

PROJECT MANUAL FOR:

MSU Stadium Lots

MONTANA STATE UNIVERSITY
BOZEMAN, MONTANA

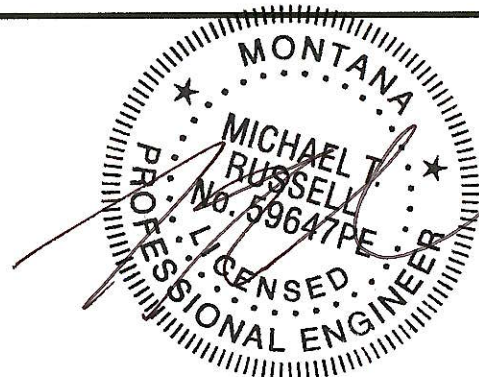
March 14, 2024

PPA No. 22-0012



**MONTANA
STATE UNIVERSITY**

UNIVERSITY FACILITIES MANAGEMENT
BOZEMAN, MONTANA
PHONE: (406) 994-5413 FAX: (406) 994-5665



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ASPHALT CONCRETE PAVEMENT	02510
CONCRETE CURB & GUTTER	02528
CONCRETE SIDEWALKS	02529
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IRRIGATION	02810
TURF & GRASSES	02930
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PERMIT NOTICE

At the time of Bidding, the City of Bozeman, Building Inspection Division, has determined that this project does not require building permits as the work is considered Repair and Maintenance. However, an **Electrical Permit is required**. Should the scope of the project change in the future, building permits may be required.

Bidders are encouraged to contact the City of Bozeman, Building Inspection Division, for further information regarding permits.

**CITY OF BOZEMAN
BUILDING INSPECTION DIVISION
20 EAST OLIVE STREET
SUITE 208
BOZEMAN, MONTANA 59715
(406) 582-2375**

INVITATION TO BID

Sealed bids will be received until **2:00 PM** on **Wednesday, April 3rd, 2024**, and will be publicly opened and read aloud in the offices of **MSU University Facilities Management, Plew Building, 6th & Grant, Bozeman, Montana**, for: **MSU Stadium Lots, PPA No. 22-0012**.

Bids shall be submitted on the form provided within the Contract Documents. Contract documents may be obtained at the offices of:

Montana State University
UNIVERSITY FACILITIES MANAGEMENT
Plew Building, 6th & Grant
PO Box 172760
Bozeman, Montana 59717-2760

On the web at:
<http://www.montana.edu/pdc/bids.html>

A PRE-BID WALK-THROUGH IS SCHEDULED FOR Thursday, March 21st, 2024, AT 8:00 AM PARTICIPANTS SHOULD MEET AT Bobcat Stadium (1 Bobcat Circle, Bozeman, MT 59717), Gate 11 (Southeast stadium entrance near the Track & Field Complex). ATTENDANCE IS STRONGLY RECOMMENDED. Bidders should thoroughly review the contract documents before the pre-bid conference.

Bids must be accompanied by a bid security meeting the requirements of the State of Montana in the amount of 10% of the total bid. After award, the successful bidder must furnish an approved Performance Security and a Labor & Material Payment Security each in the amount of 100% of the contract for contracts equal to or greater than \$150,000.

No bidder may withdraw his bid for at least thirty (30) calendar days after the scheduled time for receipt of bids except as noted in the Instructions to Bidders.

The Owner reserves the right to reject any or all bids and to waive any and all irregularities or informalities and the right to determine what constitutes any and all irregularities or informalities.

Time of Completion

Bidder agrees to commence work immediately upon receipt of the Notice to Proceed and to substantially complete the project **by August 17th, 2024**.

The State of Montana makes reasonable accommodations for any known disability that may interfere with an applicant's ability to compete in the bidding and/or selection process. In order for the state to make such accommodations, applicants must make known any needed accommodation to the individual project managers or agency contacts listed in the contract documents.

State of Montana - Montana State University

INSTRUCTIONS TO BIDDERS

1. Table of Contents

Provided in the Printed Project Manual:

Invitation to Bid
Instruction to Bidders
Bid Proposal, Form 098
Sample Standard Form of Contract
State of Montana General Conditions
MSU Supplementary Conditions
Specifications
Drawings

Periodic Estimate for Partial Payment, Form 101
Acknowledgement of Subcontractors, Form 102
Consent of Surety to Final Payment, Form 103
Contract Change Order, Form 104
Contractor's Affidavit, Form 106
Certificate of Substantial Completion, Form 107
Construction Change Directive, Form 109
Request for Information, Form 111
Performance Bond, Form 112
Labor and Material Payment Bond, Form 113
Certificate of Final Acceptance, Form 118
Buy-Safe Montana Form

These additional forms can be found on our website or will be provided upon request:

<http://www.montana.edu/pdc/docs/index.html>

Substitution Request, Form 99
Schedule of Values, Form 100

For most current Montana Prevailing Wage Rates applicable to this project download from this site: <http://erd.dli.mt.gov/labor-standards/state-prevailing-wage-rates>

2. Viewing of Contract Documents

2.1. The Contract Documents may be viewed at the following locations:

Builders Exchange of Billings
2050 Broadwater STE A
Billings MT 59102
406/652-1311
bbx@billingsplanroom.com

NW MT - Flathead Builders
Exchange
2303 Hwy 2 E
Kalispell, MT 59901
406/755-5888
planex@kalcop.com

Helena Plans Exchange
1530 Cedar Street Suite C
Helena MT 59601
406/457-2679
helenaplanex@helenacopycenter.com

Bozeman Builders Exchange
1105 Reeves RD W STE 800
Bozeman MT 59718
406/586-7653
exchange@bozemanplanroom.com

Great Falls Builders Exchange
202 2ND Avenue S
Great Falls MT 59401
406/453-2513
gfbe@greatfallsplans.com

Missoula Plans Exchange
201 N Russell ST
Missoula MT 59801
406/549-5002
mpe@vemcoinc.com

Butte Builders Exchange
4801 Hope Road
Butte MT 59701
406/782-5433
butteplans@gmail.com

3. Borrowing of Documents: Up to two hard copy sets may be obtained for General Contractors. Additionally, Contract Documents will be available electronically. If shipping of hard copies is required, it will be at the contractor's expense.

3.1. Contract Documents may be obtained at the office of:

**MONTANA STATE UNIVERSITY
UNIVERSITY FACILITIES MANAGEMENT
PLEW BUILDING 1st FLOOR
6TH AND GRANT
BOZEMAN, MONTANA 59717-2760
406/994-5413**

3.2. All borrowed Contract Documents shall be returned to University Facilities Management within ten (10) calendar days after the bid opening for the deposit refund (if deposit was required). However, if the Contract Documents are not in a condition where they can be reused by the

Owner to construct the project, the Owner may at its sole discretion may retain the deposit or levy costs to contractor in order to reproduce a replacement set.

4. Visits to Site

4.1. Prospective bidders are requested to contact the following for inspection of the site:

**John Scott, Project Manager
Montana State University
University Facilities Management
6th and Grant, PO Box 172760
Bozeman, Montana 59717-2760
Ph: 406/994-5470; Fax: 406/994-5665**

4.2. Failure to visit site will not relieve the Contractor of the conditions of the contract.

5. Requests for Substitution

5.1 Any requests for product substitutions must be submitted on the "Substitution Request" Form 099, to the Architect/Engineer at least ten (10) days prior to the date of the bid opening for consideration by the Architect/Engineer. Any request for substitution made after this time restriction, including those made after award during project construction may be rejected without consideration by either the Architect/Engineer or the Owner.

