removed into areas of non-accessibility. Patch to match existing, openings in walls, ceilings, or floors left or created as a result of conduit removal.

   b. Conduits that are being removed and that extend below slab on grade shall be ground flush with the top of the slab, plugged with concrete, and the slab patched to match existing.

4. Where other electrical items are fed through, supported by or attached to a removed item, reroute raceways and/or cut back building surfaces as necessary to rejoin raceways, provide new conductors as necessary, and patch and finish all damaged construction to match surrounding surfaces.

5. Salvage or disposal of removed items shall be as noted on the drawings, or as directed by the Owner.

B. All existing equipment left remaining shall be maintained in service. When encountered in work, whether shown on the drawings or not, protect, brace and support existing items. If existing active electrical services are encountered that require relocation in order to execute general, electrical or mechanical work, relocate services as required and as directed without additional cost to the Owner. Any equipment which is not specifically indicated for removal or is not shown or noted shall remain in service.

1.10 VAPOR BARRIER PENETRATIONS

A. Penetrations of the building vapor barrier caused by the electrical installation shall be minimized, and where they do occur they shall be sealed as elsewhere described in these Specifications.

1.11 FIRESTOPPING

A. Where electrical raceways or other features penetrate fire-rated building surfaces, they shall be securely sealed to the surrounding surface with intumescent coatings as elsewhere described in these Specifications for the general construction.

B. Acceptable manufacturers include, but are not limited to, the following: 3M, Gardner Bender, NSi, DAP or equal.

1.12 ELECTRICAL WORK EXPOSED TO WEATHER

A. Provide corrosion protection for all ferrous metal portions of electrical work items exposed to weather including conduit, clamps, supports, disconnect switches and other items.

B. All ferrous metal shall be hot-dip galvanized after fabrication, painted or cadmium plated, or similarly protected against corrosion. Approval of painting material and methods is required.

C. All enclosures and equipment shall be weathertight and shall be NEMA rated for the environment.

D. Arrange all equipment in such a fashion as to prevent a buildup of water or other weather related issues that may result in premature failure of the device, damage of materials or other potential public safety hazards.

1.13 PROTECTION AND CLEANING

A. All electrical equipment shall, during the entire duration of construction work, be protected against water, dust, debris, overspray or any other contamination, whether environmental in origin or as a result of construction work.

B. All construction dust, debris, overspray, scrap and surplus materials, etc., resulting from this Work shall be cleared away, leaving the installation in completely clean condition.

C. Clean up all equipment to factory condition. Use touch-up paint where required. All cleaning shall be in accordance with the manufacturer's recommendations.

D. These cleaning requirements apply not only to exterior surfaces, but also interiors of accessible enclosures. In particular, the interiors of equipment having contacts or heat dissipating components shall be thoroughly vacuum-cleaned prior to energizing.

1.14 TRENCHING AND BEDDING MATERIAL

A. Where trenching, bedding material and backfill for conduits are called out in the contract documents for electrical work refer to criteria in specification 31 20 00 EARTH MOVING definitions for bedding material.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 05 19 - WIRE CONDUCTORS AND CABLE

A. Provide 600 volt building wire and cable as shown on the drawings and further specified herein. All wire and cable shall conform to the latest specifications of the NEC and/or the ICEA.

B. All wire and cable sizes noted on the drawings are for copper conductors, and copper conductors only shall be used for building wire throughout the entire installation.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers include, but are not limited to, the following: American Insulated Wire, BICC General, Carol Cable, Excel Wire & Cable, Okonite, Southwire, Superior Essex, AFC Cable Systems or equal.

2.2 CONDUCTORS

A. All conductors shall be copper, except as otherwise noted. Conductors No. 10 AWG and smaller shall be stranded or solid. Conductors No. 8 AWG or larger shall be stranded.

2.3 INSULATION TYPES

A. Branch circuit conductors shall be 600 volt insulated, and unless otherwise noted on the drawings, shall have the following insulation types:

1. Heated indoor spaces - THHN/THWN or XHHW.

2. Outdoors or other cold locations where exposed to temperatures less than 32 degrees F - XHHW.

B. Feeder conductors shall have type XHHW insulation.

C. Nylon-jacketed conductors such as types THHN or THWN shall not be used in any location subjected to ambient temperatures below 32 degrees Fahrenheit.

D. Special applications: Conductors in light fixture wiring channels shall have 90 degrees Celsius insulation rating, types THHN, XHHW, or equal. Conductors in high temperature locations shall have one of the high temperature insulation types suitable for the use and as permitted by the NEC.

PART 3 EXECUTION

3.1 COLOR CODING

A. Conductors No. 6 AWG and smaller shall be color-coded by factory pigmentation of the insulation. Larger conductors may be color-coded by wrapping the ends with colored tape in all enclosures, except that white (or gray) and green conductors may never be phase-taped for any use other than neutral and ground, respectively. Color-coding throughout the entire installation shall be as follows:

SYSTEM VOLTAGE		
Conductor	208Y/120	480Y/277
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green

3.2 INSTALLATION

A. Install cable in accordance with NECA Standards of Installation.

B. Branch circuit conductors shall be No. 12 AWG copper, except for the following:

1. On 120 volt, 20 amp circuits over 70 feet (actual measured one-way distance) from panel to the last receptacle or middle of the lighting string (as appropriate), use No. 10 conductors for the entire circuit.

2. Where branch circuit conductor sizes are indicated on the drawings, they shall take precedence over the foregoing. Where field conditions dictate circuit routings that increase conductor lengths beyond what would be expected from the layout shown on the drawings, they shall be submitted to the Owner for acceptance.

C. All conductor connections shall be made up securely with solderless pressure connectors such as setscrew lugs, wirenuts, "wingnuts", insulated tap connectors, insulation piercing tap connectors, or suitable crimp fittings. Split bolt connector shall not be used. Where the connector manufacturer does not require twisting together of conductors, conductors shall be left untwisted.

D. Use compression type connectors for copper wire splices and taps, #6 AWG and larger. Utilize heat shrink tubing of the proper voltage rating for uninsulated conductors and connectors.

E. Thoroughly clean wires before installing lugs and connectors.

F. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

G. Terminate spare conductors with wire nuts.

H. Where stranded conductors are used, their ends shall be terminated with crimp-on connectors, set screw lugs, box lugs, or self-lifting pressure terminals.

I. Flexible cords shall be connected to equipment, fixtures, boxes, or other enclosures only by means of cord-grip bodies or other strain-relief fittings specifically designed for the purpose.

J. Where conductors or their connectors are to be connected to metal surfaces, the surface shall first be scraped free of any paint, oxide, or other non-conductive substances. Where there is a possibility of corrosion due to moisture or other causes, a conductive corrosion inhibitor shall be used between the conductor and the metal surface.

K. Where compression fittings are used to terminate conductors operating under 600 volts, the fitting shall have a viewport, or other approved method, so that it can be verified that the conductor is properly seated in the connector.

L. Conductor terminations shall use the manufacturer's recommended methods and hardware unless specifically noted otherwise.

M. Conductors shall be pulled into raceways only by constant-tension pulling methods. Where necessary, wire-pulling lubricants of a type that is not harmful to conductor insulation and will not harden shall be used.

N. Completely and thoroughly swab the raceway system before installing conductors.

O. Neatly train and lace wiring inside boxes, equipment, and panelboards.

P. All conductors shall be protected from damage. Where the conductor or insulation is damaged, the Owner may require, at no cost to the Owner, the replacement of the entire conductor, or the implementation of an approved repair method approved by the Owner.

Q. Provide dedicated neutral conductors to branch circuits where neutral conductors are required. Multi-wire branch circuits are not permitted. Use of handle tied breakers to provide simultaneous disconnecting of ungrounded conductors for multi-wire branch circuits is not permitted unless specifically called out elsewhere in these contract documents.

3.3 SEPARATION OF SYSTEMS

A. Wiring of different voltage levels, frequency, current characteristics (AC & DC) or functions (normal vs. emergency) shall not share the same raceway or enclosures unless specifically shown on the drawings or permitted by the Owner, or inherently necessary for correct system function (i.e., at transfer switches, transformers, etc.).

B. For A.C. Variable Frequency Drives and Inverters of any kind, conductors for supply, load, and control functions shall not share the same raceway.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 05 26 - GROUNDING AND BONDING

A. All metal raceways, enclosures, and other electrical equipment, as well as non-electrical equipment that may pick up harmful potentials from the electrical system, shall be securely bonded and grounded as required by the NEC, the Drawings, and this Specification.

B. Provide a separate, insulated equipment grounding conductor inside all feeder and branch circuit conduits.

PART 2 PRODUCTS

2.1 CONDUCTORS

A. All grounding conductors and bonding jumpers shall be copper (absolutely no aluminum substitution permitted), sized according to the NEC. Where separate equipment grounding conductors are called for, they shall be green insulated where run with branch circuits and feeders.

2.2 HARDWARE

A. Clamps, lugs, connectors, bonding bushings, and all other such grounding and bonding hardware shall be approved for the purpose; shall be made of hot-dip galvanized steel, or bronze or other corrosion-resistant alloy. Acceptable manufacturers include, but are not limited to, the following: O.Z. Gedney, T & B, Erico, or any other manufacturer meeting the requirements of the contract documents. No split bolt connectors allowed.

PART 3 EXECUTION

3.1 GROUNDING CONDUCTOR RACEWAY BONDING

A. All grounding electrode conductors run in metal raceways shall be bonded to the raceway at both ends. At grounding electrodes, compliance with NEC requirements for conduit connection to the electrode will satisfy this requirement.

3.2 CONCENTRIC AND ECCENTRIC KNOCKOUTS

A. In addition to the NEC requirements for service equipment, metal raceways throughout the project shall be provided with bonding bushings and NEC-sized bonding jumpers where they enter enclosures through concentric or eccentric knockouts, reducing washers, or other arrangements that may be disturbed by relative movement between raceway and enclosure.

3.3 COMMUNICATIONS RACEWAY GROUNDING

A. Communications raceways shall be continuously grounded.

3.4 EXTERNAL BONDING JUMPERS

A. Where the NEC permits grounding conductors external to, but routed with, a raceway, such routing shall be accomplished by spiraling the conductor around the raceway no more than two revolutions.

3.5 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Grounding and bonding conductors shall be terminated using a separate terminal for each conductor.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 05 33 - RACEWAYS

A. All conductors shall be run in metal raceways as follows, unless otherwise noted on the Drawings.

1.2 APPLICATIONS

A. Feeder Raceways - Rigid Steel Conduit (RSC). Electrical Metallic Tubing (EMT) may be used for indoor feeder raceways where not subject to physical damage.

B. Raceways Buried in Ground or Under Slab or Encased in Concrete - Rigid Steel Conduit (RSC).

C. Branch Raceways - Unless otherwise shown, raceways shall be as follows:

1. Exposed raceways shall be:

a. EMT in mechanical and electrical spaces, shops, and other similar unfinished type areas with exposed devices and features.

b. Surface metal raceway in finished areas.

D. The substitution of Intermediate Metal Conduit for Rigid Steel Conduit, where permitted by the NEC, is permitted by this Specification, except for the following applications:

1. Buried raceways.

2. RSC and IMC shall not be intermixed in any conduit run unless a pullbox or conduit body is provided between them.

E. The final connection to any motor, rotating equipment, vibrating equipment, or other equipment which may require position adjustment after installation, shall be made through a slack section of flexible metal conduit 18 inches to 36 inches long. For such connections to pump motors, and to equipment in damp, wet, or exterior locations or in Mechanical Rooms, the flex shall be of the oil-resistant liquid-tight type.

F. Other raceways shall be as noted on the Drawings or further specified herein.

G. Nonferrous metal conduit is not permitted unless specifically noted.

PART 2 PRODUCTS

2.1 TYPE

A. Minimum size for all raceways shall be 1/2-inch diameter. Minimum size of conduit for home-runs shall be 3/4-inch diameter.

B. Raceways shall be of types and characteristics recognized by the NEC.

2.2 QUALITY ASSURANCE

A. Conduit and fittings shall be standard types and sizes as manufactured by a nationally recognized manufacturer of this type of material and be in conformity with applicable standards and UL listings.

2.3 CONDUIT AND TUBING

A. Rigid Metal Conduit (RMC)

1. RMC shall be hot-dip galvanized, Schedule 40 Dimensions with smooth interior.

2. RMC shall be made up with threaded fittings only.

3. Acceptable manufacturers include, but are not limited to, the following: Allied Tube & Conduit, J & L, Triangle, Western Tube & Conduit, Youngstown, or equal.

B. Electrical Metallic Tubing (EMT)

1. EMT shall be galvanized, with smooth interior.

2. EMT shall be made up with concrete-tight compression fittings. Provide rain-tight compression EMT fittings for exterior locations. Connectors shall have insulated throats.

3. Acceptable manufacturers include, but are not limited to, the following: Allied Tube & Conduit, J & L, Triangle, Western Tube & Conduit, Youngstown, or equal.

C. Intermediate Metal Conduit (IMC)

1. IMC shall be hot-dip galvanized steel, with smooth interior.

2. IMC shall be made up with threaded fittings only.

3. Acceptable manufacturers include, but are not limited to the following: Allied Tube & Conduit, Cyprus, Western Tube & Conduit, or equal.

D. Flexible Metal Conduit (FMC)

1. FMC shall be unjacketed (“Greenfield” or “Reduced Wall Flex”), made of interlocking galvanized steel armor.

2. Acceptable manufacturers include, but are not limited to, the following: Alflex, American Metal, Carol Cable Co., Electri-flex, National Electric, Thomas & Betts, Triangle, or equal.

E. Liquid-tight Flexible Metal Conduit (LFMC)

1. LFMC shall have a flexible galvanized steel spiral core with a flexible outer jacket of PVC, resistant to water, oil, grease, corrosive agents, and abrasion. Acceptable manufacturers include, but are not limited to the following: Carol, Anaconda, or equal.

2. Fittings for liquid-tight flexible conduit shall be steel or malleable iron of a type incorporating a threaded grounding cone, nylon or plastic compression ring, and a tightening gland, providing a low resistance ground connection. All throats shall be insulated.

3. Exterior or other extreme temperature applications of LFMC shall have temperature rating of minus 67 degrees Fahrenheit to plus 220 degrees Fahrenheit.

4. If used without a separate equipment grounding conductor, liquid-tight flex shall have a continuous copper ground wire integral with its construction, and shall be made up with fittings approved for grounding.

5. Acceptable manufacturers include, but are not limited to, the following: AFC Cable Systems, Eaton, Thomas & Betts, Carol, Anaconda, or equal.

F. Rigid Polyvinyl Chloride Conduit (PVC)

1. PVC shall be Schedule 40 or Schedule 80. Fittings for Rigid Nonmetallic Conduit shall be polyvinyl chloride; installed using PVC solvent to form a watertight joint, except elbows (including bends exceeding 15 degrees) shall be metallic. These metallic bends shall be of the type suitable for the environment in which they are to be installed.

2. PVC for power circuits shall be Schedule 80, rated for 90 degrees Celsius. PVC shall conform to UL 651 and NEMA TC 2.

3. Acceptable manufacturers include, but are not limited to, the following: Cantex, Allied Tube & Conduit, JM Eagle, or equal.

G. High Density Polyethylene Conduit (HDPE)

1. HDPE conduit with smooth interior with minimum Schedule 40 thickness walls.

2. Acceptable manufacturers include, but are not limited to, the following: Carlon, JM Eagle, Duraline, or equal.

2.4 CONDUIT TRANSITION FITTINGS AND COUPLINGS

A. Use of manufactured transition fittings and couplings between differing types of raceway systems (i.e. transition from RSC to HDPE) shall be listed for this purpose. Couplings within the raceway system in below grade applications shall be configured and connected so these joints are watertight.

2.5 WIREWAYS AND GUTTERS

A. Unless otherwise noted, wireways and gutters shall be similar to pull and junction boxes in construction, with screw covers.

B. Wireways and gutters shall only be used where shown on the drawings or specifically accepted by the Owner. Auxiliary gutters which are used at distribution panelboards and other service equipment are not subject to this owner acceptance requirement.

2.6 CONDUIT BODIES

A. Use of conduit bodies having the "LL" or "LR" configurations is not permitted unless specifically called for or accepted by the Owner.

PART 3 EXECUTION

3.1 LAYOUT

A. Raceways shall be exposed and run square with the building lines.

B. Unless otherwise noted on the Drawings or directed by the Owner, branch circuit raceways shall be sized per the NEC tables.

C. Structural members shall not be cut, drilled, or notched for raceways or other electrical features unless specifically accepted by the Owner.

D. Underfloor raceways for slab-on-grade construction shall be embedded in the fill under the slab, not in the slab itself. Where raceways are required or permitted to be embedded in concrete, the thickness of concrete on all sides of each raceway shall not be less than 2 inches.

E. Metal raceways crossing expansion joints and other required places, shall make provision for 3-way movement at such points. Such fittings shall be installed so that they are initially in the center of all 3 axes of movement (i.e.: not deflected to make part of a conduit bend, nor compressed or extended to compensate for incorrect conduit length).

F. At all raceway penetrations of the vapor barrier provide a double splice patch (one on each side of vapor barrier) by cutting a square piece of vapor barrier 12 inches larger on all sides than the pipe. Cut a round hole in the center of the square splice patch, smaller than the pipe, to form a stretched fit. Force the pipe through the splice patch and tape all sides to the vapor barrier and seal the vapor barrier to the pipe at the penetration with an adhesive compatible with the vapor barrier material.

G. Provide solid blocking installed flat at all vapor barrier penetrations. On the interior face of the exterior stud wall, flat blocking installed at each penetration shall be a minimum of four inches larger than the penetration. Locate the penetration at the centerline of the flat blocking.

H. All raceways running from a warm area to a cold area, and all raceways passing through penetrations in vapor barriers, shall be securely sealed inside the warm end with ductseal, a silicone compound not harmful to the wire insulation, or equal.

I. Maintain a minimum 6 inch clearance between conduit and piping. Maintain 12 inch clearance between conduit and heat sources such as flues, steam pipes, heating pipes, and heating appliances.

J. Nylon pull wires shall be provided in all spare and unused conduits.

K. Where electrical raceways must penetrate roofing membranes, such penetrations shall be flashed and sealed as required for mechanical piping penetrations of roof.

L. Raceways shall be installed in switchboards, panelboards, gutters, pull boxes and the like from the back of the enclosure closest to the mounting surface, to the front in a manner that will not obstruct the future installation of raceways.

M. The ceiling grid and ceiling support wire shall not be used for raceway support. Support all wiring from the structural ceiling. Fixture wire support may be used for flexible wiring but shall not be used for supporting other raceway types.

N. Panelboard, switchgear, and motor control center enclosures, and enclosures for other similar equipment, shall not be used for through wiring. Only manufacturer installed wiring shall be allowed to run between such enclosures which have multiple sections.

O. Do not route raceways on floor unless specifically shown on drawings.

3.2 ASSEMBLY

A. Raceways shall be physically and electrically continuous from enclosure to enclosure. Electrical continuity for nonmetallic conduits shall be assured by inclusion of an NEC-sized grounding conductor. For metallic conduits, it shall be assured by making up all joints wrench-tight and free of foreign materials. Threaded conduits shall enter enclosures by means of threaded hubs or double-locknut-and bushing connections. For conduits of one inch trade size and larger, bushings shall be of the insulated type.

B. Conduit joints shall be cut square, reamed smooth, and cleaned of burrs, cutting oil, cuttings, and other foreign materials prior to assembly. Ends shall be capped to prevent entrance of foreign materials during construction.

C. Bends, offsets, and saddles shall be made with factory elbows and fittings, or field-made with approved benders, to not less than NEC-required radii.

D. Raceways shall be securely fastened in place at NEC-required intervals and at each elbow by means of malleable one-hole straps, clamp-backs where necessary, two-hole sheet metal straps, or other approved devices; all with fastening hardware per Section 26 05 90. Wire shall not be used for fastening raceways. The use of adjustable "trapeze" hangers made of U-channel strut suspended by threaded rods is encouraged for the support of groups of parallel conduits. Conduits shall be secured to each such trapeze by means of the strut manufacturer's standard conduit clamps or by J-bolts, with U-bolts at elbows and ends of runs.

E. Use a junction box at transitions between different types of raceways. Exception: Use one-piece manufactured transition fittings between rigid and flexible conduit. Use manufactured transition fitting between conduit and multi-outlet assembly.

F. Where connecting HDPE conduits is required, the conduit shall be joined with coupling or other products listed specifically and designed for this purpose.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 05 34 - OUTLET BOXES

A. Provide outlet boxes for connection of branch circuits to fixtures and devices as shown on the plans and further specified herein.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Boxes shall be the products of Raco, Steel City, Appleton, Crouse-Hinds, or equal.

2.2 OUTLET BOXES

A. Outlet boxes shall be deep-type (2-1/8 inches nominal) unless space limitations or drawing notes require shallower boxes.

B. Outlet boxes for wall-mounted devices shall be galvanized sheet steel, 4 inches square for up to two devices, and solid ganged boxes for more than two devices.

C. Ceiling-mounted boxes for use with exposed raceways shall be galvanized sheet steel.

D. Cast boxes with threaded hubs, external mounting brackets or holes, and gasketed covers shall be used in the following locations:

1. Exterior locations.

2. Wet or Damp locations.

3. Mechanical rooms and pump stations, etc., where subject to physical damage.

4. Adjacent to water or steam connections.

E. Communications outlet boxes shall be galvanized sheet Steel, 4-11/16”x4-11/16”x2-1/4” square.

PART 3 EXECUTION

3.1 COORDINATION OF LOCATIONS

A. Provide electrical boxes as shown on the drawings, and as required for splices, taps, wire pulling, equipment connections and code compliance.

B. Electrical box locations shown on the drawings are approximate unless dimensioned.

C. Locate and install boxes to allow access. Where installation is inaccessible, coordinate locations and sizes of required access doors.

D. Locate and install to maintain headroom and to present a neat appearance.

3.2 INSTALLATION

A. Outlet boxes shall be installed plumb with, and securely fastened to the structural framing of, the surrounding construction.

B. No through-wall boxes will be permitted. Where outlets are shown mounted back-to-back on a common wall, they shall be offset horizontally a minimum of 12 inches, to minimize sound transmission.

C. Install boxes in walls without damaging wall insulation.

D. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

E. Where sheetmetal boxes penetrate the building vapor barrier, their exterior surfaces shall be completely covered with overlapped application of vapor-barrier tape to effectively seal all unused knockouts and other holes against vapor migration. The edges of the hole in the vapor barrier shall be securely sealed to the lip of the box with vapor barrier tape and/or an adhesive compatible with the vapor barrier material.

F. Provide the best suitable box for each outlet requirement. Extension rings should not be used on new construction except where needed to bring an outlet box to 1/8 inch of the finished wall or ceiling, or where required by specific device requirements. No more than one extension ring should be used for each outlet box.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 05 35 - PULL AND JUNCTION BOXES

A. This Section covers general electrical requirements for work covered under this Division.

1.2 PULL BOXES

A. Where necessary in raceway systems to facilitate conductor installation, provide pull boxes as further specified herein. At the minimum, raceway runs shall have a pull box every 100 feet or after every 360 degrees of bends.

1.3 JUNCTION BOXES

A. Where shown on the plans or where otherwise necessary to tap, terminate, or redirect raceway runs, provide junction boxes as specified herein.

PART 2 PRODUCTS

2.1 PULL BOXES AND JUNCTION BOXES

A. For larger than branch circuit raceways and conductors, and where noted on the drawings, pull and junction boxes shall be made of Code-gauge sheet steel with baked enamel or galvanized finish.

B. Boxes shall have removable screw covers.

C. Unless otherwise noted on the Drawings, pull and junction boxes shall be sized according to NEC requirements for the number, size, and entry configuration of the conduits and conductors entering them.

2.2 OUTLET BOXES

A. Unless otherwise noted on the Drawings, pull and junction boxes for branch circuit raceways shall be outlet boxes as specified in Section 26 05 34, with matching blank covers.

PART 3 EXECUTION

3.1 INSTALLATION

A. Pull and junction boxes shall be securely fastened to the building structure by means independent of the raceways entering them.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 05 53 - IDENTIFICATION

A. Provide nameplates, panelboard directories, junction box, wire and cable markers, and outlet box color coding as specified herein.

1.2 SUBMITTALS

A. Provide copies of the final panel schedule information for completed work in the O&M documents or contractor redlined drawings for integration into the record drawings.

PART 2 PRODUCTS

2.1 NAMEPLATES

A. Engraved three-layer plastic, 0.125-inch thick, black with white center core unless noted otherwise, with matte finish and square corners.

B. Minimum size shall be 3/4 by 2 inches; minimum lettering shall be ¼-inch and lettering shall be aligned.

C. Unless otherwise noted, all labels shall be nameplates as specified herein.

2.2 WIRE AND CABLE MARKERS

A. Cloth markers, split sleeve, adhesive wrap-on type or shrink tubing type.

B. Lettering shall be machine generated or manually typed.

2.3 RECEPTACLE PLATE LABELS AND UTILIZATION CONNECTION POINT LABELS

A. Clear adhesive Mylar or plastic type, minimum 3/16 inches size with black letters by a Kroy or other electronic label maker.

PART 3 EXECUTION

3.1 INSTALLATION

A. Disconnect switches, contactors, motor starters, circuit breakers, and the like shall be labeled with laminated plastic labels.

1. Degrease and clean surfaces to receive nameplates.

2. Install nameplates parallel to equipment lines.

3. Labels shall be secured with pop rivets or fasteners. Adhesive attachment is not acceptable, except for labels on receptacle plates or nameplates mounted on unheated indoor surfaces with foam tape.

4. Secure nameplate to inside face of recessed panelboard doors in finished areas.

B. Terminals on strips shall be numbered with indelible markings on special strips designed for the purpose, and a diagram or typed directory shall be provided in the terminal enclosure to identify the origin, function, and destination of each conductor in the enclosure.

C. Indelibly mark the outside cover of each junction box with the breaker number and panel identity of the source of power to each circuit within the box.

D. All power conductors (including neutral) in pull or junction boxes or other enclosures shall be permanently and legibly tagged or labeled with panel and circuit numbers or other data which clearly identifies their origin, function, and destination. Cloth markers or tubing type, handwritten marking is not acceptable.

1. Exception: Conductors in a pull or junction box which contains only an individual branch circuit or a single multi-wire branch circuit whose conductors are terminated on a multi-pole breaker or contiguous breakers need not be tagged or labeled.

E. Provide control and instrumentation cables with permanent type identification markers with permanent type identification markers with type cable number and from/to information at each point of termination.

1. Position cable markers to be readily visible for inspection.

2. Cable numbers shall match those when shown on the Drawings.

3. Provide wire tags at each termination point for each conductor.

F. All receptacle plates and utilization connection points shall be labeled with the panel and circuit number for the branch circuit that supplies the receptacle.

G. No temporary markings are permitted to remain on equipment. Remove all temporary markings where possible. Where markings cannot be removed, repaint trims, housing, etc. to cover markings. Refinish defaced finishes.

3.2 CIRCUIT DIRECTORIES

A. Provide new updated typed circuit directories for all panelboards affected by the Work of this project. Each entry shall accurately and uniquely identify the specific purpose of the connected load (i.e., Lighting, Receptacles, Mechanical Equipment, etc.) in accordance with NEC 408.4.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 05 90 - FASTENING HARDWARE

A. Furnish and install all fasteners and other hardware necessary for the proper, secure installation of all electrical features.

PART 2 PRODUCTS

2.1 FASTENERS

A. Raceway supports, boxes, and other electrical devices shall be fastened by wood screws or sheet metal screws on wooden surfaces, toggle bolts on hollow masonry units, expansion bolts on concrete or brick, and machine screws or welded threaded studs on steel work. Threaded studs driven by a powder charge and provided with a lock washer, flat washer, and nut(s) are acceptable in lieu of expansion bolts or machine or wood screws.

2.2 ASSOCIATED HARDWARE

A. All fasteners shall be provided with flat washers. All fasteners having untapered threads (such as machine screws) shall also be provided with a lock washer under the bolt head or nut, whichever is turned in the process of tightening. Fasteners through resilient materials shall have stop sleeves.

2.3 HARDWARE FINISHES

A. All threaded fasteners and associated hardware shall be steel, with a corrosion resistant finish. Threaded fasteners subjected to wet or damp conditions shall be galvanized.

2.4 TOOLING

A. Bolts shall have Hex or Allen heads. Screws shall have straight-slotted, Phillips, or Allen heads. Screws with square-socket heads ("locked-recess" or "Canadian"-style) are permitted only for fastening raceways or other features which the Owner would normally not be expected to have to change during the life of the facility; their use on enclosures or other assemblies which might eventually require Owner access is specifically prohibited.

PART 3 EXECUTION

3.1 GENERAL

A. All fasteners shall be tightened to within secure limits for the size of fastener and material(s) fastened. For critical applications, such as busbar connections, panelboard lugs, field installed bolt in breakers, transformer connections and breaker and ground bus connections having over a No 10 AWG conductor, a torque wrench shall be used to tighten the fasteners to the manufacturer's recommended value.

B. Fasten hangar rods, conduit clamps, and outlet and junction boxes to building structure using threaded bolts and screws.

C. Do not fasten supports to piping, ductwork, mechanical equipment, conduit or ceiling suspension system. For cable whips for luminaries these may be supported above a suspended ceiling independent support wiring specifically marked as such may be added to provide the required support. No other equipment will be allowed to be supported by wires and shall be securely supported by the surrounding structure.

D. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

E. In wet and damp locations use steel channel supports to stand cabinets one inch off wall.

F. Earthquake Anchorages:

1. Equipment weighing more than 50 pounds shall be adequately anchored to the building structure to resist lateral earthquake forces.

2. Total lateral (earthquake) forces shall be 2.75 times the equipment weight acting laterally in any direction through the equipment center of gravity. Provide adequate backing at structural attachment points to accept the forces involved.

G. Where necessary to install fasteners into the underside of metal roof decking, they shall be placed in the low points of the corrugations where the roofing membrane is thickest, and they shall not be long enough to penetrate the membrane.

H. Fasteners used on doors or covers shall have no sharp edges or points which may cut personnel opening or removing door or cover. Fasteners used on doors and covers shall not damage conductors.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 27 26 - WIRING DEVICES AND PLATES

A. Provide wiring devices and cover plates as shown on the drawings and further specified herein.

1.2 SUBMITTALS

A. Submit manufacturer's product data and specifications.

B. Submit product data showing configurations, finishes, dimensions, and manufacturer's instructions.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Among the acceptable wiring devices and plates are the products of Arrow-Hart, Bryant, Hubbell, Leviton, Pass & Seymour, or equal.

2.2 LIGHT SWITCHES

A. Light switches shall be:

1. Premium specification grade, AC quiet type, with screw terminals.

2. Rated 20 amperes at 120 volts for 120 volt circuits.

3. Two-pole, three-way, four-way, and other types of switches shall be provided where indicated on the drawings. Where not otherwise designated, switches shall be single-pole, single-throw.

4. Dimming switches shall be 0-10 volt based.

5. Switch handles, buttons, or sliders shall be white, except where pilot-light switches are called for, in which case they shall have a LED lamp mounted in a translucent red handle.

6. Pilot light switches shall be LED lamp type mounted in the handle (lighted handle), “on” when switch is “on”, rated for the voltage of the wiring system. Lighted switches shall be the same except “on” when the switch is “off”.

2.3 RECEPTACLES

A. Single and duplex receptacles shall be Commercial Specification grade, nylon faced, white-color, self-grounding, 120 volt, 20 amp, 3-wire, NEMA 5-20R configuration, with screw terminals. Exterior receptacles shall be weather-resistant “WR” type.

B. Weatherproof covers shall have a full width hinged cover suitable for receptacles installed in wet locations to maintain the integrity of the receptacle when the attachment plug is inserted. Covers shall be constructed of die cast aluminum, for duplex receptacles, drilled for four screw holes for horizontal mounting.

C. GFI receptacles shall be of NEMA 5-20R configuration, for single-strap mounting, with "test" and "reset" buttons accessible from front. Ground fault trip level shall be 5mA, and the trip circuitry shall be essentially immune to nuisance tripping due to spurious influences such as RF noise. Feedthrough terminals shall be provided for protection of downstream outlets.

2.4 PLATES

A. Cover plates for devices in recessed boxes shall be made of satin-finished 430 stainless steel. Cover plates for devices in surface-mounted boxes shall be of pressed or machined metal construction, specifically designed to suit the boxes.

2.5 CORD CAPS AND PLUGS

A. Cord caps and plugs shall be of the NEMA configurations indicated on the drawings; constructed of high-impact nylon, hard rubber, or Bakelite with metal armor shell. Cord caps and plugs shall have cord strain relief feature, and shall incorporate NEC "deadfront" construction.

2.6 SEALING PAD

A. On exterior wall, on walls of mechanical rooms having recessed boxes, on toilet room walls and on all sound isolation walls provide a closed cell foam sealing pad under the outlet or switch plate. Sealing pads/putty shall be as manufactured by Sound Isolation Co., STI, or equal.

2.7 TERMINALS

A. Wiring devices shall have binding-screw type terminals only. Terminals using spring pressure to secure the wire and make electrical contact are not permitted.

PART 3 EXECUTION

3.1 WIRING

A. Devices shall be connected with no more than one conductor under each screw terminal.

B. Connect wiring device grounding terminal to outlet box with bonding jumper and to branch circuit equipment grounding conductor. Grounding through the yoke or screw contact is not an acceptable alternate to the ground wire.

C. Connect wiring devices by wrapping conductor around screw terminal for termination of solid conductors #10 AWG and smaller. Use compression or clamp type terminals for stranded wire.

3.2 INSTALLATION

A. Provide cover plates of the appropriate configuration for all devices provided for the project, suitable for the box and installation.

B. Devices and plates shall be installed using the fasteners supplied or recommended by the manufacturer for the components to be installed. The use of sheet metal screws instead of machine screws where threaded holes are provided is not acceptable.

C. Install devices and wall plates flush and level.

D. Operate each wall switch with circuit energized and verify proper operation.

E. Verify that each receptacle device is energized.

F. Test each receptacle device for proper polarity and voltage drop.

G. Test each GFI receptacle for proper operation, including ground fault test.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 28 15 - DISCONNECTS

A. Provide disconnect switches for motors and other circuits as shown on the drawings and further specified herein.

1.2 SUBMITTALS

A. Submit manufacturer's product data and specifications.

B. Submit product data showing configurations, switching, overcurrent protective devices, and manufacturer's instructions.

C. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit current interrupting rating.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Among the acceptable disconnects are the products of Square D, Cutler-Hammer, Siemens, or equal.

2.2 DISCONNECT SWITCHES

A. Unless otherwise noted, disconnect switches shall have the following features:

1. The proper NEMA enclosure to suit the location, or as noted on the Drawings.

2. The proper voltage rating to suit the circuit voltage.

3. Quick-make/quick-break mechanisms with visible blades (when the cover is open), to disconnect all ungrounded conductors.

4. Switch handle positions shall be marked to indicate the ON and OFF conditions, and the handles shall be pad-lockable in the OFF position. Covers shall be interlocked with the handles to prevent cover opening while switch is ON, and a means shall be provided to permit qualified personnel to defeat this feature.

5. Disconnects shall be fusible, heavy-duty switches, unless otherwise noted. Where disconnects are not readily accessible, they shall be of the non-fusible type, and fusible protection for the circuit shall be provided in an accessible location. Disconnects provided as a "local" disconnect, where short circuit protection is provided by upstream devices, shall be of the non-fusible type.

6. Motor disconnects shall be sized according to their standard, not maximum, ratings.

7. Where separate control voltages are supplied to motor controllers, the disconnect switch shall simultaneously disconnect the control circuit(s) with the power circuit(s).

B. For single-phase motors controlled by a manually-operated switch, said switch may suffice as the disconnecting means if all applicable code requirements are met.

C. Where "light switches" are called for on the drawings to be used as disconnects for single-phase fractional horsepower motors, they shall be toggle-type unless noted key-type, 20A /1P with horsepower rating at least 50 percent larger than motor served.

PART 3 EXECUTION

3.1 INSTALLATION

A. All disconnects are to be installed within sight of the equipment being served and where they are readily accessible with required working clearances. Locations indicated on the drawings are for general location and may not show interferences with mechanical piping or other materials. Make all location adjustments as necessary to assure working clearances are achieved at no additional cost to the Owner.

B. Install fuses in fusible disconnect switches.

C. Provide a label on inside door of each switch indicating UL fuse class and size for replacement.

D. Where a disconnect switch is indicated on the drawings as being required for a specific piece of equipment and the equipment is supplied with an integral disconnect switch, the Contractor shall omit the disconnect switch and offer the Owner full credit for the disconnect switch.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 28 16 - OVERCURRENT PROTECTIVE DEVICES

A. Provide fuses and circuit breakers of the correct sizes and types as called for on the Contract Drawings and further specified herein.

1.2 SPARE FUSES

A. Provide three spare fuses of each size and type used for new transformers, motor starters, etc. in the project.

1.3 SUBMITTALS

A. Submit manufacturer's product data and specifications.

B. Submit product data showing sizes, configurations, and manufacturer's instructions.

PART 2 PRODUCTS

2.1 FUSES

A. Acceptable Manufacturers are limited to the following: Bussman, Reliance, Shawmut, or equal. Fuses shall be of the correct voltage rating for the circuit where used, and the following types unless otherwise noted:

1. In service and distribution equipment up to 600 amperes: UL Class RK1, time delay and current-limiting dual-element type.

2. In service and distribution equipment over 600 amperes: UL Class L, current-limiting type.

3. In motor disconnect switches: UL Class RK-1, dual-element time-delay type, current limiting, sized to suit the motor nameplate full load current in accordance with the manufacturer's recommendations for overload and single-phasing protection.