6. Bids/Proposals

6.1. The bidder shall submit his bid on the Bid Proposal Form furnished with the Contract Documents.

6.2. DO NOT send the Contract Documents with the Proposal. The Contract Documents shall be returned as noted in Article 3.2 of the Instructions to Bidders.

6.3. If the project is funded by any portion of federal funds, the following may apply: on Federally-funded projects, a "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion" form must be submitted with the bid proposal. If the debarment form is not included within the Construction Documents, federal funds (if included) do not require the form or are not included in the project and the debarment form is not required.

6.4. Proposals shall be in a sealed envelope and addressed to:

**STATE OF MONTANA, MONTANA STATE UNIVERSITY
UNIVERSITY FACILITIES MANAGEMENT
PLEW BUILDING 1ST FLOOR
6TH AND GRANT
PO BOX 172760, BOZEMAN, MONTANA 59717-2760**

6.5. The envelope shall state that it contains a "BID PROPOSAL" and indicate the following information:

Name of Project: **MSU Stadium Lots**
Location: **Montana State University Bozeman Campus**
MSU PPA Project Number: 22 -0012
Name of Bidder: _____
Acknowledge Addendum Number: __, __, __, __

6.6. It is the bidder's responsibility to deliver or ensure delivery of the bid proposal to Montana State University, University Facilities Management. Proposals received after the scheduled closing time for bids by either the bidder, a delivery service (e.g. Federal Express, U.S. Postal Service, United Parcel Service, etc.), or the state's own mail delivery system, will be rejected. Proposals entitled for consideration must be time-stamped in the Owner's office prior to the closing time for receipt of bids. The official time clock for receipt of bids and fax modifications is the Owner's time and date stamp clock located in the reception area of the Owner's office. No other clocks, calendars or timepieces are recognized. All bidders are responsible to ensure all bids and fax modifications are received in the Owner's office prior to the scheduled closing time.

- 6.7. If requested on the Bid Proposal, any person making a bid to perform the Work shall, as a requirement of a responsible bid, set forth the name of each subcontractor specified in the "List of Subcontractors" which is part of the bid proposal. The bidder shall list only one subcontractor for each such portion or work listed. The bidder whose bid is accepted shall not:
 - 6.7.1. Substitute any other subcontractor in place of the subcontractor listed in the original bid, except by specific consent of the Owner. The Owner, at its sole discretion, may grant substitution with consent of the originally listed subcontractor, or in consideration of other factor(s) involved if deemed relevant to the successful performance of the Contract.
 - 6.7.2. Permit any such subcontract to be voluntarily assigned, transferred or allow it to be performed by any party other than the subcontractor listed in the original bid without the consent of the Owner.
- 6.8. Bid Proposals entitled to consideration shall be made in accordance with the following instructions:
 - 6.8.1. Made upon form provided;
 - 6.8.2. All blank spaces properly filled;
 - 6.8.3. All numbers stated in both writing and in figures;
 - 6.8.4. Shall contain no additions, conditional or alternate bids, erasures or other irregularities;
 - 6.8.5. Shall acknowledge receipt of all addenda issued.
- 6.9. Bid Proposals entitled to consideration shall be signed by the proper representative of the firm submitting the proposal as follows:
 - 6.9.1. The principal of a single owner firm;
 - 6.9.2. A principal of a partnership firm;
 - 6.9.3. An officer of an incorporated firm, or an agent whose signature is accompanied by a certified copy of the resolution of the Board of Directors authorizing that agent to sign; or,
 - 6.9.4. Other persons signing for a single-owner firm or a partnership shall attach a power-of-attorney evidencing his authority to sign for that firm.
- 6.10. Unit Prices: When a Bid Proposal Form contains unit prices, any errors discovered in the extension of those unit prices will be corrected by the Owner using the unit price figures. The adjusted extended amount will then be used to determine the correct total bid. Only after the amounts have been checked and adjusted, if necessary, will the valid low bid be determined.
- 6.11. Estimated Quantities: All estimated quantities stipulated in the Bid Proposal and other Contract Documents are approximate and are to be used only as a basis for estimating the probable cost of the work and for the purpose of comparing proposals submitted for the work. It is understood and agreed that the actual amounts of work done, and materials furnished under unit price items may vary from such estimated quantities. The actual quantities will depend on the conditions encountered at the time the work is performed.
- 6.12. Any bidder may modify his bid by fax communication only.
 - 6.12.1 It is the bidder's responsibility to ensure that the entire modification is received at the bid opening location prior to the scheduled closing time for receipt of bids. The modification shall not reveal the bid price but shall only provide the ADDITION or SUBTRACTION from the original proposal.
 - 6.12.2 The Owner is not responsible for the performance of the facsimile/printer machine, maintaining adequate paper levels, toner levels, the telephone connection, quality of the facsimile, or any other factors affecting receipt of the fax. Unreadable or difficult-to-read facsimiles may be rejected at the sole discretion of the Owner.
 - 6.12.3 Changes in the listed subcontractors, if any, shall also be provided.
 - 6.12.4 Bid modifications must be verified by hard copy provided to the Owner within two (2) business days after the bid opening.
 - 6.12.5 Bid modifications shall be directed to fax phone (406) 994-5665.
 - 6.12.6 All facsimiles shall be date and time stamped on the same time-stamp clock in the Owner's office that is used for receipt of bids in order to be considered valid. The Owner may also use the date and time on the automatically-generated email notification of

facsimile receipt as generated by the State's system. Any date and time indicated at the top of the facsimile on either the bidder's or the Owner's facsimile/printer machine will not be used in determining time of arrival of the modification.

- 6.13. The Owner reserves the sole right to reject any or all bids and to waive any irregularities or informalities. The Owner also reserves the sole right to determine what constitutes irregularities or informalities and/or what is material and/or immaterial to the bids received.

7. Bid Security

- 7.1. IF THE PROJECT COST IS LESS THAN \$25,000, AT ITS SOLE DISCRETION THE STATE OF MONTANA MAY OR MAY NOT REQUIRE BID SECURITY (18-2-302 MCA).
- 7.2. Proposals over \$150,000 shall be accompanied by a bid security in the amount of 10% of the bid price, as evidence of good faith (18-2-302 MCA).
- 7.3. Bid security shall be in the form of lawful moneys of the United States, cashier's check, certified check, bank money order or bank draft, bid bond or bonds payable to the State of Montana (18-2-302 MCA).
- 7.4. If the bidder, to whom a contract is awarded, fails to enter into and execute the proposed contract within fifteen (15) calendar days of award, the bidder shall forfeit the bid security (18-1-204 MCA).
- 7.5. The bid security of unsuccessful bidders will be returned when the contract has been awarded to the successful bidder or when all bids have been rejected (18-1-205 MCA).
- 7.6. Execution of and entering into a contract includes providing all necessary insurance certificates, bonds, signed contract and current copy of the construction contractor registration certificate.
- 7.7. **NOTE: PER STATE POLICY, IF CASH, CHECK, MONEY ORDER, OR BANK DRAFT ARE PROVIDED AS BID SECURITY, IT WILL BE DEPOSITED IN THE TREASURY. UNSUCCESSFUL BIDDERS WILL HAVE THEIR SECURITY RETURNED UPON CONTRACT AWARD. THE SUCCESSFUL BIDDER'S SECURITY MAY BE RETURNED UPON ISSUANCE OF NOTICE TO PROCEED.**

8. Withdrawal of Bids

- 8.1. Any bidder may withdraw his bid proposal at any time prior to the scheduled closing time for the receipt of bids.
- 8.2. Once the closing time for the receipt of bids is reached, a bid may not be withdrawn for a period of thirty (30) calendar days.