2.2 CIRCUIT BREAKERS

A. Unless otherwise noted, circuit breakers shall be of the molded-case thermal-magnetic type, with the following features:

1. Size, number of poles, and interrupting capacity as shown on the drawings. Ampere ratings shall be clearly visible, even when the breaker is installed in its appropriate enclosure.

2. Voltage rating to suit the voltage of the system on which they are used.

3. Each breaker pole shall provide both instantaneous and inverse-time tripping, with tripping clearly indicated, and a common-tripping tie to any other poles in the same breaker. Handle-ties are not acceptable for this purpose.

4. Breakers shall be operated by a toggle handle and shall have a quick-make, quick-break, over-center switching mechanism that includes a trip-free feature so that the contacts cannot be held closed against tripping currents.

5. Circuit breakers shall be labeled or listed by an independent testing laboratory and shall conform to the latest NEMA Standards and the short-circuit test parameters of NEMA Publication AB 1.

6. Circuit breakers shall not use solid-state components for any function except ground-fault tripping.

2.3 GROUND-FAULT CIRCUIT INTERRUPTER (GFCI) BREAKERS

A. Unless otherwise noted, GFCI circuit breakers shall be thermal-magnetic circuit breakers as previously specified herein but shall also have a ground-fault current trip mechanism operating at a current level of 5mA.

B. GFCI circuit breakers for use in dedicated heating cable circuits shall have a ground-fault current trip mechanism for equipment protection operating at a current level of 30 mA.

C. All GFCI breakers shall be essentially immune to nuisance tripping due to spurious influences such as RF noise and shall be equipped with a test button on the front.

PART 3 EXECUTION

3.1 GENERAL

A. Provide overcurrent protective devices as shown on the drawings and as specified herein.

B. Single pole breakers with handle ties are not acceptable for multi-pole breakers.

3.2 INSTALLATION

A. Inside the cover of each fusible switch enclosure, the correct size and type of fuse for that switch shall be plainly and legibly typed on a card placed in a plastic pocket. A laminated schedule of fuses needed for each disconnect provided shall be mounted in the main mechanical room.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 29 01 - MOTOR STARTERS

A. Provide motor starters where specifically indicated on the drawings. Where motor starters are furnished by others as part of mechanical equipment units or packages, refer to Specification Section 26 05 01 for additional connection requirements.

1.2 DEFINITION

A. Motor starters are also referred to in these Documents by the NEC-defined term "Controller."

1.3 SUBMITTALS

A. Submit manufacturer's product data and specifications.

B. Submit product data showing configurations, pilot devices, relays, switching, overcurrent protective devices, and manufacturer's instructions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Among the acceptable motor starters are the products of Square D, Cutler-Hammer, Siemens, or equal.

2.2 MANUAL MOTOR START SWITCHES

A. Fractional Horsepower motor start switches with thermal overloads (TT switches) shall be Square D Class 2510, Type F, rated 16 amps or equal, with red LED type pilot light, resettable overload protection, and toggle handle with guard/lockoff hasp.

2.3 MAGNETIC STARTERS

A. Unless otherwise noted, magnetic starters shall be:

1. Full-voltage non-reversing starting, with resettable integral solid state, ambient insensitive motor overload protection with Trip Class 20 protection.

2. Of the correct voltage rating for the system on which they are installed, with NEMA size and number of poles as shown on the drawings.

3. Housed in the NEMA enclosure appropriate for the location in which they are installed.

4. With hand-off-automatic switch for motors with automatic control, on-off switch for motors with manual control, red and green LED type pilot lights, and overload reset button in front cover.

5. With 120 volt coil and fused control circuit, control power to be derived from a separate control transformer in each starter enclosure, except for 120 volt motor starters or 208 volt motor starters where a separate neutral is provided to give a 120 volt control circuit.

6. With provisions for field-installation of at least two auxiliary control contacts, both normally-open and normally-closed types.

2.4 COMBINATION MAGNETIC STARTER/DISCONNECTS

A. Combination magnetic starter/disconnects, also referred to in these Documents as "Combination Starters", shall each consist of a fusible disconnect switch per Section 26 28 15 and a magnetic starter as specified above, in a common enclosure with front-mounted operator handle for the disconnect.

2.5 OTHER TYPES

A. Where starter types other than full-voltage non-reversing (FVNR) are called for on the Drawings, they shall be provided complete with all features specified for FVNR starters.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide overload elements and devices correlated with full load current, NEMA code letter and service factor reflected on actual nameplate of each furnished motor.

B. After final connections are made, check and correct the rotation of all motors.

C. Provide engraved nameplates for all units clearly identifying the equipment served.

D. Do not mount starters on vibrating equipment. Fasten securely to supporting structure at walls and mounting stands.

E. Motor Data: Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperage, code letter, service factor, voltage/phase rating, and the final settings of overload devices.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 50 00 - LIGHTING

A. Provide a complete and functional lighting system as shown on the Drawings and further specified herein.

1.2 SUBMITTALS

A. Submit manufacturer's product data for each type of luminaire as defined within this specification and as noted in the Lighting Fixture Schedule on the drawings.

PART 2 PRODUCTS

2.1 LIGHT FIXTURES

A. Provide luminaires as indicated on the drawings. Provide luminaires complete with illumination levels, color temperature and input wattage as indicated on the contract documents. Details, shapes and dimensions are indicative of the general type desired, but are not intended to restrict selection to luminaires of a particular manufacturer. Luminaires of similar designs, light distribution and brightness characteristics, and of equal finish and quality may be submitted.

2.2 LENSES AND DIFFUSERS

A. Where plastic lenses or diffusers are specified, they shall be made only of discoloration-resistant virgin acrylic or polycarbonate as listed in fixture schedules, with a minimum overall thickness of .125 inch, or specifically noted otherwise in the Contract Documents. Polystyrene lenses and diffusers are not permitted.

2.3 LED ELEMENTS AND DRIVERS

A. LED solid state elements shall be inclusive of the fixture and not require periodic replacement.

B. LED Drivers shall be solid state units with minimum 85% efficiency and capable of dimming via 0-10V inputs or as otherwise indicated on the contract documents. Driver shall have integral short circuit, open circuit and overload protection and shall comply with FCC 47 CFR Part 15.

C. Where specified within the lighting fixture schedule, the luminaire shall be provided with an integral battery back-up system which will illuminate the light elements for the required 90 minute period. Backup system shall have self-diagnostic functions and have provisions for connection of remote test switches if indicated on contract documents.

PART 3 EXECUTION

3.1 ACCESSORIES

A. Lighting fixtures shall be provided complete with all suspension, trim, mounting, and operating accessories normally considered necessary for a complete, functional, and safe installation, whether specifically called for in the Contract Documents or not.

B. For pendant-hung fixtures, run the power cord from the ceiling to the fixture neatly alongside the cable from which the fixture is hung.

3.2 COORDINATION WITH CEILING CONSTRUCTION

A. Prior to ordering, the Contractor shall verify complete compatibility of all lighting fixture construction, trim, and mounting accessories with the reflected ceiling plans and finish schedules of the Architectural Drawings.

3.3 LIGHTING FIXTURE SUPPORTS

A. Fixtures (other than those designed for simple box mounting) that are mounted directly on the building structure shall be supported with fasteners per Section 26 05 90 appropriate for the type of construction, in the following configurations:

1. Lighting fixtures up to 2 feet by 4 feet shall have four fasteners, one near each corner.

2. Longer fixtures shall have two fasteners at each end as well as at every 4 feet of length.

3. Any other type of fixtures shall be supported by at least two fasteners or by support as provided by the manufacturer.

B. Fasteners into wooden members shall be appropriately -sized sheet metal or lag screws, penetrating at least 1-1/4 inches into members at least 2 inches thick.

C. Pendant or chain-hung fixtures no more than 8 feet long shall have two such supports, each approximately 1/4 of the fixture length in from each end.

D. Fixtures weighing more than 50 pounds shall have special supports, subject to acceptance by the Owner.

3.4 ADJUSTING AND CLEANING

A. Align luminaires and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt and debris from installed luminaires.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 26 51 02 - LIGHTING CONTROL DEVICES

A. Provide occupancy sensors and occupancy sensor systems, complete with all components required for complete and properly functional systems.

1.2 SUBMITTALS

A. Submit manufacturer's product data and specifications.

B. Submit product data showing configurations, relays, switching, wiring diagrams and manufacturer's instructions.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers include, but are not limited to, the following: Hubbell, Wattstopper, Leviton, Mytech or equal.

2.2 OCCUPANCY SENSORS

A. All occupancy sensors shall be equipped with low-voltage leads and an internal Form C relay. Provide with auxiliary relays for multiple circuit switching where shown on the drawings.

B. Type OSW occupancy sensors shall be dual technology ultrasonic and passive infrared devices with all digital technology to continuously analyze the environment and self-adapt to meet specific changes, wall mounted, immediate activation, automatic or adjustable 5 minute to 30 minute adjustable electronic timer upon evacuation, 1,000 square feet, 180 degree coverage, use with auxiliary power switch packs, 120 or 277 volt, 20 amp contacts, white, optional Manual ON override switch.

PART 3 EXECUTION

3.1 GENERAL

A. Ultrasonic occupancy sensor switches shall have bi-directional transmitters which will emit an ultrasonic wave pattern, and receivers, which will trigger an adjustable timing circuit, and in turn will switch on the lights.

B. Ultrasonic sensors shall be crystal-controlled and sensors shall not interfere with each other when two or more sensors are placed in the same room.

C. Units shall have a bypass pin, which will leave lights on in the event of electronic failure of the switch. The bypass provision pin or device shall remain in the sensor and shall be visible from the floor.

D. The unit shall be equipped with an adjustable sensitivity control.

3.2 INSTALLATION

A. Sensors shall be capable of detecting presence in 95 percent of the floor area to be controlled.

B. Detection shall be maintained when a person of average size and weight moves only once every six minutes, within a maximum distance of six inches in a horizontal or vertical manner at the approximate speed of 12 inches per second.

C. Timers on occupancy sensors shall be set at 15 minutes.

D. Provide all occupancy sensor system wiring in raceway.

E. Provide occupancy sensor equipment neatly mounted and properly terminated.

F. Provide all connections, grounding, bonding and other accessories in accordance with the manufacturer's instructions.

G. Where occupancy sensors control lighting and light switches are also shown on the drawings, install the occupancy sensors ahead of lighting switches. The intent is to allow occupants the ability to manually turn off the room lighting.

H. Provide complete identification of components; including power supplies and relays.

I. The placement and type of occupancy sensors and all associated power supplies and relays shall be accurately shown on the as-built drawings.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 27 20 00 - TELECOMMUNICATIONS SYSTEM

A. Install all work in strict accordance with:

1. Telecommunications Industry Association (TIA) and Electronic Industries Alliance (EIA) Building Telecommunications Wiring Standards.

2. Manufacturer's recommendations.

1.2 QUALIFICATIONS

A. Firms shall have at least 3 years of telecommunications installation experience in the application, installation and testing of the specified systems and equipment.

1.3 SUBMITTALS

A. Submit manufacturer's product data and specifications for equipment and component devices.

PART 2 PRODUCTS

2.1 RACEWAYS

A. Raceways shall be as specified for power wiring, for the locations where they are to be installed.

B. Minimum conduit size shall be 3/4 inches, or as otherwise noted on the Drawings or specified herein.

2.2 DISTRIBUTION CABLES

A. Distribution cables shall be 4 pair, 24 AWG solid, unshielded, plenum rated outer jacket, UL/NEC rated Type CMP, TIA/EIA-568-B.2-1 Category 6, 100 ohm impedance. Cable shall be provided with an overall jacket with sequential footage markings and a ripcord for easy cable entry.

2.3 OUTLETS

A. The standard communications outlet shall include 2 terminated communication ports unless otherwise noted in the drawings. The telecommunications ports shall be constructed of high impact rated thermoplastic housing, RJ-45 non-keyed type, 8 position, 8 conductor (8P8C), modular in construction, with reusable insulation displacement terminations, conforming to TIA/EIA-568-B.2-1 Category 6 requirements, configured and color coded for TIA/EIA-568-B.2-1 designation T568B wiring.

B. Outlets shall mount in a single gang plaster ring in outlet boxes as specified in 26 05 34. Surface mounted outlets shall mount on a single gang box, unless otherwise required by the indicated configuration.

C. The outlets and associated components shall be Commscope Catalog #6644-1-154-XX faceplate with Catalog #6830-1-830-XX, or similar products manufactured by Ortronics, Siemens, Leviton, or equal.

2.4 OUTLET BOXES

A. Junction boxes shall be provided as necessary and shall conform to the requirements for junction boxes in Section 26 05 35 of these Specifications.

B. Double gang electrical boxes 4-11/16-in square by 2 1/4-in boxes suitable for 1-in conduit installations shall be utilized for standard outlet locations.

2.5 OUTLET FACEPLATES

A. Faceplates for standard outlets shall be single gang, capacity for a minimum of four ports or modules. Blank modules shall be provided to fill unused ports in the faceplate. Provide color coded snap-in icon tabs denoting the current media service (e.g. phone, data, video, etc.) with color as chosen by the Owner. Fill all unused openings with blank modules and insert one data tab per utilized port.

PART 3 EXECUTION

3.1 WIRING AND RACEWAYS

A. Equipment or devices shall have complete cable systems from the equipment or device outlet box to a terminal block or patch panel. All cables shall be terminated in a modular jack at the outlet port, and on the terminals in the patch panels or terminal block. One separate run per outlet port shall be provided.

B. All wiring shall be continuous from the communications outlet to the terminal block. No splices shall be allowed.

C. Cables shall be run in surface-mounted, metal raceways as specified for power wiring. Conduit fill shall not exceed 40 percent.

D. Maximum distribution cable length for computer outlets shall not exceed 90 meters (295 feet).

E. Wiring shall not share raceways or be bundled with other building systems.

F. All cables shall be labeled at each end with the location of the other end.

G. Computer distribution cable shall be punched down by approved methods for TIA/EIA 568-B.2-1 standards for Category 6 wiring on the back sides of the modular to 110 patch panels and properly terminated at each outlet configured for TIA/EIA 568-B.2-1 designation T568B wiring. Note that raceways and conductors are not necessarily shown on the Drawings but are to be provided complete.

H. Addressing:

1. Each telecommunications outlet and associated jacks on the front of the patch panels shall display the outlet port address.

2. Addressing at the patch panels and the outlets shall be performed on heavy paper strips by a Kroy lettering device and mounted behind the clear plastic covers provided with the equipment. Provide outlet and jack addressing and labeling as directed by the Owner.

3. The Contractor shall provide a floor plan map which shows the outlet numbers adjacent to each outlet location. These maps shall be included in the Operation & Maintenance Manuals.

4. Network backbone cables shall be terminated on the bottom rightmost outlets on the patch panel and shall be labeled.

3.2 QUALITY ASSURANCE

A. A qualified field technician shall inspect and test the complete wiring system. Testing shall be performed on each conductor and fiber. Testing shall be performed before and after the cable is installed. Testing after installation shall include the testing of terminations. Cable which does not conform shall be replaced at the expense of the Contractor. Acceptability and testing of the system shall extend through the Warranty period. The testing of the system shall not be deemed completed until after the equipment is in place and the wiring system proves to be 100 percent functional.

B. Category 6 Cable Testing:

1. All Category 6 cable testing shall be performed after completion of building electrical systems are online and in service.

2. Perform Category 6 link tests in accordance with TIA/EIA-568-B.1 and TIA/EIA-568-B.2. Test shall include wire map, length, insertion loss, NEXT, PSNEXT, ELFEXT, and PSELFEXT, return loss, propagation delay and delay skew.

C. Provide results of final acceptance tests to the Owner after completion of tests. Test reports shall include:

1. The equipment calibration date and calibration expiration date.

2. The test equipment nomenclature, model, serial number and manufacturer.

3. Name(s) of the testing team member(s), organization/company name, company address and the company telephone number(s).

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 31 20 00 - EARTH MOVING

A. Provide all site preparation, excavating, filling, compacting, and related items of work required to complete the earthwork as indicated on the Drawings and as specified herein.

B. Provide all excavation and backfill as required for the installation of all buried utility work.

C. Remove from site and legally dispose of all excavated materials that are not suitable for reuse as fill. Disposal site as selected by Contractor.

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

B. Excavation: Removal of material of whatever character encountered above subgrade elevations and to lines and dimensions indicated.

C. Fill: Soil materials used to raise existing grades.

D. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

E. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 INFORMATIONAL SUBMITTALS

A. Submit qualifications of independent geotechnical engineering testing agency used to perform quality control tests for this work.

B. Submit ASTM C-117/C-136 Gradation Analyses for structural fill, sand bedding, pea gravel bedding, or other backfill material specified to be used for this work. Submit test results prior to beginning any backfill work. At the discretion of the Project Manager retest and resubmittal may be required when source of material changes or when the appearance of the product delivered to the jobsite varies significantly.

C. Submit ASTM D-1557 Modified Proctor test results for structural fill, pea gravel bedding, sand bedding, common fill, and in-situ soils below structures requiring compaction of subgrade. Submit test results prior to beginning any backfill work. Retest and resubmittal required when source of fill changes or varies significantly. Determination to be made by the Project Manager.

D. Submit copies of all ASTM D-2922 compaction test results within 24 hours of the performance of the test.

E. Product data for each type of plastic warning tape.

F. Copies of permits required for activities associated with excavation, dewatering, or backfill.

1.4 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing. Agency shall be under the direct supervision of an engineer registered to practice in Alaska.

B. MANDATORY Pre-Installation Conference:

1. Review requirements and frequency of testing and inspections.

a. Review installation scheduling, coordination, placement of building concrete, and placement of items installed in and under concrete.

b. Review installation scheduling, coordination and placement of site concrete, and of items installed in concrete.

c. Review “Verification of Conditions” requirements.

d. Review requirements for preparation of subgrade and aggregate base requirements.

e. Review formwork requirements.

f. Review approved mix design requirements, mix designs, and use of admixtures.

g. Review reinforcing bar submittals.

h. Review installation schedule and placement of reinforcing bars.

i. Requirement placement, finishing, and curing of concrete, including cold weather requirements.

j. Review joint layout plan for control and expansion joints.

2. Review jointing requirements.

a. Review concrete slab tolerances and corrective measures if tolerances are not met.

b. Review safety issues.

1.5 FIELD CONDITIONS

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

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Project Manager.

C. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures are in place.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter and is compactable under the provisions of SSHC 203-3.04 and 203-3.05.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Structural Fill: Material meeting following gradation:

Size	% Passing
4"	100
No. 4 Mesh	30-60
No. 200 Mesh	0-5

E. Unclassified Fill: Earth, sand, gravel, rock, or combinations thereof containing no muck, peat, frozen material, roots, sod, or other deleterious matter and is compactable under the provisions of Part 3 of this Section. Plasticity index shall not be greater than 6 as tested by AASHTO T89 and T90.

F. Non-Frost Susceptible (NFS) Soils or Fill: Sand and gravel containing less than five (5) percent passing the No. 200 sieve, based on the material passing the 3/4-inch sieve.

G. Common Fill under Improvements: Any sandy gravel, sand, sandy-silt, silt, or other common soil materials, containing no debris or organic contamination and is compactable under the provisions of Part 3 of this Section.

H. Common Fill for Area Grading or Landscape Areas: Any sandy gravel, sand, sandy-silt, or other common soil material containing no debris. Organic materials up to 10 percent by weight may be mixed in the soil mass provided the material is reasonably mixed and the organic content does not consist of large roots, stumps or tree limbs.

I. Crushed Aggregate: Base Course: Material meeting the requirements of SSHC 703-2.03 AGGREGATE FOR BASE AND SURFACE COURSE, Gradation D-1. Mechanically crushed and artificially graded mixture of crushed gravel, crushed stones and natural or crushed sand free of organic material, debris or other deleterious material and meeting the following gradation:

Size	% Passing
1	100
¾”	70-100
3/8”	50-80
No. 4	35-65
No. 8	20-50
No. 50	6-30
No. 200	0-6

At least 70 percent by weight of the particles retained on a No. 4 sieve shall have at least one fractured face as tested by Alaska Test Methods Manual (ATM 305).

J. Sand: ASTM C 33/C 33M; fine aggregate.

K. Pea Gravel: Clean washed aggregate, free of organic material, debris, or other deleterious material meeting the following gradation:

Size	% Passing
3/8"	100
No. 4 Mesh	10-30
No. 10 Mesh	10 maximum
No. 200 Mesh	0.5 maximum

L. Bedding Material: Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

2.2 BORROW SOURCE

A. Use materials from excavation where qualified. Additional materials to come from source of Contractor's choosing. All borrow materials shall be approved by the Project Manager.

2.3 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.DEWATERING

D. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding Project site and surrounding area.

E. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation support, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

F. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

3.2 EXCAVATION, GENERAL

A. General:

1. Depth and extent of excavation shall be in conformance with Contract Drawings and Specifications and shall be sufficient for placement of structural fill, bedding or other specified backfill beneath curbs, sidewalks, paved areas, utilities, foundations, slabs, and other structures at elevations shown on Drawings.

2. No excavation is authorized below indicated depths unless so required in writing by Project Manager to obtain suitable bearing materials or to remove objectionable debris.

3. Unauthorized over-excavation beyond limits set by Drawings and/or Specifications shall be replaced with structural fill materials as specified elsewhere in this Section. Backfill and compaction of unauthorized over-excavation shall be at Contractor's expense.

4. Organic and frozen material encountered below required excavation limits shall be removed and replaced with structural fill. Obtain written approval from Project Manager prior to accomplishing work below required excavation limits.

5. Additional authorized excavation below elevations or outside lines as indicated on Drawings shall be paid for as a Contract extra at applicable unit prices.

6. Provide adequate lights, flares, and guards as required to protect the public.

7. Protect adjacent building foundations, utilities, road surfacing, and survey controls by careful excavation and shoring as required.

8. Provide bridging of excavations as required to permit access to all areas of the job site by other crafts.

9. Contractor is responsible for excavating all types of material encountered in excavations including frozen soils down to the specified excavation limits without extra cost to the Owner, except for solid rock (where rock is not indicated on Drawings). Solid rock shall consist of igneous, metamorphic and sedimentary rock, which cannot be excavated without the use of blasting or rippers.

B. Sheeting and Bracing:

1. Contractor is responsible for establishing excavation backslopes and protecting banks for safe working conditions and prevention of erosion.

2. Furnish, place, and maintain such sheeting and bracing as may be required to support the sides of the trenches and excavation and prevent any movement therein which might damage or delay the work or cause injury to adjacent property, and as necessary to provide full safety for workers and the public. If, in the opinion of the Project Manager, any timbering is inadequate, the Project Manager may order additional supports which must be furnished and placed, but compliance with such orders or failure of the Project Manager to give them shall not release the Contractor from responsibility in respect to the adequate maintenance of trenches or excavation. If necessary to preserve a suitable grade, the trench or excavation shall be solid-sheeted with interlocking sheeting which shall be driven far enough below grade to prevent the in-flow of material from outside the trench or excavation lines. Transverse bulkheads may also be required to prevent movement along the line of the trench.

3. Unless expressly ordered by the Project Manager, remove all shoring materials from the trench or excavations before or during the backfilling operations. If, in the opinion of the Project Manager, the safety of the street, public or private utilities, or public or private property requires that any portion of the shoring materials be left in the trench, the Project Manager shall so order, in writing, and shall designate particularly what shoring materials be left in place. Sheeting left in the trench shall be cut off about two feet below the finished surface of the ground.

3.3 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.4 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

C. Bedding Course: Install bedding course where indicated to uniform line and grade to avoid distortions in pipe. Completed bed shall be free of rock formations, protruding stones, frozen lumps, roots and other foreign matter that may cause uneven settlement.

3.5 SUBGRADE INSPECTION

A. Notify Project Manager when excavations have reached required subgrade.

B. If Project Manager determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

3.6 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Project Manager.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Project Manager.

3.7 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.8 BACKFILL

A. General:

1. Place and compact backfill in excavations promptly, but not before completing the following:

a. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.

b. Surveying locations of underground utilities for Record Documents.

c. Testing and inspecting underground utilities.

d. Removing concrete formwork.

e. Removing trash and debris.

f. Removing temporary shoring, bracing, and sheeting.

2. Obtain Project Manager's approval of excavations prior to placement of fills.

3. No extra payment for fill in excess of limits shown on Drawings or as specified herein without written approval of Project Manager.

4. Remove all forms, trash and debris from excavation before starting backfill.

5. Lifts shall be placed on level planes. Step sides and bottom of excavations if necessary to accomplish level fills.

6. Each lift of backfill material to be carried level to all sides of excavated area. No partial fills permitted.

7. Edges of fills shall be compacted and brought up at a maximum slope of 2:1.

8. Do not place fill on frozen ground unless specifically authorized by the Project Manager. Placing of fill on frozen ground shall only be done with the prior notification and written approval of the Project Manager.

9. Clean up and grade all areas disturbed by placement of backfill.

B. Structural Fill:

1. Material required (MINIMUM) beneath referenced structure or area when not specifically detailed on plans:

a. Building footings: 12 inches.

b. Exterior walks and curbs: 12 inches.

c. Interior floor slabs: 6 inches.

d. Asphalt paving: 18 inches.

2. Maximum loose depth of each lift shall be 8 inches in areas to be compacted by machine.

3. Fill in horizontal layers shall not exceed 6 inches loose depth where hand tampers or hand operated vibratory compactors are used.

C. Pea Gravel and Sand Bedding:

1. Pea gravel and sand fills shall be placed in lifts as required to fill the designated areas.

2. Adjust lift thickness, moisture content and placement methods as necessary to achieve specified density.

3. Water jetting or slurrying shall be permitted only with prior approval from the Project Manager.

D. Common Fill:

1. Use common fill for backfill as shown on the plans and for areas outside of building and paved parking areas, except where other materials are indicated on Drawings.

2. Maximum loose lift thickness 8 inches under footings or areas to be paved.

3. Maximum loose thickness 12 inches under area grading or landscape areas.

3.9 BACK FILL FOR STRUCTURES

A. Backfill shall be placed at same vertical rate and at same time on both sides of all foundations.

B. Avoid damage to foundation walls.

C. Tamp by hand tampers only unless walls are equally backfilled both sides as a simultaneous operation, or unless structural floor system which serves to brace wall is in place and properly anchored.

D. Backfill against insulation with care to prevent damage.

3.10 BACKFILL AT BURIED UTILITIES & SEWER

A. Unless otherwise shown on the Drawings, the following requirements for pipe placement and bedding shall be met:

1. Bedding and structural fill shall extend the full width of the trench.

2. Water lines to be laid directly on undisturbed soils. Structural fill shall be placed to a depth of 12 inches above the pipe.

3. Sewer lines to be bedded on a minimum of 12 inches of structural fill beneath the pipe and structural fill shall be placed to a depth of 12 inches above the pipe.

4. Electrical and communication conduits to be bedded on a minimum of 3 inches of bedding sand. Sand bedding shall be placed to a depth of 3 inches above the conduits. The same shall apply to conduits superimposed upon one another in the same trench with the exception that there shall be 3 inches of sand between conduits.

5. Backfill remainder of trench as specified. Soils from the excavation may be used in areas designated on the plans as area grading or landscaping provided that it meets the requirements for common fill. Structural Fill shall be used for backfill in areas designated on the plans as paving or under structures.

B. Clean up and grade all areas disturbed by utility construction.

3.11 WARNING TAPE INSTALLATION

A. Lay in continuous strip of plastic warning tape for each utility as follows:

1. Water: Blue, place 36 inches above pipe.

2. Sewer: Green, place 36 inches above pipe.

3. Electric: Red, place 24 inches above conduits or direct bury cable.

4. Communications: Orange, place 24 inches above conduits or direct bury cable.

5. Fuel piping: Yellow, place 24 inches above piping.

3.12 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.13 COMPACTION OF SOIL BACKFILLS AND FILLS

A. General:

1. See SSHC 203-3.03.

2. Adjust moisture content as required to accomplish proper compaction and to provide dust control when required by the Project Manager.

3. Compaction shall be thorough and to minimum density specified herein at all points throughout depth of fill.

4. Compact to specified percentage of maximum dry unit weight at optimum moisture content obtainable by ASTM D-1557, Procedure A or B as appropriate.

B. Compaction Requirements:

Soil Material	% of Maximum Dry Unit Weight
Top 6 inches of subgrade under structural fill or bedding	95%
Structural Fill	95%
Sand	98%
Pea Gravel	98%
Top 6 inches of subgrade under common fill	90%
Common Fill against foundations and footings within 5 feet of foundation wall	95%
Top 18 inches of Common Fill in areas to receive topsoil	90%

3.14 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.

2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1-inch.

2. Walks: Plus or minus 1-inch.

3. Pavements: Plus or minus 1/2-inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2-inch when tested with a 10-foot straightedge.

3.15 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.

2. Determine that fill material classification and maximum lift thickness comply with requirements.

3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.

B. Soil Testing:

1. Soil testing shall be performed by the Contractor's approved independent geotechnical engineering testing agency (see Section 1, TESTING AND INSPECTION SERVICE) according to the approved Quality Control (QC) plan.

2. OR Maximum dry unit weight determination shall conform with ASTM D-1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

C. Compaction Testing:

1. Test methods:

a. Field density testing shall conform with ASTM D-6938 (nuclear gauge method), ASTM D-1556, (Sand-Cone Method) or by ASTM D-2167 (Rainhart Volumeter). The ASTM D-1556 and D-2167 is applicable only to cohesive soils and silty sands and shall only be used to test densities in sand bedding, or common fill which do not contain appreciable amounts of coarse materials in excess of 1.5 inches.

b. The location of tests shall be at the option of the Project Manager. The number of tests shall be (minimum) as follows. Additional testing shall be required if, in the opinion of the Project Manager, the soil compaction test results indicate that the specified compaction is not being obtained:

1) For building foundations: One per 2000 square feet of each lift or one per 100 linear feet of footing per lift, whichever is more frequent, but in no case fewer than three tests.

2) For embankment and fill under paved areas: One lift per 2000 square feet, but in no case fewer than one test.

3) For slabs on grade, including sidewalks, aprons, and floors: One per lift per 2000 square feet of slab, but in no case fewer than three tests.

4) For utility trenches: One per lift per 150 linear feet of trench, but in no case fewer than two tests.

3.16 SURVEY MONUMENTS

A. When placing or replacing survey monuments in public Rights-of-Way, and all asphalt surfaces outside of public Rights-of-Way, install a survey monument case, SDM Drawing M-16.01. When placing survey monuments in other concrete paved areas reference SDM 13.01.

B. Disturbed Survey Monuments: Employ a qualified Land Surveyor licensed in the state of Alaska to replace any survey monuments disturbed by this project.

3.17 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Project Manager; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Project Manager.

B. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

3) For slabs on grade, including sidewalks, aprons, and floors: One per lift per 2000 square feet of slab, but in no case fewer than three tests.

4) For utility trenches: One per lift per 150 linear feet of trench, but in no case fewer than two tests.

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1. Scarify or remove and replace soil material to depth as directed by Project Manager; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Project Manager.

B. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 32 92 19 - SEEDING

1.2 DESCRIPTION

A. Lawns and grasses includes, but is not limited to, the following:

1. Delivering and placing topsoil.
2. Fine grading.
3. Seeding.
4. Fertilizing.
5. Maintaining grass areas during warranty period.

1.3 SCOPE OF WORK

A. Contractor shall provide all Work described in this section, described elsewhere in the Specifications, and indicated on the Drawings.

1.4 REFERENCES

A. Codes and standards referenced in this and subsequent articles of this section shall become a part of the Specifications to the extent of their applicability to the particular product, method, assembly, or system under consideration. In case of conflict the most stringent shall govern.

1. State of Alaska, Department of Environmental Conservation concerning applications of herbicides, pesticides, and inspections.
2. State of Alaska, *Seed Regulations,* 11 AAC 34.

B. Related Requirements:

1. Section 015639 "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
2. Section 312000 “Earth Moving” for excavation, subgrade preparation, and grading.
3. Section 329300 “Plants” for trees, shrubs and landscape accessories.

1.5 SUBMITTALS

A. PRECONSTRUCTION

1. Topsoil Location: Location of the topsoil source for inspection by the Landscape Architect.

B. PRODUCT DATA

1. Substitutions: Submit requests for substitutions 30 days prior to planting.

2. Product Data for Credit MR 5: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. TEST REPORTS

1. Soils Tests: Soil test report on topsoil proposed for use. Include tests for pH, nitrogen, phosphorous, and potassium, particle size and organic content by volume.

D. CERTIFICATES

1. Fertilizer: Certificate, bearing manufacturers guaranteed analysis.

2. Seed Certificates: Seed certificates bearing the grower's guaranteed analysis.

E. O&M DATA

1. Maintenance Schedule: Submit 30 days prior to Substantial Completion inspection for Landscape Architect’s approval. Maintenance Schedule shall indicate:

a. Watering schedule for grass.

b. Fertilization/Liming schedule: Include fertilizer proportions and application rate to be used at the time of application.

1.6 PRODUCT DELIVERY, STORAGE, HANDLING, AND REPLACEMENT

A. Deliver seed and fertilizer in original unopened containers, each bearing manufacturers guaranteed analysis, name, trade names, and conformance with governing regulations and law.

B. Store materials in areas protected against harmful weather until product is used.

C. Remove unacceptable products from the job site immediately and replace with material acceptable to Landscape Architect.

D. Obtain appropriate certification of personnel handling herbicides and pesticides.

1.7 NOTICES

A. Notify Landscape Architect one week minimum before Owner assumes maintenance.

B. Notify Landscape Architect 24 hours before seeding and 48 hours prior to Substantial Completion Inspection.

C. Notice to be provided in writing.

1.8 PROJECT/SITE CONDITIONS

A. Do no seeding when air or ground temperatures are below 40 degrees F.

B. Topsoil shall not be spread over frozen or excessively wet ground.

C. Ensure potable water is available prior to the beginning of any planting operations and throughout the maintenance period.

D. Seeding Season: All seeding shall be performed between June 1 and August 15. Seeding at other than the specified date, will only be allowed upon written permission of the Landscape Architect. Seeding shall not be done during windy conditions or when climatic or ground conditions would hinder placement or proper growth.

1. Dormant seeding may be done

1.9 MAINTENANCE/WARRANTY

A. Provide one year and one full growing season of maintenance and warranty for lawn seed areas. Areas which show a germination rate lower than specified or a growth rate less than other seeded areas shall be replaced. If seed is installed in the middle or end of the growing season, warranty period shall continue until the end of next year's growing season.

B. Satisfactory stand of seeded areas shall be defined as a minimum of 300 grass plants per square foot and where no gaps larger than 2 inches in diameter occur anywhere in the lawn area.

C. The Contractor shall arrange an inspection with the Landscape Architect on or before June 15 of the year following the date of planting. Areas of insufficient coverage shall be replanted at the Contractor's expense. Acceptance will be based upon a satisfactory stand as defined above.

PART 2 PRODUCTS

2.1 TOPSOIL

A. Friable loam free of subsoil, large roots, grass, stones, noxious weeds, debris, and other foreign materials. Sandy-silt or silty sand not acceptable. Soil mixture must contain 25-45 percent sand, 35-55 percent silt, 10-20 percent by volume of finely chopped, well mixed organic materials, be free of stones 1/2 inch or larger in any dimension and other extraneous materials harmful to plant growth, and have a maximum moisture content of 50 percent with an Acidity (pH) range between 5.5 to 7.0.

1. Topsoil may be imported from off-site sources OR existing in-place surface soil may be amended to produce topsoil.

2. Approval of material and material source by the Landscape Architect required.

3. Topsoil provided by the government may not meet the topsoil specification, but may be reused with the approval of the Contracting Officer.

2.2 FERTILIZER

A. Provide 17-17-17 for initial application at the time of seeding.

1. Contractor may vary the Nitrogen, Phosphorus and Potassium ratios for subsequent applications as required to produce healthy plant growth and reduce the possibility of diseases, molds, and stress from heat and cold. Variations in fertilizer mixture must be approved by the Landscape Architect prior to application.

B. Standard commercial types in moisture-proof containers. Each container shall be marked with the weight and the manufacturer's guaranteed analysis.

C. Tolerances of the chemical ingredients shall be plus or minus 2 percent.

D. No cyanamid compounds or hydrated lime will be permitted in mixed fertilizers.

2.3 GRASS SEED MIX

A. Conform to the following:

Name	Proportion by Weight	Purity	Germination
Seeding – 5 lbs/1,000 sf			
"Kenai" Kentucky Bluegrass (Poa pretensis "Kenai")	50%	90%	85%
Creeping Red Fescue (Festuca rubra "Arctared")	25%	90%	85%
Perennial Ryegrass (Lolium multiflorum)	25%	90%	85%

B. Conform to the following:

Name	Proportion by Weight	Purity	Germination
Seeding – 3 lbs/1,000 sf			
Nortran Tufted Hairgrass (Deschampsia caespitosa)	50%	90%	85%
Creeping Red Fescue (Festuca rubra "Arctared")	40%	90%	85%
Perennial Ryegrass (Lolium multiflorum)	10%	90%	85%

2.4 HYDROSEEDING MULCH

A. Wood Fibers: Hydroseeded areas to be mulched using natural wood cellulose fiber specifically manufactured for the purpose such as Weyerhaeuser Company (Silvafiber), the Conwed Corporation (Conweb), or approved equal. Paper mulch is unacceptable.

B. Dye green to facilitate metering materials application.

2.5 WATER

A. Potable.

B. Provide equipment using on-site source or Contractor provided source.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine subgrade areas for defects that will adversely affect the work.