9. Interpretation of Contract Documents

- 9.1. Bidders shall promptly notify the Architect/Engineer of any ambiguity, inconsistency, or error which they may discover upon examination of the Contract Documents or of the site and local conditions.
- 9.2. Bidders requiring clarification or interpretation of the Contract Documents shall request, in writing, clarification from the Architect/Engineer at least ten (10) calendar days prior to the date set for receipt of bids.
- 9.3. Any interpretations, corrections, or change in the Contract Documents prior to the bid opening will be made by written addendum issued by the Architect/Engineer. The Architect/Engineer will endeavor to notify all plan holders of any addenda issued but it shall be the responsibility of the individual bidders to insure they have received all addenda prior to the submission of their bid.
- 9.4. All written addenda issued by the Architect/Engineer will become part of the Contract Documents and all bidders shall be bound by such addenda whether or not received and/or acknowledged by the bidder. No oral or telephone modifications of the Contract Documents will be considered or allowed.

10. Award of Bids

- 10.1. All bids received by the stated hour will be opened and publicly read aloud.
- 10.2. The Owner reserves the right to reject any and all bids and to waive any informality or irregularity in any bid received. Owner reserves the right to determine what constitutes material and/or immaterial informalities and/or irregularities.
- 10.3. The low bid shall be determined on the basis of the lowest Base Bid or the lowest combination of Base Bid and Alternate Bids, accepted in consecutive order.
- 10.4. The Owner shall award such contract to the lowest responsible bidder (18-1-102 MCA).
 - 10.4.1. The Owner may make such investigations as it deems necessary to determine whether or not any or all bidders are responsible.
 - 10.4.2. The term "responsible" does not refer to pecuniary ability only, nor the ability to tender sufficient performance and payment bonds.
 - 10.4.3. The term "responsible" includes, but is not limited to:
 - 10.4.3.1. Having adequate financial resources to perform the contract or the ability to obtain them;
 - 10.4.3.2. Being able to comply with the required delivery, duration, and performance schedule;
 - 10.4.3.3. Having a satisfactory record of integrity and business ethics;
 - 10.4.3.4. Having the necessary organization, experience, accounting, and operational controls;
 - 10.4.3.5. Having the necessary production, construction, technical equipment, and facilities; and,
 - 10.4.3.6. Having the technical skill, ability, capacity, integrity, performance, experience, lack of claims and disputes, lack of actions on bonds, lack of mediations, arbitrations and/or lawsuits related to construction work or performance, and such like.
 - 10.4.4. Bidders shall furnish to the Owner all information and data for this purpose as the Owner may request.
 - 10.4.5. The Owner reserves the right to reject any bid if the investigation or evidence of any Bidder fails to satisfy the Owner that such Bidder is properly and adequately qualified to suitably perform and satisfactorily execute the obligations of the Contract and Work defined in the Contract Documents.
- 10.5. The Owner shall award such contract to the lowest responsible bidder without regard to residency except on a reciprocal basis: a resident bidder will be allowed a preference on a contract against the bid of any non-resident bidder from any state or country that enforces a preference for resident bidders. The preference given to resident bidders of the State of Montana must be equal to the preference given in the other state or country (18-1-102, MCA). This does not apply when prohibited by Federal requirements.
- 10.6. The State of Montana may negotiate deductive changes, not to exceed 15% of the total cost of the project, with the lowest responsible bidder when the lowest responsible bids causes the project cost to exceed the appropriation; or with the lowest responsible bidders if multiple contracts will be awarded on the projects when the total of the lowest responsible bids causes the project cost to exceed the appropriation. A bidder is not required to negotiate his bid but is required to honor his bid for the time specified in the bidding documents. The Owner may terminate negotiations at any time (18-2-105(7) MCA).

11. Contract

- 11.1. The sample Standard Form of Contract between Contractor and Owner, as issued by the Owner, will be used as the contracting instrument and is bound within the Contract Documents.
- 11.2. The form shall be signed by a proper representative of the bidder as defined above in these instructions.
- 11.3. The contractor shall also complete and return a federal form W-9 with the Contract.

12. Performance, Labor and Material Payment Security

- 12.1. IF THE PROJECT COST IS LESS THAN \$150,000, AT ITS SOLE DISCRETION THE STATE OF MONTANA MAY OR MAY NOT REQUIRE A PERFORMANCE OR LABOR AND MATERIAL PAYMENT SECURITY (18-2-201 MCA). **(MSU REQUIRES BONDS ON ALL PROJECTS ABOVE \$150,000.)**
- 12.2. THE CONTRACTOR SHALL PROVIDE BOTH SECURITIES FOR THIS PROJECT AS SPECIFIED BELOW, UNLESS SPECIFICALLY DIRECTED THAT THIS REQUIREMENT HAS BEEN WAIVED ELSEWHERE IN THESE DOCUMENTS.
- 12.3. The Owner shall require the successful bidder to furnish a Performance Bond in the amount of 100% of the contract price as security for the faithful performance of his contract (18-2-201, MCA).
- 12.4. The Owner shall require the successful bidder to furnish a Labor and Material Payment Bond in the amount of 100% of the contract price as security for the payment of all persons performing labor and furnishing materials in connection therewith (18-2-201 MCA).
- 12.5. The bonds shall be executed on forms furnished by the Owner. No other forms will be acceptable.
- 12.6. The bonds shall be signed in compliance with State statutes (33-17-111 MCA).
- 12.7. Bonds shall be secured from a State licensed bonding company.
- 12.8. Power of Attorney
 - 12.8.1. Attorneys-in-fact who sign contract bonds must file with each bond a certified and effectively dated copy of their power of attorney;
 - 12.8.2. One original copy shall be furnished with each set of bonds.
 - 12.8.3. Others furnished with a set of bonds may be copies of that original.
13. Notice To Proceed
 - 13.1. The successful bidder who is awarded the contract for construction will not be issued a Notice to Proceed until there is a signed Contract, the specified insurance certificates and a copy of the bidder's current Construction Contractor Registration Certificate in the Owner's possession. All items are required within fifteen (15) calendar days of contract award made by the Owner.
14. Laws and Regulations
 - 14.1. The bidders' attention is directed to the fact that all applicable federal and state laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over the project shall apply to the contract throughout and will be deemed to be included in this contract as if bound herein in full.
15. Payments
 - 15.1. NOTICE OF APPROVAL OF PAYMENT REQUEST PROVISION. Per Title 28, Chapter 2, Part 21, this contract allows the Owner to change the number of days to approve a Contractor's payment request. This contract allows the Owner to approve the Contractor's payment request within thirty-five (35) calendar days after it is received by the Owner without being subject to the accrual of interest.
16. Buy Safe Montana Provisions
 - 16.1. The successful bidder who is awarded the contract for construction shall provide their incident rate, experience modification ratio (EMR) and loss ratio via the Buy-Safe Montana form with the Award documents.
17. Time of Completion
 - 17.1. Bidder agrees to commence work immediately upon receipt of the Notice to Proceed and to substantially complete the project by **(8/17/24)**.