B. Start of work shall mean acceptance of areas as capable of producing an acceptable job.

3.2 WASTE DISPOSAL

A. Dispose of unsuitable earth, debris, clippings, and unused plant materials at an approved disposal site.

3.3 SEEDING

A. Soil Preparation: Grade to smooth even line. Place topsoil to a 6 inch lightly compacted depth. Rake the seedbed lightly. Remove debris, plant growth, and irregularities.

B. Fertilizer: Apply 12 pounds of 17-17-17 fertilizer per 1,000 sf at the time of seeding.

C. Application Methods: Apply grass seed mixture specified in this Section at the rate of 5 pounds per 1,000 square feet. Seed, fertilizer, and mulch material may be placed by the following methods:

1. Hydraulic Method: Place a slurry made of seed, fertilizer, seeding mulch, and water. Mulch shall be added to the water slurry in the hydraulic seeder after the proportionate amounts of seed and fertilizer have been added. Slurry mixture shall be combined and applied to result in an even distribution of all materials. Hydraulic seeding equipment shall be capable of maintaining a continuous agitation so that a homogeneous mixture can be applied through a spray nozzle. The pump shall be capable of producing sufficient pressure to maintain a continuous, non-fluctuating spray capable of reaching the extremities of the seeding area with the pump unit located on the roadbed. Sufficient hose shall be provided to reach areas not practical to seed from the nozzle unit situated on the roadbed.

2. Dry Method: Mechanical spreader, seed drills, landscape seeder, culti-packer seeder, fertilizer spreader, or other approved mechanical spreading equipment may be used. Fertilizer shall be spread first at the specified rates and then incorporated in one operation to a minimum depth of 2 inches. Seed shall be spread over fertilizer and topsoil at specified rates. Seeded areas shall be compacted within 24 hours from the time the seeding is completed, weather and soil conditions permitting, by culti-packer, roller or other equipment satisfactory to the Landscape Architect .

a. Seeding by hand is not acceptable.

D. Watering:

1. Seed shall be watered immediately upon application.

2. Follow approved watering schedule.

3.4 MAINTENANCE/WARRANTY

A. General:

1. Begin maintenance of seeding immediately following installation.

2. Inspection of the seeding shall take place during the Substantial Completion acceptance inspection for the project. Contractor shall immediately remedy punch list items and request approval. Warranty and continuing maintenance shall commence upon execution of the Certificate of Substantial Completion. No partial acceptance will be granted for Substantial Completion.

3. Scope of Maintenance: Furnish all labor, materials, equipment, supervision, traffic control, transportation and secure all necessary permits and licenses required to maintain an attractive and healthy landscape. Meet requirements of the approved maintenance schedule.

4. Work Force: The Contractor shall have on his staff, supervisory personnel experienced in landscape maintenance. The Work Force is to be experienced and familiar with maintaining plant materials in sub-arctic conditions.

5. Materials: Shall conform to bid specifications.

6. Replacement of Damaged Improvements: Repair and replace dead or damaged improvements within 14 days of written notice from the Landscape Architect at no additional cost to the Owner.

B. Warranty:

1. Upon approval of Substantial Completion, commence warranty period and provide continuing maintenance. All work and material shall be guaranteed for a period of one year and through one full growing seasons from date of preliminary acceptance.

2. Growing season is defined as that period between May 1-September 30. If the project is completed in the fall of one year, the maintenance and warranty period will be suspended September 30 and begin again May 1 until the required maintenance and warranty provisions are satisfied.

3. Landscape Architect shall have the right to periodically inspect the site during the warranty period.

4. All seeded areas which are found to be dead, or in the determination of the Landscape Architect, in an unhealthy or unsightly condition shall be reseeded subject to the approval of the Landscape Architect at no additional expense to the Owner and shall be subject to a new maintenance and warranty for the affected materials.

C. Maintenance: Seeded Areas

1. Protect seeded areas against traffic by warning signs or barricades, as approved by the Landscape Architect. Surfaces gullied or otherwise damaged following seeding shall be repaired by regrading, reseeding, and remulching as directed by the Landscape Architect and the Contractor shall otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the Work.

2. Watering: Meet approved maintenance schedule. Seeded areas shall be watered at such frequency as weather conditions require, to maintain soil moisture to below root zone. When establishing turf areas, the soils shall be watered often enough to maintain a moist seedbed to aid in seed germination and a vigorous, healthy vegetative growth throughout the entire maintenance period.

3. Repair: Repair and replacement of all damaged or dead turf or seeded areas shall occur immediately or upon request of the Landscape Architect regardless of cause at no additional cost to the Owner.

4. Fertilization: Fertilize one month following installation with Landscape Architect approved fertilizer mix and rate.

5. Disease and Pests: An approved pesticide or insecticide shall be applied as necessary to maintain turf and seeded areas in a healthy and growing condition.

6. Cleanup: The Contractor shall keep the project site clean and free of excess equipment, materials and rubbish incidental to his work at all times. Leave walks, paving, adjacent walls and windows clean and free of clippings and mud spatter.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 33 11 00 - WATER UTILITY PIPING

A. This Section covers selection, installation, testing, and sterilization of water piping.

1.2 ABBREVIATIONS

B. NSF – NATIONAL SANITATION FOUNDATION

1.3 SUBMITTALS

A. Manufacturer's Data, catalog cuts and selections of pipe and fittings.

B. Submit data showing that pipe, fittings, and accessories in contact with domestic water are NSF 61 rated to current lead free requirements.

C. Submit DEC certificate of performance from disinfecting and flushing operations.

1. Documentation that the modified portions of the public water system were disinfected and flushed per AWWA C651. Include pipe section locations, dates, and times of flushing and disinfection.

2. Documentation that bacterial testing was performed. Provide sample locations and results of total coliform bacterial testing after flushing and disinfection as required by AWWA C651.

PART 2 PRODUCTS

2.1 PIPE

A. All main and service pipe and materials in direct contact with potable water shall meet the requirements of NSF 61 and lead-free requirements of the Reduction of Lead in Drinking Water Act.

B. Direct bury water service size 3/4-inch through 2-inch – Type K copper tubing conforming to ASTM B-88.

2.2 PIPE FITTINGS

A. Fittings shall be ductile iron, cement mortar lined and pressure rated at 350 psi. Fittings shall conform to AWWA C153 standard for compact fittings.

2.3 PIPE INSULATION

A. Direct bury appurtenances and direct bury service piping insulate with a minimum of three (3) inches of urethane foam.

B. Direct bury water main piping insulate with a minimum of three (3) inches of urethane foam

C. Urethane spray foam insulation shall be rigid closed cell, two (2) component urethane foam, Resin Technology 2045, with the following properties:

1. Conductivity: 0.14 (BTU-inch)/(square foot-hour-Fahrenheit) maximum.

2. Water absorption: 0.07 grams per centimeters cubed maximum.

3. Water vapor permeability: 2.0 perm-in maximum.

4. Compressive Strength: 25 psi minimum.

5. Nominal Density: 2.0 to 4.0 pcf

D. Protective Coatings: two (2) component, one hundred (100) percent solids, sprayable polyurethane coating, Permax 700.

E. Top coat at exposed installations: UV protective, Permax 800.

F. Applicator shall demonstrate prior experience of at least two (2) years. The Utility shall be the sole judge of the qualifications of system, application method, and applicator.

G. The Contractor shall furnish labor, materials, equipment and services necessary for, and incidental to, application of spray urethane foam. Rigid closed cell, two component.

2.4 RIGID BOARD INSULATION

A. High density extruded or expanded polystyrene, minimum sixty (60) PSI compressive strength, equivalent to R-20 per four (4”) inch thick insulation meeting ASTM C578 Type VII.

2.5 MECHANICAL PIPE SEALS AT BUILDING ENTRANCES:

A. Piping passing through concrete or cinder walls and floors shall be protected against external corrosion by a protective sheathing or wrapping or other means that will withstand any reaction from the lime and acid of concrete. Minimum wall thickness of material shall be 0.025-inch and shall allow for movement including expansion and contraction of piping.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install piping and equipment in accordance with manufacturer's recommendations, with accessories recommended by the manufacturer for service intended, and with accessories indicated.

B. Cut pipe square and clean, ream, and clear pipe of all burrs and debris.

C. Install couplings in accordance with manufacturer's recommendations.

D. For cold weather assemblies keep the temperature of the restrained joint gaskets above 40 degrees F prior to installation.

3.2 PRESSURE TESTING

A. Hydrostatically test new and existing system at 120 psig for 2 hours with no noticeable pressure drop or water leaks.

B. Report any leaks in the existing system to the Project Manager. At the option of the Project Manager, he will issue a Contract Amendment to repair leaks or he will have other maintenance personnel repair the leaks.

C. Pressure test should be performed in accordance with AWWA C600 NFPA 13 and NFPA 24. If the installed pipeline provides water to any fire protection equipment, NFPA 13 and NFPA 24 take precedence over AWWA C600.

D. All mechanical joints shall be left exposed until completion of the pressure test. All portions of the pipeline shall be adequately restrained or backfilled to counterbalance thrust forces introduced by the pressure test. All pit orifice assemblies, service tees and hydrants shall be installed prior to the pressure test. All air shall be properly vented from the pipe during charging.

3.3 DISINFECTION AND FLUSHING

A. Flush piping clear of debris or discoloration prior to sterilization.

B. All services (laterals) shall be disinfected, flushed and tested in accordance with 18 AAC 80.635 Disinfection requirements.

C. Refer to 33 21 00 Water Supply Wells for additional disinfection and flushing criteria for the well installation.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 33 21 00 - WATER SUPPLY WELLS

A. This section covers the construction, development, and testing of a Drilled Water Well and the selection and installation of accessories indicated. The intent is to provide a completed Well to the indicated depth and yield.

B. Conditions:

1. Drill well at the location shown on the Drawings or as otherwise determined.

2. The Owner shall have access to the Work to make observations, study hydrologic and geologic conditions and make special tests and studies.

3. Obtain all permits necessary for the Work and observe all applicable codes.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Tested Water Supply Well Performance Capacity: 7 GALLONS PER MINUTE.

1.3 SUBMITTALS

A. Manufacturer's Data, catalog cuts and selections of pipe and fittings are not required.

1. Catalog cuts and selections for equipment, accessories, and component parts.

2. Pump curves.

3. Operating characteristics, including capacity, head, brake horsepower and efficiency.

4. Electrical data and motor efficiency.

5. Control interface diagrams.

6. Data showing parts in contact with domestic water are ANSI/NSF 61 rated to current lead free requirements.

B. Contractor Qualifications:

1. Name and address of drilling contractor.

2. Well drilling contractor’s certificates, qualifications, and experience, including references, in water well drilling of comparable type and size to those associated

with this Project, including a list of recent water wells in which screens were installed.

C. Well Plan and Forms:

1. Project specific plan/procedures for water well drilling.

2. Copies of standard logs and report forms proposed for use on this Project.

D. Application Schedule: Submit a schedule of casing, piping and fittings listing the application, product, material, and size proposed for each application.

E. Sample: Screen selection.

F. Drill logs.

G. Well development and flow test logs.

H. Design Drawings; As-built well Construction Drawing.

I. Water test report.

J. Operation and Maintenance Data

1.4 QUALITY ASSURANCE

A. Driller shall be a member of the National and Alaska Water Well Association and have a minimum of five years local drilling experience.

B. Well shall be drilled and developed by mechanics especially experienced and qualified in this Work.

C. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with AWWA A100 for water supply wells.

PART 2 PRODUCTS

2.1 SCREEN

A. Telescoping screen of type 304 stainless steel of all fusion welded construction. Johnson Well Screen Co. or equal.

B. Constructed from triangular shaped drawn wire wrapped and welded to vertical support members. Triangle shaped wire shall have its base on exterior of screen to provide an orifice between wires with increasing flow area toward screen center.

C. Provided with necessary fittings to close the bottom and to provide a tight seal between the top of the screen and the well casing. Provide a rubber-type packer at the top. All fittings except the packer and bottom plug shall be of the same material as the screen.

2.2 WELL CASINGS

A. PVC Casing: ASTM F 480 and NSF 14 & 61 PVC, Schedule 40 bell-and-spigot pipe and couplings for solvent-cemented joints. Include NSF Listing Mark.

B. Pitless Adapter: Fitting, of shape required to fit onto casing, with waterproof seals.

C. Well Seals: Casing cap, with holes for piping and cables, that fits into top of casing and is removable, waterproof, and vermin proof.

2.3 GROUT

A. Cement: ASTM C 150, Type II.

B. Aggregates: ASTM C 33, fine and coarse grades.

C. Water: Potable.

2.4 PACK MATERIALS

A. Coarse, uniformly graded filter sand, maximum 1/8-inch in diameter.

B. Fine gravel, maximum 1/4-inch in diameter.

2.5 SUBMERSIBLE PUMP

A. Provide submersible well pump assembly complete with pump and motor. ANSI/NSF-61 certified and assembly UL778 listed. Goulds with Franklin Electric motor or equal.

B. Provide well pump controller to suit application and manufactured by the same manufacturer as the submersible well pump assembly.

C. Select submersible well pump assembly to provide capacity and head indicated. Indicated head includes riser losses and static lift requirements.

D. Provide submersible well pump assembly suitable for continuous operation at 30 percent to 140 percent of capacity requirements.

E. Provide assembly that is completely field serviceable.

F. Provide assembly with corrosion resistant, non-toxic, and non-leaching metal parts and FDA compliant non-metal parts.

G. Provided motor with sufficient length motor lead to reach pump controller.

H. Constructed to accommodate hydraulic thrust created by the pump.

I. Complete with stainless steel discharge check valve with buna “N” seat; stainless steel casing and discharge head; replaceable fluted rubber discharge head bearing; injection molded thermoplastic or stainless steel, multi-stage, mixed flow, impeller; fluted stainless steel shaft; stainless steel inlet strainer; and stainless steel motor adapter.

J. Water lubricated bearings and seals.

K. Motor

1. Corrosion resistant construction. Built-in surge arrestor on single phase motors. Stainless steel splined shaft, hermetically sealed windings. Replaceable motor lead assembly.

2. Water lubricated and cooled.

L. Pump Controller:

1. Factory wired ready for single point electrical complete with lockable disconnect switch, safety control, magnetic contactor, start button, and hand-off-auto switch.

2. Enclosure suitable for application and installation.

3. Safety Control: Solid state, load-sensing control that monitors motor load and automatically shuts down motor when motor load drops below preset level for a preset time. Field adjustable, auto reset, time delay.

2.6 PIPE

A. Riser: ANSI/NSF-61 certified schedule 40 galvanized steel pipe with 300 pounds per square inch galvanized malleable iron couplings and 21 feet maximum joint lengths.

B. Discharge pipe: ANSI-NSF-61 certified schedule 40 galvanized steel pipe with 300 pounds per square inch galvanized malleable iron fittings. Wrap fittings and exposed threads with two layers of dielectric pipe wrap.

2.7 PITLESS ADAPTER

A. Designed to provide below grade discharge from casing, well pump support from casing, pump removal without disruption of casing or requiring excavation and passage of electrical wiring from well cap to pump within the casing. ANSI/NSF-61 certified for potable water applications.

2.8 WELL CAP

A. Designed to provide a watertight, non-ventilating seal of well casing top, provide watertight entry of pump electrical service and allow easy removal of pump without disconnection of electrical service.

B. Complete with tapping for code size raceway for conductors furnished.

2.9 ELECTRICAL CABLE

A. Provide sufficient three conductor cable to extend from pump to pump controller.

B. Cable shall be manufactured and insulated for water well use.

C. Size cable to limit voltage drop to maximum of seven percent at motor terminals.

PART 3 EXECUTION

3.1 WELL DRILLING

A. Drill well with down hole hammer air rig or cable tool rig without the use of drilling mud or other similar materials. Drive well casing concurrently with advancement of hole.

B. Keep an accurate record of the location of top and bottom of each stratum penetrated and have a sample of at least ten pounds of the material taken from every change in soils gradation. The sample containers furnished by the Contractor shall be heavy cotton bags at least seven ounce weight or approved equal.

C. Attach label to sample bag designating the exact top and bottom depth at which the sample was taken and a description of the material and how it was collected.

D. Keep an accurate record of the grade, size and length of the individual pieces of casing as assembled and installed and note the exact position of each casing.

E. Maintain a well log, current with drilling activities, describing the ease or difficulty of drilling, the nature of the material encountered, the Work accomplished each day, including items such as depths drilled, casing set, amount of sand removed during surging and developing Work, the water level in the well at the beginning and end of each shift, the depth at which water was lost at any time during drilling, and all other pertinent data.

F. Drill plumb and true to line to allow screen and pump installation without binding. Variations that may affect operation will not be accepted.

G. Drill well to depth required to provide minimum capacity indicated without well pump loss of suction or surging at capacity operation, taking into account normal seasonal water fluctuations. Well depth indicated is estimate of probable required depth and shall only be used as a guide and not a contract minimum or maximum.

3.2 PROTECTION OF WATER QUALITY

A. Take all precautions necessary or required to permanently prevent contaminated water, or water having undesirable physical or chemical characteristics from entering through or around the well bore or into the stratum from which the well is to draw its supply.

B. Take all necessary precautions during the construction period to prevent contaminated water, fuel, or other contaminants from entering the well either through the opening or by seepage through the ground surface.

C. In the event the well becomes contaminated, or water having undesirable physical or chemical characteristics, does enter the well due to neglect of the Contractor they shall, at their own expense, perform such Work and supply such casings, seals, sterilizing agents or other material as necessary to eliminate the contamination and to shut off the undesirable water. Take water samples in accordance with "Well Completion" paragraph below.

3.3 SCREEN

A. After final well depth is reached, procure samples of materials from the aquifer, and based on laboratory analysis of samples, provide well screen of such length and slot openings as required for maximum withdrawal, free from sand, and with the highest efficiency available.

B. The sample analysis shall be made by the well screen manufacturer or an approved laboratory from well samples. Screen selection shall be by screen manufacturer or authorized agent. Determine the size opening and length in accordance with the effective size and uniformity coefficient of the sands found in the water-bearing strata, and as recommended by the manufacturer. Minimum screen length shall be ten feet.

C. Insert screen into casing and set at bottom of well, then pull casing to expose entire screen but not beyond screen packer.

D. Set screen by sealing to bottom of casing with approved packer recommended by manufacturer of screen.

3.4 DEVELOPMENT

A. After installation of the screen, thoroughly surge and develop aquifer around the screen using techniques approved by the manufacturer of the screen.

B. Construct well in such a way that the full yield of the formation can be transmitted into the well free from sand (less than two parts per million sand by weight).

C. Extract from the well casing sand drawn through the screen into the well during well development.

D. Exercise extreme care in the performance of well development in order to prevent the breakdown or caving in of strata overlying that from which the water is to be drawn.

E. The screen must have no change of alignment after installation.

F. Direct runoff to existing natural drainage through a sedimentation pond provided by Contractor.

3.5 TESTING

A. After the well has been completely constructed, developed, cleaned out and depth accurately measured, notify the Contracting Officer and make all necessary arrangements for conducting the final yield and drawdown test. Yield and drawdown tests shall be made in the well prior to acceptance.