17.2. Actual damages may be assessed pursuant to the General Conditions. The Contractor acknowledges and understands that the Owner may suffer loss for every day of delay Final Acceptance is not achieved. Nothing contained in this waiver of liquidated damages shall be deemed to preclude an award of actual damages in accordance with Paragraphs 4.3 through 4.6 of the General Conditions of the Contract for Construction.

~END OF INSTRUCTIONS~



BID PROPOSAL

**MSU Stadium Lots
 PPA No. 22-0012**

TO:
 State of Montana, Montana State University
 University Facilities Management
 Attn: Contract Administrator
 Plew Building, 6th & Grant,
 PO Box 172760
 Bozeman, Montana 59717-2760

Prospective Bidders:

The construction contract operates on a lump sum basis. Unit prices are used in event of change order, see Section 012200 Unit Price.

The undersigned, having familiarized themselves with the Contract Documents, site, location, and conditions of the Work as prepared by **DJ&A, 220 West Lamme Street, Suite 1D, Bozeman, MT 59715, Phone: (406) 721-4320** or **UNIVERSITY FACILITIES MANAGEMENT** by submission of this Bid Proposal, hereby agrees to provide all materials, systems, equipment and labor necessary to complete the Work for the total sum as follows:

BASE BID UNIT PRICES:

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
M1	MOBILIZATION & MISC WORK	LS			
M2	PERMITTING	LS			
A1	TEMPORARY TRAFFIC CONTROL	LS			
A2	TEMPORARY CONSTRUCTION FENCING	LS			
A3	SOIL EROSION AND POLLUTION CONTROL	LS			
A4	RECLAIM AND REUSE EXISTING ASPHALT	SY			

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
A5	REUSE EXISTING GRAVEL	SY			
A6	CLEARING AND GRUBBING	SF			
A7	EARTHWORK	CY			
A8	HAUL OFF/SPREAD EXISTING CUT MATERIAL	CY			
A9	REMOVE TREES	EA			
A10	REMOVE EXISTING CURB & GUTTER	LF			
A11	REMOVE CHAIN LINK FENCING	LF			
A12	REMOVE & SALVAGE SIGNAGE	EA			
A13	REMOVE & SALVAGE FLAG POLES & PLAQUES	EA			
A14	REMOVE & SALVAGE MEMORIAL BRICKS	SF			
A15	REMOVE & SALVAGE LIGHT POLES (including wiring, conduit, base, etc.)	EA			
A16	REMOVE CONCRETE LIGHT POLE BASE	EA			
A17	REMOVE & SALVAGE EXISTING PIN DOWN CURBS	EA			
A18	SAWCUT EXISTING ASPHALT PAVEMENT	LF			
A19	SAWCUT EXISTING CONCRETE	LF			
A20	REMOVE & RELOCATE FIRE HYDRANT (+ ductile iron extension)	EA			
A21	REMOVE BOLLARD	EA			

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
A22	REMOVE EXISTING PARKING DIVIDER FENCE	LF			
A23	REMOVE EXISTING CONCRETE DRIVEWAY	SF			
A24	REMOVE & SALVAGE EXISTING INLET	EA			
A25	REMOVE LANDSCAPE WALL	LF			
A26	REMOVE CONCRETE STEPS & RAILING	EA			
A27	MISC. DEMOLITION WORK	EA			
A28	LANDSCAPE ROCK/GRAVEL MULCH	SF			
A29	BASE STABILIZER TREATMENT PRODUCT (See Geotech Report)	LS			
A30	WOVEN GEOTEXTILE FABRIC (Mirafi 180N)	SF			
A31	GRAVEL PARKING SECTION (3" Replacement of Asphalt)	SY			
A32	ASPHALT PAVEMENT (light duty – 3")	SF			
A33	ASPHALT PAVEMENT (heavy duty – 4")	SF			
A34	PLAZA CONCRETE FLATWORK (heavy duty – 5" + fiber mesh additive)	SF			
A35	PLAZA CONCRETE FLATWORK (heavy duty – 6" + fiber mesh additive)	SF			
A36	CONCRETE SIDEWALK	SF			
A37	INSTALL CURB & GUTTER	LF			
A38	INSTALL SOLID INLET	EA			

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
	COVER				
A39	INSTALL HEEL PROOF INLET	EA			
A40	INSTALL CONCRETE VALLEY GUTTER (4' Wide)	LF			
A41	INSTALL CONCRETE VALLEY GUTTER (2' Wide)	LF			
A42	CONCRETE DRIVEWAY APPROACH (Traffic-rated pad)	EA			
A43	INSTALL CONCRETE WHEEL STOPS	EA			
A44	INSTALL REMOVABLE BOLLARDS	EA			
A45	INSTALL ADA PARKING SIGN & PAVEMENT MARKING	EA			
A46	INSTALL CHAIN LINK FENCE	LF			
A47	INSTALL NEW MONUMENT SIGN	EA			
A48	PERMANENT PAVEMENT MARKINGS ~ 4" STRIPING	LF			
A49	CHAMBER SYSTEM (Lot 20)	CF			
A50	CHAMBER SYSTEM (Lot 25)	CF			
A51	STORM DRAIN STRUCTURE + INLET + ENVIROHOOD	EA			
A52	ADJUST EXISTING UTILITIES TO GRADE	EA			
A53	UPGRADE EXISTING UTILITIES WITHIN TRAVEL WAY TO BE TRAFFIC RATED	EA			

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
A54	ELECTRICAL SYSTEM	LS			
A55	12" HDPE STORM DRAIN PIPE	LF			
A56	18" HDPE STORM DRAIN PIPE	LF			
A57	BIKE RACKS	EA			
A58	LANDSCAPE IRRIGATION	LS			
A59	TREES (Canopy, Evergreen, Ornamental)	EA			
A60	SHRUBS	EA			
A61	EDGING	LF			
A62	SEEDING & SOIL AMENDMENTS	LS			
A63	16" IRRIGATION VALVE	EA			
A64	4" HDPE IRRIGATION PIPE	LF			
A65	LANDSCAPE BOULDERS	EA			
A66	MISC. WORK	LS			
TOTAL					

BASE BID LUMP SUM:

_____ and _____ /100 DOLLARS
(ALPHA notation) \$ _____ (NUMERIC notation)

ALTERNATE NO.1 CHANGES

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
A31	GRAVEL PARKING SECTION (3" Replacement of Asphalt)	SY			

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
A32	ASPHALT PAVEMENT (Light Duty – 3")	SF			
A33	ASPHALT PAVEMENT (Heavy Duty – 4")	SF			
A48	PERMANENT PAVEMENT MARKINGS – 4" STRIPING	LF			
TOTAL					

ALTERNATE NO. 1: ADD - LOT 25 – REPLACE 3" GRAVEL WITH 3" ASPHALT
 THE BIDDER AGREES TO **ADD/ALTER** THE SPECIFIED SCOPE OF WORK FOR THE TOTAL SUM OF:

_____ and _____ /100 DOLLARS
 (ALPHA notation) \$ _____ (NUMERIC notation)

ALTERNATE NO. 2 CHANGES

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
A34	PLAZA CONCRETE FLATWORK (Heavy duty 5" + fiber mesh additive)	SF			
A35	PLAZA CONCRETE FLATWORK (Heavy duty 6" + fiber mesh additive)	SF			
TOTAL					

ALTERNATE NO. 2: ADD – 1" ADDITIONAL THICKNESS CONCRETE SECTION
 THE BIDDER AGREES TO **ADD** THE SPECIFIED SCOPE OF WORK FOR THE TOTAL SUM OF:

_____ and _____ /100 DOLLARS
 (ALPHA notation) \$ _____ (NUMERIC notation)

By signing below, the bidder agrees to all terms specified and AGREES TO fulfill the requirements of the CONTRACT in strict accordance with the bidding documents.

Company Name: _____

Business Address: _____

Construction Contractor
Registration No.:

Phone No.: _____

Fax No.: _____

Email: _____

Date: _____

Bid Proposals entitled to consideration shall be signed by the proper representative of the firm submitting the proposal as follows (Initial which requirement you meet):

- The principal of a single owner firm;
- A principal of a partnership firm;
- An officer of an incorporated firm, or an agent whose signature is accompanied by a certified copy of the resolution of the Board of Directors authorizing that agent to sign; or (attach a copy of the resolution),
- Other persons signing for a single-owner firm or a partnership shall attach a power-of-attorney evidencing his authority to sign for that firm.

Signature: _____

Print Name: _____

Title: _____

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

(Form Revision Date: November 2023)

ARTICLE 1 – GENERAL PROVISIONS

1.1. BASIC DEFINITIONS

1.1.1. **CONTRACT DOCUMENTS.** The Contract Documents consist of the Contract between Owner and Contractor (hereinafter the “Contract”), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Contract and Modifications issued after execution of the Contract. A Modification is: (1) a written amendment to the Contract signed by both parties; (2) a Change Order; (3) a Construction Change Directive; or, (4) a written order for a minor change in the Work issued by the Architect/Engineer. The Contract Documents shall include the bidding documents and any alterations made thereto by addenda. In the event of a conflict, discrepancy, contradiction, or inconsistency within the Contract Documents and for the resolution of same, the following order of hierarchy and control shall apply and prevail:

1) Contract; 2) Addenda; 3) Supplementary General Conditions; 4) General Conditions; 5) Specifications; 6) Drawings; 7) Instructions to Bidders; 8) Invitation To Bid; 9) Sample Forms.

1.1.1.1. If a conflict, discrepancy, contradiction, or inconsistency occurs within or between the Specifications and the Drawings, resolution shall be controlled by the following:

1.1.1.1.1. As between figures, dimensions, or numbers given on drawings and any scaled measurements, the figures, dimensions, or numbers shall govern;

1.1.1.1.2. As between large scale drawings and small scale drawings, the larger scale drawings shall govern;

1.1.1.1.3. As between the technical specifications and drawings; the technical specifications shall govern.

1.1.1.1.4. Shop Drawings and Submittals: Shop drawings and other submittals from the Contractor, subcontractors, or suppliers do not constitute a part of the Contract Documents.

1.1.1.2. The Contractor acknowledges, understands and agrees that the Contract Documents cannot be changed except as provided herein by the terms of the Contract. No act(s), action(s), omission(s), or course of dealing(s) by the Owner or Architect/Engineer with the Contractor shall alter the requirements of the Contract Documents and that alteration can be accomplished only through a written Modification process defined herein.

1.1.2. **THE DRAWINGS.** The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, intent, location, and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

1.1.3. **THE SPECIFICATIONS.** The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

1.1.4. **THE CONTRACT.** The entire Contract for Construction is formed by the Contract Documents. The Contract represents the entire, complete, and integrated agreement between the Owner and Contractor.

hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind between: (1) the Architect/Engineer and Contractor; (2) the Owner and any Subcontractor, Sub-subcontractor, or Supplier; (3) the Owner and Architect/Engineer; or, (4) between any persons or entities other than the Owner and Contractor. However, the Architect/Engineer shall at all times be permitted and entitled to performance and enforcement of its obligations under the Contract intended to facilitate performance of the Architect/Engineer's duties.

1.1.5. THE WORK. The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to completely fulfill the Contract and the Contractor's obligations. The Work may constitute the whole or a part of the Project.

1.1.6. THE PROJECT. The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner or by separate contractors.

1.1.7. TIME. Time is of the essence in performance, coordination, and completion of the Work contemplated herein. The Owner may suffer damages if the Work is not completed as specified herein. When any duration or time period is referred to in the Contract Documents by days, the first day of a duration or time period shall be determined as the day following the current day of any event or notice starting a specified duration. All durations in the Contract Documents are calendar days unless specifically stated otherwise.

1.2. **CORRELATION, INTER-RELATIONSHIP, AND INTENT OF THE CONTRACT DOCUMENTS**

1.2.1. The intent of the Contract Documents is to include all items and all effort necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary and inter-related, and what is required by one shall be as binding as if required by all. Performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

1.2.2. Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. It is the Contractor's responsibility to control the Work under the Contract.

1.2.3. Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

1.3. **CAPITALIZATION**

1.3.1. Terms capitalized in these General Conditions include those which are: (1) specifically defined; and, (2) the titles of numbered articles and identified references to Paragraphs, Subparagraphs and Clauses in the document.

1.4. **INTERPRETATION**

1.4.1. In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

1.5. **EXECUTION OF THE CONTRACT AND CONTRACT DOCUMENTS**

1.5.1. The Contract shall be signed by the Owner and Contractor. Execution of the Contract by the Contractor constitutes the complete and irrevocable binding of the Contractor and his Surety to the Owner for complete performance of the Work and fulfillment of all obligations. By execution of the Contract, the Contractor acknowledges that it has reviewed and familiarized itself with all aspects of the Contract Documents and agrees to be bound by the terms and conditions contained therein.

- 1.5.2. Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.
- 1.5.3. The Contractor acknowledges that it has taken all reasonable actions necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to: (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, gas, electric power, phone service, and roads; (3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation, topography, and conditions of the ground; and, (5) the character of equipment and facilities needed for performance of the Work. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory geotechnical work done by the Owner, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the action described and acknowledged in this paragraph will not relieve the Contractor from responsibility for properly ascertaining and estimating the difficulty and cost of successfully performing the Work or for proceeding to successfully perform the Work without additional expense to the Owner.
- 1.5.4. The Owner assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the Owner, nor does the Owner assume responsibility for any understanding reached or representation made by any of its officers, agents, or employees concerning conditions which can affect the Work unless that understanding or representation is expressly stated in the Contract Documents.
 - 1.5.4.1. Performance of any portion of the Work beyond that required for complying with the specifications and all other requirements of the Contract, shall be deemed to be for the convenience of the Contractor and shall be at the Contractor's sole expense.
 - 1.5.4.2. There shall be no increase in the contract price or time allowed for performance which is for the convenience of the Contractor.

1.6. **OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS, AND OTHER INSTRUMENTS OF SERVICE**

- 1.6.1. The Drawings, Specifications and other documents, including those in electronic form, prepared by the Architect/Engineer and the Architect/Engineer's consultants are Instruments of Service through which the Work to be executed by the Contractor is described. The Contractor may retain one record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect/Engineer or the Architect/Engineer's consultants. Unless otherwise indicated, the Architect/Engineer and the Architect/Engineer's consultants shall be deemed the authors of them and will retain all common law, statutory and other reserved rights, in addition to the copyrights except as defined in the Owner's Contract with the Architect/Engineer. All copies of Instruments of Service, except the Contractor's record set, shall be returned or suitably accounted for to the Architect/Engineer upon completion of the Work. The Drawings, Specifications and other documents prepared by the Architect/Engineer and the Architect/Engineer's consultants, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect/Engineer, and the Architect/Engineer's consultants. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect/Engineer and the Architect/Engineer's consultants appropriate to and for use in the execution of their Work under the Contract Documents. All copies made under this authorization shall bear the statutory copyright notice, if any, shown on the Drawings Specifications and other documents prepared by the Architect/Engineer and the Architect/Engineer's consultants. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect/Engineer's or Architect/Engineer's consultants' copyrights or other reserved rights.