B. Test pump well with air or high capacity temporary pump. Test pump capacity shall not be less than 200 percent of indicated or specified required capacity.

C. Furnish all necessary pumps, compressor, plungers or other needed equipment and test the well by such accepted methods as necessary to determine the maximum yield of water-per-foot of drawdown and the GPM against drawdown in five GPM increments.

D. Furnish, install, and maintain equipment of approved size and type for measuring the flow of water such as weir box, orifice or water meter, accurate to within ten percent of actual

flow and an airline complete with gauge, hand pump, and check valve to measure the depth of water at any time.

E. The yield at the beginning of any test will not be considered as the true yield if the water level is dropping. Measure yield after the water level in the well has become stationary.

F. Make observations of returning water levels after pumping has ceased.

G. The estimated yield of the well or of the stratum will be determined by the average output in gallons per minute during 12 hours of the test, provided, however, that during such period the rates of discharge and the water level in the well have remained substantially in equilibrium.

H. After completion of the final acceptance test, remove any sand or other objectionable material that may have accumulated in the well during testing operations.

I. Dispose of water pumped from the well to natural drainage accepted by the Contracting Officer. Dispose of all water in a manner that will not create a hazard to roads, buildings, or other property. Conduct water far enough away from the well so it is not recirculated.

3.6 WELL COMPLETION

A. Install and set pump at well depth indicated.

B. Excavate to pitless adapter depth. Install pitless, upper casing and discharge pipe.

C. Seal well casing below pitless adapter to adjacent undisturbed soil with a minimum of 50 pounds of high-grade bentonite or 2,000 psi concrete.

D. Backfill excavation and install new well pump, riser, cover and associated electrical. Wrap exposed threads of riser pipe with plastic electrical tape.

E. Following DEC regulation 18 AAC 80, Drinking Water, before use, a newly constructed well must be flushed of sediment and disinfected as specified in ANSI/AWWA Standard C654-03, Disinfection of Wells, adopted by reference in 18 AAC 80.010(b).

F. After disinfection period, pump well with project pump until residual chlorine is less than 0.1 ppm. During pumping period demonstrate that well and pump will provide required head and capacity for a minimum period of one hour.

G. Take well water samples and have approved independent testing laboratory test water sample as required by Alaska Department of Environmental Conservation and as required to determine the following information: acidity, alkalinity (P) and (M), calcium content, chloride content, conductivity, hardness, iron content, magnesium content, manganese content, nitrate content, nitrite content, phosphate content (ortho and poly), residue content (filterable and non-filterable), silica content, sodium content, sulfate content, sulfide content, zinc content, color, turbidity, total dissolved solids content, and Langelier Index. Report findings to the Contracting Officer.

H. Repeat disinfection, sampling, testing, and reporting if coliform content is not within acceptable limits.

3.7 ABANDONMENT

A. If the well will not produce adequate capacity, the Owner may choose to abandon the well and commence drilling in another location.

B. The abandoned well shall be capped four feet below grade and cap covered with a minimum of two cubic feet of concrete prior to backfilling to original grade.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE: SECTION 33 31 00 - SANITARY UTILITY PIPING

A. This Section covers selection, installation, and testing of sanitary sewer piping.

1.2 SUBMITTALS

A. Manufacturer's Data, catalog cuts and selections of pipe and fittings.

B. Fusion Joints

1. All persons performing the fusion process shall have been trained and qualified by a company that has been trained in the correct method of butt fusion and electro fusion in accordance to ASTM F 2620-06 PPI TN-42 / TR-33. All persons shall be trained, and qualified annually. The fusion operator shall be thoroughly familiar with and trained on the equipment being used. Submit fusion technician qualifications for all pipe diameters and SDR's fused on project.

2. All fusion equipment (butt fusion and electro fusion) used on this project shall have been certified to show that it is in good working order. All butt fusion equipment shall have an annual certification sticker and all electro fusion equipment shall have been recalibrated and tested every two years. The sticker will show the certification date and location and company that preformed the certification. The selected butt fusion equipment shall be capable of meeting all parameters of the job. The equipment shall have jaws or reducing inserts designed to properly hold the size of the pipe being fused, it shall be able to generate enough force to reach the required fusion pressure during all fusion conditions. Submit fusion equipment certifications.

3. A minimum of one fusion sample shall be preformed and tested upon each shift start-up, and or upon each new fusion operator's shift. Each sample will be tested and logged in to the fusion sample log. If the test sample does not pass another sample will be taken 180 degrees from the first sample and re-tested, if this test sample also fails all butt fusion activities shell be stopped until a passing test has been preformed. Acceptable methods of testing will be bend back test, in field tensile tester, guided side bend tester, and or a qualified testing facility that performs these test as part of their normal operation. A hand operated fusion unit and electro fusion test log shall be kept and turned in upon the completion of the project.

PART 2 PRODUCTS

2.1 PIPE, FITTINGS, AND JOINTS

A. Gravity service piping, 4-inch and larger

1. Direct bury, HDPE (High Density Polyethylene) pipe manufactured in accordance with AWWA C906 from PE4710 polyethylene compounds that meet or exceed ASTM D3350. Material cell classification of 445574, color and ultraviolet stabilizer of code C per ASTM D3350. Shall conform to standard iron pipe size outside dimensions (IPS) having a wall thickness with a standard dimensional ration (SDR) of 17.

2.2 PIPE FITTINGS

A. For HDPE pipe electrofusion fittings must comply with ASTM F1055 or butt fusion welded in accordance with ASTM F2620.

B. Fittings for transitions between HPDE pipe and dissimiliar material must comply with ASTM C1173

2.3 INSULATION

A. Direct bury appurtenances and direct bury service piping insulate with a minimum of three (3) inches of urethane foam.

B. Urethane spray foam insulation shall be rigid closed cell, two (2) component urethane foam, Resin Technology 2045, with the following properties:

1. Conductivity: 0.14 (BTU-inch)/(square foot-hour-Fahrenheit) maximum.

2. Water absorption: 0.07 grams per centimeters cubed maximum.

3. Water vapor permeability: 2.0 perm-in maximum.

4. Compressive Strength: 25 psi minimum.

5. Nominal Density: 2.0 to 4.0 pcf

C. Protective Coatings: two (2) component, one hundred (100) percent solids, sprayable polyurethane coating, Permax 700.

D. Top coat at exposed installations: UV protective, Permax 800.

E. Backfill shall not take place until all insulation has been inspected. Backfill shall be placed so that pipe insulation will not be damaged.

2.1 RIGID BOARD INSULATION

A. High density extruded or expanded polystyrene, minimum sixty (60) PSI compressive strength, equivalent to R-20 per four (4”) inch thick insulation meeting ASTM C578 Type VII.

2.2 MECHANICAL PIPE SEALS AT MANHOLES AND BUILDING ENTRANCES:

A. Manholes: Watertight, modular mechanical type, consisting of interlocking links shaped to continuously fill the annular space between the pipe and wall opening. Thunderline Link-Seal, Metraflex, or equal. Pipe penetrations shall be sealed with non-shrink grout inside and out.

B. Piping passing through concrete or cinder walls and floors shall be protected against external corrosion by a protective sheathing or wrapping or other means that will withstand any reaction from the lime and acid of concrete. Minimum wall thickness of material shall be 0.025 inch and shall allow for movement including expansion and contraction of piping.

2.3 CLEANOUT

A. Provide cleanout at 5 feet from building maximum, where changes in alignment or grade exceed 45 degrees, at every 200 feet along exterior runs, and where indicated. Wastewater clean-outs will be installed using a combination and HDPE pipe riser with threaded plastic clean out end cap.

C. Cleanout cover assembly: cast iron, East Jordan Iron Works 221 or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

D. Install piping and equipment in accordance with manufacturer's recommendations, with accessories recommended by the manufacturer for service intended, and with accessories indicated.

E. Cut pipe square and clean, ream, and clear pipe of all burrs and debris.

F. Pitch drainage piping down ¼ inch per foot in direction of flow unless otherwise indicated.

G. Final accuracy of gravity sanitary sewer main installations shall be within one-hundredths (1/100) of a foot vertically and one-half (1/2) of a foot horizontally of the exact location taken from the project plans. In addition, no single section of pipe shall vary by more than ten (10) percent from the grade shown on the project plans. In no case will a reverse or flat grade be allowed. Pipe which exceeds the above limits of variation shall be adjusted immediately and no further pipe shall be laid until so authorized by the Utility.

H. Provide a minimum of six-inch layer of sand or pea gravel bedding below buried piping unless otherwise shown on drawings.

I. Fusion Joints

1. Butt Fusion Procedure Parameters: Generic Fusion Interface Pressure Range 60-90 psi. Generic Heater Surface Temperature Range 400-450 degrees F.

2. Securely fasten the components to be joined.

3. Clean the inside and outside of the pipe to be joined by wiping with a clean lint-free cloth. Remove all foreign matter.

4. Face the pipe ends: The pipe ends must be faced to establish clean, parallel mating surfaces. Remove any pipe chips from the facing operation and any foreign matter with a clean, lint-free cotton cloth. A visual inspection of this operation should verify that faces are square, perpendicular to the pipe centerline on each pipe end and with no detectable gap. Align the pipe profile.

5. After joining the pipes and holding, avoid pulling, installation or rough handling for an additional 30 minutes. Additional time may be required for pipes with a wall thickness greater than 2 inches.

6. Visual inspection:

   a. Visually inspect and compare the joint against the manufacturer's recommended appearance guidelines. Visually, the width of butt fusion beads should be approximately 2-2½ times the bead height above the pipe and the beads should be rounded and uniformly sized all around the pipe circumference. The v-groove between the beads should not be deeper than half the bead height above the pipe surface.

   b. Visually unacceptable joints should be cut out and re-fused using the correct procedure.

3.2 TESTING

J. During testing, isolate piping system equipment and accessories that are not rated to withstand test pressures or perform test prior to connection of such equipment and accessories to the piping system.

K. Plastic gravity sewer lines to be tested in accordance with ASTM F 1417. Test sections shall be isolated and initially pressurized to four (4) psi. After stabilization, reduce the pressure to three point five (3.5) psi before starting the test. If a one (1) psi drop does not occur within the test time, the line has passed. If the pressure drop is more than one (1) psi during the test time, the line is presumed to have failed the test. For minimum test time see table below.

Nominal Pipe Size (inch)	Time (minutes/100ft)
4	3.8
6	5.7

L. Force main shall be pressure tested per the latest revision of AWWA C600 at 1.5 times the shutoff head of the connected pump(s) or one hundred fifty (150) psi, whichever is greater.

3.3 CLEANING

A. When all installation work is complete, remove debris from all pipe, manholes, wet wells etc. The mains and manholes shall be flushed with water to the satisfaction of the Utility.

END OF SECTION

Geotechnical Report

June 26, 2025

John Rowe, PLA, ASLA
Design Alaska, Inc.
601 College Road
Fairbanks, AK 99701

Subject: Geotechnical Engineering Services
PMC Seed House Addition

In accordance with the request of Design Alaska, Inc. (Client), HDL Engineering Consultants, LLC (HDL) conducted a geotechnical engineering evaluation for the proposed development located at 5310 Bodenburg Spur Road in Butte, Alaska (Site). This letter report (Report) provides the findings, conclusions, and recommendations that HDL derived from the geotechnical evaluation. This Report includes a description of the project, description and results of the subsurface exploration and laboratory testing, and geotechnical recommendations. This Report is subject to the attached limitations.

BACKGROUND

The proposed development is located at the Alaska Plant Materials Center in Butte, Alaska. HDL understands the proposed development consists of an addition to the existing seed house. The conceptual plan provided by the Client indicates the proposed addition will be approximately 60 feet long and 12 feet wide and located on the east side of the existing seed house. HDL understands a shallow, insulated, thickened edge slab-on-grade foundation will support the proposed heated addition.

Historical explorations performed near the Site generally encountered silty soils extending from the ground surface to depths ranging from 2 feet to 6 feet below the existing ground surface (bgs) followed by sand and gravel extending to the depths explored. The explorations encountered free groundwater at depths ranging from 7 feet to 12.5 feet bgs. The Client informed HDL that the property owner previously cleared most of the Site and removed and replaced surface organics with granular fill.

SETTING

The following section provides information about the geologic and climatic setting for the Site.

General Geology

The project area is located within the Cook Inlet-Susitna Lowland Section of the Coastal Trough physiographic province of Alaska. The Talkeetna Mountains border the province on the east,

the Alaska Range lies to the north and west, and the Cook Inlet lies to the south. Glacial features including ground moraines, drumlins, eskers, and outwash plains characterize the Cook Inlet-Susitna Lowlands. Kame and kettle topography, indicative of glacial outwash plains, is common and forms many of the hills and small rounded lakes that exist in the project area. The Quaternary Period included five major glacial advances across the area (Wahrhaftig, 1965).

The project is located in a region of moderate seismicity and large-scale earthquakes may cause ground ruptures in some areas. Based on the United States Geologic Survey (USGS) earthquake catalog, there were 123 events above Richter Magnitude 5 within 100 miles of the Site from 1898 through 2024, of which 23 were above Richter Magnitude 6. The 1964 Great Alaska Earthquake affected this area as well and had a Richter Magnitude of 9.2.

Climatology

The project area is located in a transitional climatic zone varying between continental and maritime climates. Pronounced diurnal and annual temperature variations, moderate annual precipitation, and moderate surface winds characterize the zone (Shulski et. al, 2007). The average January temperatures in the area range between 9.0°F and 22.6°F, while average July temperatures range between 47.8°F and 65.7°F. Average annual precipitation is 17.99 inches and average annual snowfall is 82.5 inches (Alaska Climate Research Center, 2020). The data provided is for the Lazy Mountain monitoring station and conditions at the Site may vary.

SUBSURFACE EXPLORATION

HDL evaluated the subsurface conditions near the proposed development on March 12, 2025. The subsurface evaluation consisted of 3 borings, designated HDL-01 through HDL-03. HDL located the borings in the field using a recreational-grade GPS. Boring elevations were approximated using elevation data from Google Earth. The attached Boring Location Map illustrates the approximate boring locations.

Discovery Drilling, Inc. (Discovery) provided drilling services using a truck-mounted CME-75 and hollow stem augers to drill the borings to a maximum depth of 42.0 feet bgs. Discovery conducted split-spoon sampling (designated by LSS, Large Split Spoon, on the boring logs) using the Modified Penetration Test procedure. In the Modified Penetration Test, blows of a 340-pound hammer free-falling 30 inches onto the drill rod drive a 24-inch-long, 3-inch outside diameter split spoon sampler into the bottom of the advancing hole to recover samples. The number of blows required to advance the sampler the second and third 6-inch interval is termed the Penetration Resistance, or N-value. Onsite personnel recorded the N-value for each sample. The N-values give a measure of the relative density (compactness) or consistency (stiffness) of cohesionless and cohesive soils, respectively.

HDL performed fieldwork in general accordance with the procedures outlined in the Alaska Department of Transportation and Public Facilities (DOT&PF) "Alaska Geotechnical Procedures Manual". An

experienced HDL geotechnical engineering assistant located the borings, collected samples, and logged subsurface conditions. We described the subsurface conditions in accordance with the following methods and standards:

- ASTM International Standard (ASTM) D2488 for field description of soils;
- Frost Design Soil Classification using the US Army Corps of Engineers (USACE) methodology;
- Description and Classification of Frozen Soils from the DOT&PF Alaska Field Guide for Soil Classification; and,
- Unified Soil Classification System (ASTM D2487) to confirm or modify soil classifications based on laboratory test results.

The attached Boring Log Key, Frost Design Soil Classification Key, Description and Classification of Frozen Soils, and boring logs provide further reference.

LABORATORY TESTING

HDL conducted the following laboratory tests on select soil samples at our AASHTO accredited and USACE validated laboratory:

- Twenty-one (21) natural moisture content tests (ASTM D2216);
- Three (3) grain size distribution tests (ASTM D6913); and,
- One (1) hydrometer tests (ASTM D7928).

The attached boring logs and grain size distribution curves present the results of the laboratory tests.

SUBSURFACE CONDITIONS

In general, the borings encountered a thin organic mat at the surface underlain by a layer of silty gravel followed by well-graded gravel with sand and varying amounts of cobbles extending to the depths explored.

Silty Gravel

The borings generally encountered silty gravel with sand beneath the organic mat to depths ranging from approximately 1.5 feet to 2.5 feet bgs. Table 1 provides a summary of laboratory testing results in this layer.

Table 1: Silty Gravel Laboratory Results Summary

Boring	Depth	Grain Size Distribution		
	(ft)	% Gravel	% Sand	% P200
HDL-02	0.3	41.4	32.0	26.6

Well-Graded Gravel

The borings generally encountered well-graded gravel with sand and varying amounts of cobbles beneath the silty gravel extending to the depths explored. The N-values of the sand and gravel ranged from 5 to 30, indicating loose to medium dense soils, with most of the soils classifying as medium dense. The gravel generally classified as non-frost susceptible (NFS). Table 2 provides a summary of laboratory testing results in this layer.

Table 2: Well-Graded Gravel Laboratory Results Summary

Boring	Depth	Grain Size Distribution		
	(ft)	% Gravel	% Sand	% P200
HDL-02	2.9	64.9	31.3	3.8
HDL-03	2.0	60.6	36.6	2.8

Groundwater

HDL-02 encountered free groundwater at 10.8 feet bgs at the time of drilling. Groundwater levels at the Site may fluctuate depending on the season, temperature, and precipitation. Groundwater levels during construction may be higher or lower than those encountered.

ENGINEERING ANALYSIS & RECOMMENDATIONS

Design of the proposed development must consider the bearing support capabilities of the Site soils as well as seismic loading, expected settlements, and effects of seasonal frost action. The sections below provide a summary of the geotechnical considerations and preliminary recommendations.

Site Preparation and Fill

Remove and replace soft or unstable soils or other deleterious materials encountered during excavation with compacted Structural Fill. We recommend the exposed subgrade be proof-rolled to provide a level, firm, uniform, and unyielding surface prior to the placement of fill or construction.

The borings encountered organic and silt-rich soils in the upper 2.5 feet. If left in place, these soils will increase the risk of frost related issues and differential settlement at the Site. Remove the silt-rich soils beneath the proposed addition and within the foundation influence zone and replace it with compacted fill. The foundation influence zone is the area defined by extending a line outward and downward from the bottom edges of the footing on a slope of 1 (horizontal) to 1 (vertical).

Structural Fill placed within 12 inches of the proposed footings should consist of a reasonably well graded mixture of sand and gravel meeting the DOT&PF Standard Specifications for Highway Construction (Specifications) requirements for Structural Fill, as detailed in Section 703-2.13. The well-graded gravel encountered beneath the silty surface soils generally does not meet these requirements.

Fill placed more than 12 inches beneath the proposed foundations and within the foundation influence zone should consist of a reasonably well graded mixture of sand and gravel meeting the Specifications requirements for Selected Material, Type A, as detailed in Section 703-2.07. The well-graded gravel encountered beneath the silty soils generally meets these requirements.

HDL recommends fill placed less than 6 inches beneath the slab should meet the Specifications requirements for Base Course, Gradation D-1 to support construction.

Fill placed outside of the foundation influence zone should consist of a reasonably well graded mixture of sand and gravel meeting the DOT&PF Specifications requirements for Selected Material, Type C or better. The granular soil encountered beneath the organic mat generally meets these requirements.

Place fill in lifts with a maximum loose thickness of 10 to 12 inches, and compact the lifts to a density of at least 95 percent of the maximum dry density as determined by ASTM D1557. During fill placement, remove cobbles and boulders with dimensions in excess of 2/3 the lift thickness.

Foundations

Design of the proposed structure's foundation must consider the bearing capability of the supporting soils, behavior during a seismic event, the effects of seasonal frost action, and the expected total and differential settlements. The foundation system must also consider the risk of failure and the cost of construction.

Shallow Insulated Foundation

Assuming the proposed addition meets the assumptions outlined in this Report and based on conditions encountered, an insulated shallow spread footing foundation system can support the proposed addition. The Client indicated that a thickened edge slab-on-grade is the preferred foundation configuration. Insulate the foundations and heat the structure to account for potential effects of seasonal frost action.

Foundation Recommendations

Footings should bear a minimum of 16 inches below finished grade and be a minimum of 16 inches wide.

Construct foundations immediately after subgrade preparation to protect the soil bearing surface and backfill foundation excavations as soon as possible after foundation construction.

Bearing Capacity

The proposed addition foundations will bear upon compacted Structural Fill. If the soils beneath the proposed foundations are consistent with and prepared in accordance with the requirements provided in this Report, we recommend using an allowable soil bearing capacity provided in Table 3.

Table 3: Thickened Edge Slab Foundation Bearing Capacity

Footing Width (in)	Footing Depth (in)	Allowable Bearing Capacity (psf)
16	16	3,000
18	18	3,500

Increase the above bearing values by one-third for seismic or wind loading conditions.

Insulation

Place a minimum of 3 inches of hydrophobic rigid foam board insulation vertically along the foundation and horizontally along the exterior of the foundation extending a minimum of 4 feet beyond the building. The horizontal insulation requirement includes the area adjacent to the existing building near the northwest corner of the proposed addition foundation. If sub-slab insulation is added, increase the thickness of the vertical and horizontal insulation by the thickness of the sub-slab insulation. The insulation board should meet AASHTO M 230, Type VI, except that extrusion is not required and the maximum water absorption should not exceed 0.3% by volume, as determined by ASTM C272. Compressive strength at yield of 10% deformation should not be less than 40 pounds per square inch (psi). Thermal resistance (R-value) should not be less than 4.5 (°F·ft2·hr/Btu) per inch at 75°F as determined by ASTM C177.

Prior to placing the insulation, the exposed subgrade soils and structural fill should be smooth, compacted, unyielding, and free of snow, ice, deleterious material, debris, and rocks exceeding 3-inches in diameter. Butt all joints tightly and cover the insulation with a minimum of 12 inches of material to reduce the potential for damage. The contractor should be responsible for ensuring the equipment used does not damage the insulation during construction.

Refer to ASCE 32 for further recommendations regarding design and construction of the insulated foundations.

Seismic Analysis

HDL recommends the use of the site characterization criteria found in the 2021 International Building Code (IBC) for design. Chapter 16, Section 1613 of the IBC holds the seismic design criteria. The IBC requires that soil and rock parameters determine the site characterization. Based on the subsurface conditions encountered, we considered the Site to be Seismic Site Class "D". We obtained the maximum considered earthquake ground motion spectral response accelerations for short period and for one-second peaks using the Seismic Design Maps created by Structural Engineers Association of California and California's Office of Statewide Health Planning and Development. Seismic Design Maps is a web interface that uses USGS web services to retrieve seismic design data; results of which we have summarized in Table 4.

Table 4: Seismic Design Criteria

IBC Seismic Design Criteria	Value
Spectral Response at Short Periods, Ss	1.5
Spectral Response at 1-Second Period, S_1	0.695
Site Modified Peak Ground Acceleration, PGA_m	0.6
Site Class	D
Site Coefficient Fa	1.2
Site Coefficient Fv	1.7
Site Adjusted Spectral Response at Short Periods, S_{MS}	1.8
Site Adjusted Spectral Response at 1-Second Periods, S_{M1}	1.182

Liquefaction Potential and Cyclic Softening

The extent of liquefaction and potential for cyclic softening is dependent on the groundwater elevation, which fluctuates depending on the season, temperature, and precipitation. Generally, the risk of seismically induced settlement or seismically induced cyclic softening decreases as the groundwater lowers and increases as it raises. Liquefaction analyses using the methods of Youd and Idriss (2001), Idriss and Boulanger (2014), and groundwater levels at the time of drilling indicate that a zone of potentially liquefiable sand and gravel is present at the Site extending from a depth of 10 feet bgs to the depths explored. Based on the conditions encountered and methods of Tokimatsu and Seed (1987) and Idriss and Boulanger (2014) we estimate the building may experience approximately 5 inches to 7.5 inches of seismically induced settlements during the design earthquake. The quantity of settlement could be greater if the potentially liquefiable soils extend deeper than explored or groundwater levels raise.

Static Settlement

The total settlements experienced by the proposed improvements are dependent upon the actual loads that are applied and the care of the placement and compaction of structural fills. For the foundations designed as recommended above, we estimate that total settlements of approximately 1-inch could be realized and differential settlements will be approximately one-half the total.

Frost Susceptibility

Butte is in a region of moderate freeze and thaw cycles. The well-graded gravel encountered beneath silty surface soils are considered non-frost susceptible (NFS); however, borings encountered silt-rich soils in the shallow subsurface. If left in place, these silt-rich soils will increase the risk of frost related issues at the Site. Heat the structure and remove the silt-rich soils to reduce the potential effects of seasonal frost action on the proposed addition. Frost related movement may occur if the building is not heated.

Drainage and Dewatering

HDL-02 encountered groundwater at 10.8 feet bgs. Based on the drilling conducted, groundwater is not likely to be encountered during typical foundation construction but the groundwater level will likely vary from that encountered during drilling. If groundwater is present in excavations, the soils will be prone to collapse and construction may be difficult. The subgrade soils may become difficult to compact due to natural moisture or exposure to additional rainfall or runoff. Dewater excavations as needed to place and compact fill and protect them from adjacent runoff.

HDL recommends grading the Site to promote positive drainage away from the structure and compacting the near surface soils to reduce permeability.

Excavations and Shoring

HDL assumes the need for temporary excavations to support the foundation construction and removal of silt rich soils. We recommend that the contractor be responsible for the trench side slopes, trench bottom conditions, and dewatering efforts as they are present on a day-to-day basis and can adjust efforts to obtain the needed stability and meet the applicable Alaska and Federal Occupational Safety and Health Administration (OSHA) safety regulations. Deviation from the OSHA stipulations requires the approval of a licensed Professional Geotechnical Engineer.

Shoring may be required if unstable soils are encountered. Account for additional loads from adjacent equipment, hydrostatic pressure, and structures in the pressure distribution for shoring design.

Heavy precipitation may cause soils to become saturated and less stable. The contractor should phase construction to minimize exposure of the subgrade and direct surface water away from the excavations.

LIMITATIONS

This Report is subject to the attached limitations.

We appreciate the opportunity to assist you with this important project. If you have any questions, please contact Jeremy Dvorak at jdvorak@hdlalaska.com or 907.564.2121.

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Attach:
Limitations – 2 Pages
Boring Location Map – 1 Page
Boring Log Key – 1 Page
Frost Design Soil Classification – 1 Page
Description and Classification of Frozen Soils – 1 Page
Boring Logs – 5 Pages
Grain Size Distribution Test Results – 1 Page

GEOTECHNICAL LIMITATIONS

Use of Report

1. HDL Engineering Consultants, LLC (HDL) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to HDL.

2. If substantial time has elapsed between submission of this report and the start of work at the site, or if conditions have changed because of natural causes or construction operations at or adjacent to the site, we recommend that HDL be retained to review this report to determine the applicability of the conclusions considering the time lapse or changed conditions.

Standard of Care

3. HDL's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in the Proposal for Services and/or Report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location(s), or the design has been altered in any way, HDL shall be so notified and afforded the opportunity to revise the report, as appropriate, to reflect the unanticipated changed conditions.

4. HDL's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

Subsurface Conditions

5. The generalized soil profile(s) provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs.

6. Unanticipated soil conditions are commonly encountered and cannot be fully determined by merely taking soil samples or advancing borings. Such unexpected conditions frequently require additional expenditure to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

7. In preparing this report, HDL relied on certain information provided by the Client, state

and local officials, and other parties referenced therein which were made available to HDL at the time of our evaluation. HDL did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

8. Water level readings have been made in test holes (as described in the Report) and monitoring wells at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this Report. Fluctuations in the level of the groundwater occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The water encountered in the course of the work may differ from that indicated in the Report.

9. HDL's services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.

10. Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

Compliance with Codes and Regulations

11. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

Additional Services

12. HDL recommends that we be retained to provide services during any future: site observations, design, implementation activities, construction and/or property development/redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

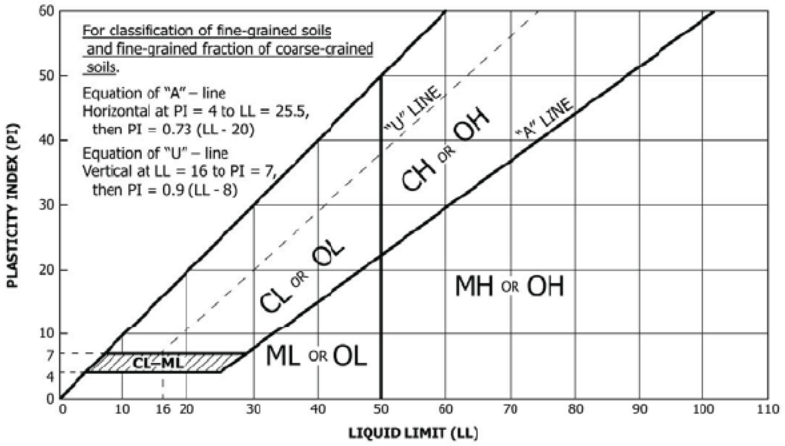
HDL ENGINEERING Consultants LLC	**PREPARED BY** HDL Engineering Consultants, LLC Anchorage, AK	**PROJECT** Name: PMC Seed House Addition Number: 25-104	**LOCATION** 61.522136, -149.080743 Palmer, AK	**SYMBOL KEY** Soil Boring

BORING LOG KEY

Summary of the Unified Soil Classification System (from ASTM International Standard D2487)[A]				Soil Classification	
				Group Symbol	Group Name[B]
Coarse-grained Soils (*More than 50% retained on No. 200 sieve*)	Gravels (*More than 50% of coarse fraction retained on No. 4 sieve*)	Gravels with < 5% fines[C]	$C_u \geq 4$ and $1 \leq C_c \leq 3$[D]	GW	Well-graded gravel[E]
			$C_u < 4$ and/or [$C_c < 1$ or $C_c > 3$][D]	GP	Poorly graded gravel[E]
		Gravels with > 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[E,F,G]
			Fines classify as CL or CH	GC	Clayey gravel[E,F,G]
	Sands (*50% or more of coarse fraction passes No. 4 sieve*)	Sands with < 5% fines[H]	$C_u \geq 6$ and $1 \leq C_c \leq 3$[D]	SW	Well-graded sand[I]
			$C_u < 6$ and/or [$C_c < 1$ or $C_c > 3$][D]	SP	Poorly graded sand[I]
		Sands with > 12% fines[H]	Fines classify as ML or MH	SM	Silty sand[F,G,I]
			Fines classify as CL or CH	SC	Clayey sand[F,G,I]
Fine-grained Soils (*More than 50% passes the No. 200 sieve*)	Silts and Clays (*LL<50*)	Inorganic	PI>7 and plots on or above "A" line[J]	CL	Lean clay[K,L,M]
			PI<4 or plots below "A" line[J]	ML	Silt[K,L,M]
		Organic	LL - Oven dried/LL - Not dried <0.75	OL	Organic clay/silt[K,L,M,N/O]
	Silts and Clays (*LL≥50*)	Inorganic	PI plots on or above "A" line	CH	Fat clay[K,L,M]
			PI plots below "A" line	MH	Elastic silt[K,L,M]
		Organic	LL - Oven dried/LL - Not dried <0.75	OH	Organic clay/silt[K,L,M,P/Q]
Highly Organic Soils	Primarily organic matter, dark in color, and organic odor			PT	Peat

NOTES:
Visual soil descriptions performed in accordance with ASTM D2488
Lowercase USCS abbreviation indicates field classification
Uppercase USCS abbreviation indicates laboratory classification

[A]Based on the material passing the 3-in. (75-mm) sieve
[B]If field sample contained cobble or boulders, or both, add "with cobbles or boulders, or both" to group name
[C]Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC Well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay
[D] $C_u = D_{60}/D_{10}$, $C_c = (D_{30})^2/(D_{10} \times D_{60})$
[E]If soil contains ≥ 15% sand, add "with sand" to group name
[F]If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM
[G]If fines are organic, add "with organic fines" to group name
[H]Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay
[I]If soil contains ≥15% gravel, add "with gravel" to group name
[J]If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay
[K]If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant
[L]If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name
[M]If soil contains ≥ 30% plus No. 200, predominatly gravel, add "gravelly" to group name
[N]PI ≥ 4 and plots on or above "A" line
[O]PI < 4 or plots below "A" line
[P]PI plots on or above "A" line
[Q]PI plots below "A" line



GRAIN SIZE		
Size Class	Inches	mm
Boulders	>12 inches	>300
Cobbles	3 to 12	75 - 300
Gravel		
Coarse	3/4 - 3	19.0 - 75
Fine	3/16 - 3/4	4.76 - 19.0
Sand		
Coarse	1/16 - 3/16	2.0 - 4.76
Medium	1/64 - 1/16	0.42 - 2.0
Fine	1/256 - 1/64	0.074 - 0.42
Silt and Clay	<1/256	<0.074

SOIL CONSISTENCY*		
Description	N-Value	Pocket Pen.
Very Soft	<2	<0.25
Soft	2 - 4	0.25 - 0.5
Medium	5 - 8	0.5 - 1.0
Stiff	9 - 15	1.0 - 2.0
Very Stiff	16 - 30	2.0 - 4.0
Hard	>30	>4.0

RELATIVE SOIL DENSITY*	
Description	N-Value
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	>50

*Soil Consistency and Relative Soil Density Tables based on values provided in the Alaska Geotechnical Procedures Manual

FROST DESIGN SOIL CLASSIFICATION

US Army Corps of Engineers (USACE) Methodology

The following frost design soil classification was developed by the USACE for describing the potential frost susceptibility of soils. The standard is published in USACE, EM 1110-3-138, "Pavement Criteria for Seasonal Frost Conditions," April 1984.

FROST GROUP	GENERAL SOIL TYPE	% FINER THAN 0.02 mm BY WEIGHT	TYPICAL USCS SOIL CLASS
NFS(1)	(a) Gravels Crushed Stone Crushed Rock	0-1.5	GW, GP
	(b) Sands	0-3	SW, SP
PFS(2)	(a) Gravels Crushed Stone Crushed Rock	1.5 -3	GW, GP
	(b) Sands	3-10	SW, SP
S1	Gravelly Soils	3-6	GW, GP, GW-GM, GP-GM, GW-GC, GP-GC
S2	Sandy Soils	3-6	SW, SP, SW-SM, SP-SM, SW-SC, SP-SC
F1	Gravelly Soils	6-10	GM, GC, GW-GM, GP-GM, GW-GC, GP-GC
F2	(a) Gravelly Soils	10-20	GW, GP, GW-GM, GP-GM, GW-GC, GP-GC
	(b) Sands	6-15	SM, SW-SM, SP-SM, SC, SW-SC, SP-SC, SM-SC
F3	(a) Gravelly Soils	Over 20	GM, GC, GM-GC
	(b) Sands, except very fine silty sands	Over 15	SM, SC, SM-SC
	(c) Clays, PI>12	--	CL, CH
F4	(a) Silts	--	ML, MH, ML-CL
	(b) Very fine silty sands	Over 15	SM, SC, SM-SC
	(c) Clays, PI<12	--	CL, ML-CL
	(d) Varied clays or other fine-grained banded sediments	--	CL or CH layered with ML, MH, ML-CL, SM, SC, or SM-SC

(1) Non-frost susceptible

(2) Possibly frost susceptible, requires lab test for void ratio to determine frost design soil classification. Gravel with void ratio > 0.25 would be NFS; Gravel with void ratio < 0.25 would be S1; Sands with void ratio > 0.30 would be NFS; Sands with void ratio < 0.30 would be S2 or F2

Municipality of Anchorage (MOA) and Federal Aviation Administration (FAA) Methodology

MOA and FAA use simplifications of the USACE methodology noted above. The Design Criteria Manual details the MOA method and Section 207 of FAA Advisory Circular 150/5320-6G details the FAA method. Both are summarized below.

FROST GROUP	SOIL TYPE	PERCENTAGE FINER THAN 0.02 mm BY WEIGHT	TYPICAL SOIL TYPES UNDER UNIFIED SOIL CLASSIFICATION SYSTEM
NFS[a]	a. Gravels	0 to 3	GW, GP
	b. Sands	0 to 3	SW, SP
F-1[a] or FG-1[b]	Gravelly soils	3 to 10	GW, GP, GW-GM, GP-GM
F-2[a] or FG-2[b]	a. Gravelly soils	10 to 20	GM, GW-GM, GP-GM
	b. Sands	3 to 15	SW, SP, SM, SW-SM, SP
F-3[a] or FG-3[b]	a. Gravelly soils	Over 20	GM, GC
	b. Sands, except very fine silty sands	Over 15	SM, SC
	c. Clays, PI>12	--	CL, CH
F-4[a] or FG-4[b]	a. All silts	--	ML, MH
	b. Very fine silty sands	Over 15	SM, SC
	c. Clays, PI<12	--	CL, CL-ML
	d. Varved clays and	--	
	other fine-grained, banded sediments	--	CL, CL-ML CL, CH, ML, SM

[a] Municipality of Anchorage, Project Management & Engineering Department, Design Criteria Manual, January 2007.

[b] Federal Aviation Authority, FAA Advisory Circular 150/5320-6G.