- 1.6.2. Owner's Disclaimer of Warranty: The Owner has requested the Architect/Engineer prepare the Contract Documents for the Project which are adequate for bidding and constructing the Project. However, the Owner makes no representation, guarantee, or warranty of any nature whatsoever to the Contractor concerning such documents. The Contractor hereby acknowledges and represents that it has not, does not, and will not rely upon any such representation, guarantee, or warranty concerning the Contract Documents as no such representation, guarantee, or warranty have been or are hereby made.

ARTICLE 2 – THE OWNER

2.1. THE STATE OF MONTANA

- 2.1.1. The Owner is the State of Montana and is the sole entity to be identified as Owner in the Contract and as referred to throughout the Contract Documents as if singular in number.
- 2.1.2. Except as otherwise provided in Subparagraph 4.2.1, the Architect/Engineer does not have authority to bind the Owner. The observations and participations of the Owner or its authorized representative do not alleviate any responsibility on the part of the Contractor. The Owner reserves the right to observe the work and make comment. Any action or lack of action by the Owner shall not be construed as approval of the Contractor's performance.
- 2.1.3. The Owner reserves the right to require the Contractor, all sub-contractors and material suppliers to provide lien releases at any time. The Owner reserves the right to withhold progress payments until such lien releases are received for all work for which prior progress payments have been made. Upon the Owner's demand for lien releases (either verbally or written), the Contractor, all sub-contractors and material suppliers shall provide such releases with every subsequent application for payment through Final Acceptance of the Project.
- 2.1.4. Except for permits and fees, including those required under Subparagraph 3.7.1, which are the responsibility of the Contractor under the Contract Documents, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.
- 2.1.5. Information or services required of the Owner by the Contract Documents shall be furnished by the Owner with reasonable promptness. Any other information or services relevant to the Contractor's performance of the Work under the Owner's control shall be furnished by the Owner after receipt from the Contractor of a written request for such information or services.
- 2.1.6. Unless otherwise provided in the Contract Documents, the Contractor will be furnished electronic copies of Drawings and Specifications as are reasonably necessary for execution of the Work.

2.2. OWNER'S RIGHT TO STOP WORK

- 2.2.1. If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Paragraph 12.2 or persistently fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated. However, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Subparagraph 6.1.3. The issuance of a stop work order by the Owner shall not give rise to a claim by the Contractor or any subcontractor for additional cost, time, or other adjustment.

2.3. OWNER'S RIGHT TO CARRY OUT THE WORK

- 2.3.1. If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may after such seven-day period give the Contractor a second written notice to correct such deficiencies within a three-day period. If the Contractor within such three-day period after receipt of such second notice fails to commence and continue to correct any deficiencies, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be

issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and increased costs, and compensation for the Architect/Engineer's additional services made necessary by such default, neglect, or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

2.4. **OWNER'S RIGHT TO PERSONNEL**

- 2.4.1. The Owner reserves the right to have the Contractor and/or subcontractors remove person(s) and/or personnel from any and all work on the project with cause but without cost to the Owner. Such requests from the Owner may be made verbally or in writing and may be done directly with the Contractor or indirectly through the Architect/Engineer. Cause may be, but not limited to, any of the following: incompetence, poor workmanship, poor scheduling abilities, poor coordination, disruption to the facility or others, poor management, causes delay or delays, disruption of the Project, will not strictly adhere to facility procedures and Project requirements either knowingly or unknowingly, insubordination, drug/alcohol use, possession of contraband, belligerent acts or actions, etc. The Contractor shall provide replacement person(s) and/or personnel acceptable to the Owner at no cost to the Owner.
- 2.4.2. Any issue or circumstance relating to or resulting out of this clause shall not be construed or interpreted to be interference with or impacting upon the Contractor's responsibilities and liabilities under the Contract Documents.
- 2.4.3. Person(s) and/or personnel who do not perform in accordance with the Contract Documents, shall be deemed to have provided the Owner with cause to have such persons removed from any and all involvement in the Work.
- 2.4.4. The Contractor agrees to indemnify and hold harmless the Owner from any and all causes of action, demands, claims, damages, awards, attorneys' fees, and other costs brought against the Owner and/or Architect/Engineer by any and all person(s) or personnel as a result of actions under this clause.

ARTICLE 3 – THE CONTRACTOR

3.1. **GENERAL**

- 3.1.1. The Contractor is the person or entity identified as such in the Contract and is referred to throughout the Contract Documents as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative.
- 3.1.2. Construction Contractor Registration: The Contractor is required to be registered with the Department of Labor and Industry under 39-9-201 and 39-9-204 MCA prior to the Contract being executed by the Owner. A bidder must demonstrate that it has registered or promises that it will register immediately upon notice of award and prior to the commencement of any work. If the prevailing bidder cannot or does not register in time for the Owner to execute the Contract within fifteen (15) days of the date on the notice of award, the Owner may award, at its sole discretion, to the next lowest responsible bidder who meets this requirement. The Owner will not execute a contract for construction nor issue a Notice to Proceed to a Contractor who is not registered per 39-9-401(a) MCA. It is solely the Contractor's responsibility to ensure that all Subcontractors are registered in accordance with Title 39, Chapter 9, MCA.
- 3.1.3. The Owner's engagement of the Contractor is based upon the Contractor's representations by submission of a bid to the Owner that it:
 - 3.1.3.1. has the requisite skills, judgment, capacity, expertise, and financial ability to perform the Work;
 - 3.1.3.2. is experienced in the type of labor and services the Owner is engaging the Contractor to perform;
 - 3.1.3.3. is authorized, licensed and registered to perform the type of labor and services for which it is being engaged in the State and locality in which the Project is located;

- 3.1.3.4. is qualified, willing and able to perform the labor and services for the Project in the manner and scope defined in the Contract Documents; and,
- 3.1.3.5. has the expertise and ability to provide labor and services that will meet the Owner's objectives, intent and requirements, and will comply with the requirements of all governmental, public, and quasi-public authorities and agencies having or asserting jurisdiction over the Project.
- 3.1.4. The Contractor shall perform the Work in accordance with the Contract Documents.
- 3.1.5. The Contractor shall provide on minimum of a bi-weekly basis the onsite Superintendent's daily reports/logs
- 3.1.6. The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect/Engineer in the Architect/Engineer's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.
- 3.1.7. Quality Control (i.e. ensuring compliance with the Contract Documents) and Quality Assurance (i.e. confirming compliance with the Contract Documents) are the responsibility of the Contractor. Testing, observations, and/or inspections performed or provided by the Owner are solely for the Owner's own purposes and are for the benefit of the Owner. The Owner is not liable or responsible in any form or fashion to the Contractor regarding quality control or assurance or extent of such assurances. The Contractor shall not, under any circumstances, rely upon the Owner's testing or inspections as a substitute or in lieu of its own Quality Control or Assurance programs.
- 3.1.8. Buy-Safe Montana Provision: The Owner shall review the Buy-Safe Montana Form provided by the Bidder under Articles 16 of the Instructions to Bidders. To promote a safe work environment, the Owner encourages an incidence rate less than the latest average for non-residential building construction for Montana as established by the federal Bureau of Labor Statistics for the prior year; an experience modification rating (EMR) less than 1.0; and a loss ratio of less than 100%. The Contractor with a greater-than-average incidence rate, an EMR greater than 1.0, and a loss ratio of more than 100% shall schedule and obtain a Comprehensive Safety Consultation from the Montana Department of Labor & Industry, Employment Relations Division, Safety Bureau before the Owner grants Substantial Completion of the Work. For assistance in obtaining the Comprehensive Safety Consultation, visit <http://erd.dli.mt.gov/safety-health/onsite-consultation>.

3.2. REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

- 3.2.1. Since the Contract Documents are complementary and inter-related, before starting each portion of the Work, the Contractor shall carefully study and compare the various Drawings and other Contract Documents relative to that portion of the Work, shall take field measurements of any existing conditions related to that portion of the Work and shall observe any conditions affecting the Work. These obligations are for the purpose of facilitating construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents. However, any errors, inconsistencies or omissions discovered by the Contractor shall be reported promptly to the Architect/Engineer as a request for information in such form as the Architect/Engineer may require.
- 3.2.2. Any errors or omissions noted by the Contractor during this review shall be reported promptly to the Architect/Engineer, but it is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional unless otherwise specifically provided in the Contract Documents.
- 3.2.3. If the Contractor believes that additional cost or time is involved because of clarifications or instructions issued by the Architect/Engineer in response to the Contractor's notices or requests for information pursuant to Subparagraphs 3.2.1 and 3.2.2, the Contractor shall make Claims as provided in Subparagraphs 4.3.4 and 4.3.5. If the Contractor fails to perform the obligations of Subparagraphs 3.2.1 and 3.2.2, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. The Contractor shall not be liable to the Owner or Architect/Engineer for damages resulting from errors, inconsistencies, or omissions in the Contract Documents or for differences between field measurements or conditions and the Contract Documents

unless the Contractor recognized such error, inconsistency, omission or difference and failed to report it to the Architect/Engineer.

- 3.2.4. Except as otherwise expressly provided in this Contract, the Contractor assumes all risks, liabilities, costs, and consequences of performing any effort or work in accordance with any written or oral order (including but not limited to direction, instruction, interpretation, or determination) of a person not authorized in writing by the Owner to issue such an order.
- 3.2.5. By entering into this Contract, the Contractor acknowledges that it has informed itself fully regarding the requirements of the Drawings and Specifications, the General Conditions, the Supplementary General Conditions, all other documents comprising a part of the Contract Documents and all applicable laws, building codes, ordinances and regulations. Contractor hereby expressly acknowledges, guarantees, and warrants to the Owner that:
 - 3.2.5.1. the Contract Documents are sufficient in detail and scope to enable Contractor to construct the finished project;
 - 3.2.5.2. no additional or further work should be required by Owner at the time of Owner's acceptance of the Work; and,
 - 3.2.5.3. when the Contractor's work is finished and the Owner accepts, the Work will be complete and fit for the purpose intended by the Contract Documents. This acknowledgment and guarantee does not imply that the Contractor is assuming responsibilities of the Architect/Engineer.
- 3.2.6. Sufficiency of Contract Documents: Prior to submission of its bid, and in all events prior to and upon signing the Contract, the Contractor certifies, warrants and guarantees that it has received, carefully reviewed, and evaluated all aspects of the Contract Documents and agrees that said Documents are adequate, consistent, coordinated, and sufficient for bidding and constructing the Work requested, intended, conceived, and contemplated therein.
 - 3.2.6.1. The Contractor further acknowledges its continuing duty to review and evaluate the Contract Documents during the performance of its services and shall immediately notify the Architect/Engineer of any problems, conflicts, defects, deficiencies, inconsistencies, errors, or omissions it discovers in the Contract Documents and the Work to be constructed; and, any variances it discovers between the Contract Documents and applicable laws, statutes, building codes, rules or regulations.
 - 3.2.6.2. If the Contractor performs any Work which it knows or should have known due to its experience, ability, qualifications, and expertise in the construction industry, that involves problems, conflicts, defects, deficiencies, inconsistencies, errors, or omissions in the Contract Documents and the Work to be constructed and, any variances between the Contract Documents and applicable laws, statutes, building codes, rules or regulations, without prior written notification to the Architect/Engineer and without prior authorization to proceed from the Architect/Engineer, the Contractor shall be responsible for and bear the costs and delays (including costs of any delay) of performing such Work and all corrective actions as directed by the Architect/Engineer.
 - 3.2.6.3. Any and all claims resulting from the Contractor's failure, including those of any subcontractor or supplier, to carefully review, evaluate, and become familiar with all aspects of the Contract Documents shall be deemed void and waived by the Contractor.
- 3.2.7. Sufficiency of Site Conditions: Prior to submission of its bid, and in all events prior to and upon signing the Contract, the Contractor certifies, warrants and guarantees that it has visited, carefully reviewed, evaluated, and become familiar with all aspects of the site and local conditions at which the Project is to be constructed. The Contractor agrees that the Contract Documents are an adequate, consistent, coordinated, and sufficient representation of the site and local conditions for the Work.
 - 3.2.7.1. The Contractor has reviewed and become familiar with all aspects with the Site Survey and Geotechnical Report for the Project and has a full understanding of the information provided therein.

- 3.2.7.2. If the Work involves modifications, renovations, or remodeling of an existing structure(s) or other man-made feature(s), the Contractor certifies, warrants and guarantees that it has reviewed, evaluated, and become familiar with all available as-built and record drawings, plans and specifications, and has thoroughly inspected and become familiar with the structure(s) or man-made feature(s).
- 3.2.7.3. Any and all claims resulting from the Contractor's failure, including those of any subcontractor or supplier, to visit, carefully review, evaluate, and become familiar with all aspects of the site, available geotechnical information, and local conditions at which the Project is to be constructed shall be deemed void and waived by the Contractor.

3.3. SUPERVISION AND CONSTRUCTION PROCEDURES

- 3.3.1. The Contractor shall supervise and direct the Work using the Contractor's best skill and attention recognizing that time and quality are of the essence of the Work. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. It is the responsibility of and incumbent upon the Contractor to ensure, confirm, coordinate, inspect and oversee all Work (which is inclusive of but not limited to all submittals, change orders, schedules, workmanship, and appropriate staffing with enough competent and qualified personnel) so that the Work is not impacted in terms of any delays, costs, damages, or additional time, or effort on the part Architect/Engineer or Owner. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect/Engineer and shall not proceed with that portion of the Work without further written instructions from the Architect/Engineer. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Architect/Engineer or Owner as appropriate shall be solely responsible for any resulting loss or damage. The Contractor will be required to: review any specified construction or installation procedure; advise the Architect/Engineer if the specified procedure deviates from good construction practice; to advise the Architect/Engineer if following the procedure will affect any warranties, including the Contractor's general warranty, or of any objections the Contractor may have to the procedure and shall propose any alternative procedure which the Contractor will warrant and guarantee. The Contractor is required to: review any specified construction or installation procedure; advise the Architect/Engineer if the specified procedure deviates from good construction practice; to advise the Architect/Engineer if following the procedure will affect any warranties, including the Contractor's general warranty, or of any objections the Contractor may have to the procedure and to propose any alternative procedure which the Contractor will warrant.
- 3.3.2. The Contractor shall furnish management, supervision, coordination, labor and services that: (1) expeditiously, economically, and properly completes the Work; (2) comply with all requirements of the Contract Documents; and, (3) are performed in a quality workmanlike manner and in accordance with the standards currently practiced by persons and entities performing or providing comparable management, supervision, labor and services on projects of similar size, complexity, cost, and nature to this Project. However, the standards currently practiced within the construction industry shall not relieve the Contractor of the responsibility to perform the Work to the level of quality, detail, and excellence defined and intended by the Contract Documents as interpreted by the Architect/Engineer.
- 3.3.3. All services and labor rendered by the Contractor, including any subcontractors or suppliers, shall be performed under the immediate supervision at the site of persons possessing expertise and the requisite knowledge in the discipline or trade of service being rendered. The Contractor shall maintain such supervision and personnel at all times that the Contractor's personnel, subcontractors, and/or suppliers are at the site. The Contractor shall never be absent from the site during performance of any portion of the Work by any entity under the supervision and direction of the Contractor. Full time attendance by the Contractor from Notice to Proceed through Final Acceptance is an explicit requirement of this Contract.