DESCRIPTION AND CLASSIFICATION OF FROZEN SOILS

(Summarized from the Alaska Field Guide for Soil Classification)

PART I: Description of Soil Phase—Independent of Frozen State(a)

	Major Group		Sub-Group		Field Identification	Pertinent Properties of Frozen Materials which may be measured by physical tests to supplement field identification.	Guide for Construction on Soils Subject to Freezing and Thawing	
	Description	Designation	Description	Designation			Thaw Characteristics	Criteria
Part II: Description of Frozen Soil	Segregated ice is not visible by eye (b)	N	Poorly Bonded or Friable	Nf	Identify by visual examination. To determine presence of excess ice, use procedure under note (c) below and hand magnifying lens as necessary. For soils not fully saturated, estimate degree of ice saturation: Medium, Low. Note presence of crystals, or of ice coating around larger particles.	In-Place Temperature Density and Void Ratio a) In Frozen State b) After Thawing in Place Water Content (Total H_2O, including ice) a) Average b) Distribution Strength a) Compressive b) Tensile c) Shear d) Adfreeze Elastic Properties Plastic Properties Thermal Properties Ice Crystal Structure (using optional instruments.) a) Orientation of Axes b) Crystal size c) Crystal shape d) Pattern of Arrangement	Usually Thaw-Stable	The potential intensity of ice segregation in a soil is dependent to a large degree on its void sizes and may be expressed as an empirical function of grain size as follows: Most inorganic soils containing 3 percent or more of grains finer than 0.02 mm in diameter by weight are frost-susceptible. Gravels, well graded sands and silty sands, especially those approaching the theoretical maximum density curve, which contain 1.5 to 3 percent finer than 0.02 mm by weight without being frost-susceptible. However, their tendency to occur interbedded with other soils usually makes it impractical to consider them separately. Soils classed as frost-susceptible under the above criteria are likely to develop significant ice segregation and frost heave if frozen at normal rates with free water readily available. Soils so frozen will fall into the thaw-unstable category. However, they may also be classed as thaw-stable if frozen with insufficient water to permit ice segregation. Soils classed as non-frost-susceptible (*NFS) under the above criteria usually occur without significant ice segregation and are not exact and may be inadequate for some structure applications: exceptions may also result from minor soil variations. In permafrost areas, ice wedges, pockets, veins, or other ice bodies may be found whose mode of origin is different from that described above. Such ice may be the result of long-time surface expansion and contraction phenomena or may be glacial or other ice which has been buried under a protective earth cover.
			No excess ice Well Bonded *Excess Ice*	Nb n Nb e				
	Segregated ice is visible by eye. (Ice 1 inch or less in thickness) (b)	V	Individual ice crystals or inclusions	Vx	For ice phase, record the following as applicable: Location, Size, Orientation, Shape Thickness, Spacing, Pattern of arrangement, Length Hardness, Structure, Color } per part III Below Estimate volume of visible segregated ice present as percent of total sample volume		Usually Thaw-Unstable	
			Ice coatings on particles	Vc				
			Random or irregularly oriented ice formations	Vr				
			Stratified or distinctly oriented ice formations	Vs				
Part III: Description of Substantial Ice Strata	Ice (Greater than 1 inch in thickness)	Ice	Ice with soil inclusions	Ice + Soil Type	Designate material as ICE (d) and use descriptive terms as follows, usually one item from each group, as applicable: Hardness: Hard, Soft (mass, not indi-crystals) Structure: Clear, Cloudy, Porous, Candled, Granular, Stratified Color: e.g.: Color-less, Gray, Blue Admixtures: e.g.: Contains Thin Silt Inclusions			
			Ice without soil inclusions	Ice				

DEFINITIONS:

Ice Coatings on Particles are discernible layers of ice found on or below the larger soil particles in a frozen soil mass. They are sometimes associated with hoarfrost crystals, which have grown into voids produced by the freezing action.

Ice Crystal is a very small individual ice particle visible in the face of a soil mass. Crystals may be present alone or in a combination with other ice formations.

Clear Ice is transparent and contains only a moderate number of air bubbles. (e)

Cloudy Ice is translucent, but essentially sound and non-pervious.

Porous Ice contains numerous voids, usually interconnected and usually resulting from melting at air bubbles or along crystal interfaces from presence of salt or other materials in the water, or from the freezing of saturated snow. Though porous, the mass retains its structural unity.

Candled Ice is ice which has rotted or otherwise formed long columnar crystals, very loosely bonded together.

Granular Ice is composed of coarse, more or less equidimensional, ice crystals weakly bonded together.

Ice Lenses are lenticular ice formations in soil occurring essentially parallel to each other, generally normal to the direction of heat loss and commonly in repeated layers.

Ice Segregation is the growth of ice as distinct lenses, layers, veins, and masses in soils, commonly but not always oriented normal to direction of heat loss.

Well-bonded signifies that the soil particles are strongly held together by the ice and that the frozen soil possesses relatively high resistance to chipping or breaking.

Poorly-bonded signifies that the soil particles are weakly held together by the ice and that the frozen soil consequently has poor resistance to chipping or breaking.

Friable denotes a condition in which material is easily broken up under light to moderate pressure.

Thaw-Stable frozen soils do not, on thawing, show loss of strength below normal, long-time thawed values nor produce detrimental settlement.

Thaw-Unstable frozen soils show on thawing, significant loss of strength below normal, long-time thawed values and/or significant settlement, as a direct result of the melting of the excess ice in the soil.

NOTES:

(a) When rock is encountered, standard rock classification terminology should be used.

(b) Frozen soils in the N group may on close examination indicate presence of ice within the voids of the material by crystalline reflections or by a sheen on fractured or trimmed surfaces. However, the impression to the unaided eye is that none of the frozen water occupies space in excess of the original voids in the soil. The opposite is true of frozen soils in the V group.

(c) When visual methods may be inadequate, a simple field test to aid evaluation of volume of excess ice can be made by placing some frozen soil in a small jar, allowing it to melt and observing the quantity of supernatant water as a percent of total volume.

(d) Where special forms of ice, such as hoarfrost, can be distinguished, more explicit description should be given.

(e) Observer should be careful to avoid being misled by surface scratches or frost coating on the ice.

Modified from: Linell, K.A. and Kaplar, C.W., 1966, *Description and Classification of Frozen Soils*, Proc. International Conference on Permafrost (1963), Lafayette, IN, U.S. National Academy of Sciences, Publ. 1287, pp 481-487.

SOIL BORING: HDL-01

Project Name: PMC Seed House Addition
Project Number: 25-104
Client: Design Alaska, Inc.
Date Drilled: 03/12/2025
Total Depth: 6 ft

Drilling Firm: Discovery Drilling, Inc.
Equipment: CME-75
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: K. Taylor

Station/Offset: - / - -
Lat/Long: 61.52222, -149.08078
Boring Elevation: 46.5 ft
Location: Northern portion of proposed addition

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	USCS Description	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
0											**ORGANIC MAT** 0.2							
1			S-1		2	7 9 8 8		gm			**SILTY GRAVEL WITH SAND (GM)**, fine to coarse grained; brown, Nbn to Nbe 1.7					22.6		
2								sp			**POORLY GRADED SAND (SP)**, fine grained; brown, dry 2.0					5.2		
3		LSS	S-2		1.7	14 12 10 8	22	gw			**WELL-GRADED GRAVEL WITH SAND (GW)**, fine to coarse grained, angular to subrounded; gray, dry, medium dense					2.4		
4																		
5			S-4		1.6	7 8 7 8	15									2.0		
6											6.0							

Terminated boring at 6.0 feet bgs.

Graphics Legend

- sp
- gw
- organic mat
- gm
- LSS - Large Split Spoon

Water Levels

- No free groundwater encountered.
- -

SOIL BORING: HDL-02

Project Name: PMC Seed House Addition
Project Number: 25-104
Client: Design Alaska, Inc.
Date Drilled: 03/12/2025
Total Depth: 42 ft

Drilling Firm: Discovery Drilling, Inc.
Equipment: CME-75
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: K. Taylor

Station/Offset: - / - -
Lat/Long: 61.52216, -149.08076
Boring Elevation: 46.4 ft
Location: Central portion of proposed addition

Comments -

Depth (ft)	Water Levels	Drilling Method	Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	USCS Description	% Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
0											**ORGANIC MAT** 0.3							
1			S-1		1.6	4 7 12 12		gm			**SILTY GRAVEL WITH SAND (GM)**, fine to coarse grained; brown, Nbn to Nbe, trace root hairs, fractured cobbles in shoe	41.4	32	26.6		27.8		
2											2.5							
3			S-2		1.7	5 9 11 13	20	GW			**WELL-GRADED GRAVEL WITH SAND (GW)**, fine to coarse grained, angular to subrounded; gray, dry, medium dense	64.9	31.3	3.8		2.7		
4																		
5			S-3		1.8	5 13 17 15	30				fractured cobbles in sample					1.8		
6																		
7			S-4		1.8	6 14 14 13	28									1.7		
8																		
9																		
10	▽		S-5		1.2	11 6 9 5	15				wet					2.3 5.3		
11																		
12			S-6		0.7	6 2 3 1	5				loose					7.2		
13																		
14																		
15			S-7		0.7	2 3 3 4	6				loss of fractured cobbles					9.3		
16																		

Hollow Stem Auger

Graphics Legend

- At Time of Drilling (ATD)
- GW
- organic mat
- gm
- LSS - Large Split Spoon

Water Levels

- Free groundwater encountered at 10.8 feet bgs.
- -

SOIL BORING: HDL-02

Project Name: PMC Seed House Addition
Project Number: 25-104
Client: Design Alaska, Inc.
Date Drilled: 03/12/2025
Total Depth: 42 ft

Drilling Firm: Discovery Drilling, Inc.
Equipment: CME-75
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: K. Taylor

Station/Offset: - / - -
Lat/Long: 61.52216, -149.08076
Boring Elevation: 46.4 ft
Location: Central portion of proposed addition

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	USCS Description	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
18								GW										
19																		
20																		
21			S-8		1.1	13 7 7 9	14				medium dense, fractured cobbles in sample					9.3		
22																		
23																		
24																		
25																		
26			S-9		1.3	11 10 10 5	20									7.6		
27																		
28																		
29																		
30																		
31			S-10		0.8	42 11 12 12	23				approximately 5 inches of heave prior to sampling, loss of fractured cobbles					8.6		
32																		
33																		

Hollow Stem Auger

Graphics Legend

GW

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 10.8 feet bgs.

-

SOIL BORING: HDL-02

Project Name: PMC Seed House Addition
Project Number: 25-104
Client: Design Alaska, Inc.
Date Drilled: 03/12/2025
Total Depth: 42 ft

Drilling Firm: Discovery Drilling, Inc.
Equipment: CME-75
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: K. Taylor

Station/Offset: - / - -
Lat/Long: 61.52216, -149.08076
Boring Elevation: 46.4 ft
Location: Central portion of proposed addition

Comments -

Depth (ft)	Water Levels	Drilling Method	Samples: Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	USCS Description	Lab: % Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
35		Hollow Stem Auger						GW										
36			S-11		0.9	46 16 14 13	30				approximately 4 inches of heave prior to sampling, fractured cobbles in sample					7.6		
37																		
38																		
39																		
40											40.0							
41			S-12		0.9	10 13 16 18	29	gw-gm			**WELL-GRADED GRAVEL WITH SILT AND SAND** (**GW-GM**), fine to coarse grained, angular to subrounded; gray, wet, medium dense					6.2		
42											42.0							

Terminated boring at 42.0 feet bgs.

Graphics Legend

GW

gw-gm

LSS - Large Split Spoon

Water Levels

Free groundwater encountered at 10.8 feet bgs.

-

SOIL BORING: HDL-03

Project Name: PMC Seed House Addition
Project Number: 25-104
Client: Design Alaska, Inc.
Date Drilled: 03/12/2025
Total Depth: 6 ft

Drilling Firm: Discovery Drilling, Inc.
Equipment: CME-75
Hammer Type: Auto
Hammer Weight: 340 lbs
Field Staff: K. Taylor

Station/Offset: - / - -
Lat/Long: 61.52210, -149.08075
Boring Elevation: 46.2 ft
Location: Southern portion of proposed addition

Comments -

Depth (ft)	Water Levels	Drilling Method	Sample Number	Sample Graphic	Recovery Length (ft)	Blow Counts	Uncorrected N-Value	USCS	Bonded	Graphic Log	USCS Description	% Gravel	% Sand	% Fines	% Finer than 0.02mm	Moisture Content (%)	% Organic Material	Atterberg Limits
											ORGANIC MAT 0.2							
1			S-1		1.8	3 6 7 10		gm			**SILTY GRAVEL WITH SAND (GM)**, fine to coarse grained; brown, Nbn to Nbe 1.5					35.1		
2								GW			**WELL-GRADED GRAVEL WITH SAND (GW)**, fine to coarse grained, angular to subrounded; gray, dry, NFS					2.7		
3		LSS	S-2		1.5	6 12 10 11	22				medium dense	60.6	36.6	2.8	1.3	2.1		
4																		
5			S-3		1.8	8 13 14 16	27				fractured cobbles in sample					1.5		
6											6.0							

Terminated boring at 6.0 feet bgs

Graphics Legend

- gm
- GW
- organic mat
- LSS - Large Split Spoon

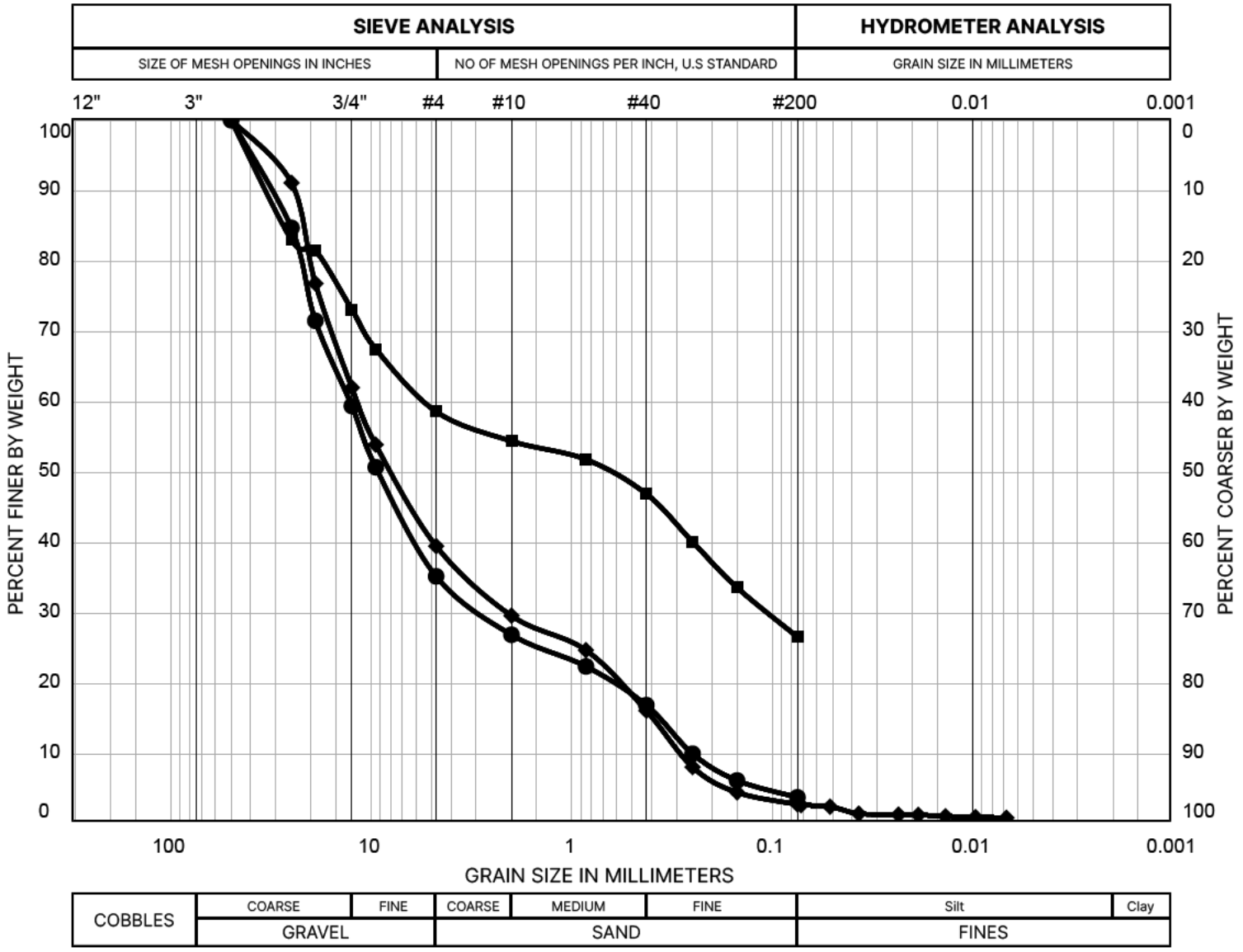
Water Levels

- No free groundwater encountered.
- -

HDL ENGINEERING Consultants LLC

GRAIN SIZE DISTRIBUTION TEST RESULTS

PMC Seed House Addition
Butte, Alaska



	EXPLORATION	SAMPLE NUMBER	DEPTH	USCS SYMBOL	GRAVEL (%)	SAND (%)	FINES (%)	D10	D30	D60	CU	CC
■	HDL-02	S-1	0.3	gm	41.4	32	26.6		0.11	5.54		
●	HDL-02	S-2	2.9	GW	64.9	31.3	3.8	0.25	3.12	12.85	51.4	3.03
◆	HDL-03	S-2	2	GW	60.6	36.6	2.8	0.3	2.13	11.8	39.33	1.28

Review Comments

Design Alaska

REVIEW COMMENTS

PROJECT: PMC Seedhouse Addition
LOCATION: Palmer, Alaska
PHASE: Draft Final
DESCRIPTION:

PROJECT NUMBER: 862501
PROJECT MANAGER: JRR
CHECKED BY:

#	Reviewer	Discipline	Sheet or Section	Detail or Para No.	Review Comments	Response / Action Taken	Response By	Reviewer Back-Check
1	Bryan/Casey		G201		Swap door on tool room to office. Also, move main door of bathroom to opposite wall. Move toilet and sink to opposite wall.	Will move door 157B to office wall and open corridor from Mech room.	JB	
2	Bryan/Casey		C200		Relocate lift station from road side to inside tool room floor. Possiably smaller tank. Lift station cannot be next to road due to parking area.	Have moved to a gravity system, no lift station required.	IAL	
3	Bryan/Casey		C200		Is there insulation in the wall between the office and bath room?	Yes. No action required.	IAL	
4	Bryan/Casey		C200		How many gallons is the proposed lift station?	Lift station is no longer required and has been removed from the project	IAL	
5	Bryan/Casey		C100		Why is the area for demolition so large?	To accommodate new entry pads and relocated gravel drive on east side of addition.	IAL	
6	Bryan/Casey		C701		Can there be less insulation around the sewer pipe, force main pipe, and water line?	Coordinated new details.	IAL	
7	Bryan/Casey		C701		What about using a copper pipe for the watere line instead of pecks? This is incase we have a frozen pipe we can thaw copper.	Discussed and copper pipe is now being utilized.	IAL	
8	Bryan/Casey		A010		Why remove existing siding from seed house building?	Concur	JB	
9	Bryan/Casey		A211		Possibly move lift station and pressure tank to tool room area.	Lift station is no longer required and has been removed from the project	JB	
10	Bryan/Casey		A300		Is the third door on the east side of addition a typo?	Elevation is correct, no action taken.	JB	
11								
12								
13								