- 3.3.4. The Contractor shall be responsible to the Owner for acts, damages, errors, and omissions of the Contractor's employees, subcontractors and their agents and employees, and other persons or entities performing portions of the Work for or on behalf of the Contractor or any of its Subcontractors.
- 3.3.5. The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

3.4. **LABOR, WAGES, AND MATERIALS**

- 3.4.1. Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, permits, licenses, goods, products, equipment, tools, construction equipment and machinery, water, heat, all utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work in accordance with the Contract Documents, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.
- 3.4.2. The Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect/Engineer and in accordance with a Change Order. This opportunity to request substitutions does not negate or waive any requirement for the Contractor to follow a pre-bidding "prior approval" requirement nor obligate the Owner to approve any substitution request.
- 3.4.3. The Contractor shall enforce strict discipline, appropriate behavior, and good order among the Contractor's employees, subcontractors at every tier and level, and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.
- 3.4.4. Prevailing Wages and Montana Residents.
 - 3.4.4.1. The Contractor and all subcontractors at any level or tier of the Work shall give preference to the employment of bona fide Montana residents in the performance of the Work and shall pay the standard prevailing rate of wages, including fringe benefits for health and welfare and pension contributions and travel allowance provisions in effect and applicable to the county or locality in which the work is being performed. (18-2-403, MCA)
 - 3.4.4.2. At least 50% of the workers, as defined by the Department of Labor & Industry (DOLI), must be bona fide Montana residents. (18-2-401, 18-2-402, MCA)
 - 3.4.4.3. Indian Employment Preference within the Boundaries of an Indian Reservation. All contractors that are awarded a state agency construction contract within the exterior boundaries of an Indian Reservation shall extend a hiring preference to qualified Indians as provided herein:
 - 3.4.4.3.1. "State agency" means a department, office, board, bureau, commission, agency, or other instrumentality of the executive or judicial branches of the government of this State. "Indian" means a person who is enrolled or who is a lineal descendent of a person enrolled in an enrollment listing of the Bureau of Indian Affairs or in the enrollment listing of a recognized Indian tribe domiciled in the United States.
 - 3.4.4.3.2. Qualified Indians – Employment Criteria: An Indian shall be qualified for employment in a permanent, temporary, or seasonal position if he or she has substantially equal qualifications for any position and resides on the reservation where the construction contract is to be performed.
 - 3.4.4.3.3. Non-Applicability: The Indian Employment Preference Policy does not apply to a project partially funded with federal-aid money from the United States Department of Transportation or when residency preference laws are specifically prohibited by federal law. It does not apply to independent contractors and their employees, student interns, elected officials, or appointed positions.
 - 3.4.4.4. The Commissioner of The Montana Department of Labor and Industry (DOLI) has established the standard prevailing rate of wages in accordance with 18-2-401 and 18-2-402, MCA. A copy of the Rates entitled "State of Montana, Prevailing Wage Rates" are bound herein. The Commissioner of the Montana DOLI has established the resident requirements in accordance with 18-2-409, MCA. The Contractor and all subcontractors at any level or tier of the Work

shall direct any and all questions concerning prevailing wage and Montana resident issues for all aspects of the Work to DOLI.

- 3.4.4.5. The Contractor and all subcontractors at any tier or level of the Work, and as determined by the Montana DOLI, shall classify all workers in the project in accordance with the State of Montana, Prevailing Wage Rates. In the event the Contractor is unable to classify a worker in accordance with these rates he shall contact DOLI for a determination of the classification and the prevailing wage rate to be paid.
- 3.4.4.6. The Contractor and all subcontractors at any tier or level of the Work shall be responsible for obtaining wage rates for all workers prior to their performing any work on the project. The Contractor is required to pay and insure that its subcontractors at any tier or level and others also pay the prevailing wage determined by the DOLI, insofar as required by Title 18 of the MCA and the pertinent rules and standards of DOLI.
- 3.4.4.7. It is not the responsibility of the Owner to determine who classifies as a subcontractor, sub-subcontractor, material man, supplier, or any other person involved in any aspect of the Work at any tier or level. All such determinations shall be the sole responsibility of the Contractor, subcontractors, sub-subcontractors, material men, suppliers and others involved in the project at any tier or level. The Contractor, subcontractors, sub-subcontractors, material men, suppliers and others involved in the project shall indemnify and hold harmless the Owner from all claims, attorneys' fees, damages and/or awards involving prevailing wage or Montana resident issues. Any changes to wages or penalties for failure to pay the correct wages will be the sole responsibility of the Contractor and/or his subcontractors and no further charges or claims shall be made to the Owner. If the parties mutually agree or an arbitrator or court determines that any change in wages is due and any part is attributable to the Owner, the Owner's sole liability shall be for the amount of wages ordered only and not for other expenses, charges, penalties, overhead, profit or other mark-ups.
- 3.4.4.8. In accordance with 18-2-422(1) MCA, each job classification's standard prevailing wage rate, including fringe benefits, that the contractors and employers shall pay during construction of the project is included herein by both reference to DOLI's "Building" or "Heavy/Highway" schedules and as part of these Contract Documents.
- 3.4.4.9. The Contractor and every employer, including all subcontractors at any tier or level, is required by 18-2-422(2) MCA to maintain payroll records in a manner readily capable of being certified for submission under 18-2-423 MCA, for a period of not less than 3 years after the contractor's, subcontractor's, or employer's completion of work on the project or the Final Acceptance by the Owner, whichever is later.
- 3.4.4.10. Each contractor is required by 18-2-422(3) MCA to post in a visible and accessible location a statement of all wages and fringe benefits in compliance with 18-2-423.
- 3.4.4.11. The contractor and all subcontractors are required by MCA 18-2-417 to make wage rate adjustments for projects with a construction duration exceeding 30 months.

3.5. **WARRANTY AND GUARANTEE**

- 3.5.1. The Contractor warrants to the Owner and Architect/Engineer that materials and equipment furnished under the Contract will be new and of good quality unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective and rejected. The Contractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect/Engineer, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.
- 3.5.2. The Contractor shall and does hereby warrant and guarantee all work, workmanship, and materials for the full warranty period as specified in the Contract Documents. The warranty period shall be defined as

commencing with Substantial Completion (or with each Substantial Completion if there is more than one) of the Project, or any portion thereof, and continuing for one (1) calendar year from the date of Final Acceptance of the entire project by the Owner. The date of Final Acceptance shall be the date of the Architect/Engineer's signature on the final request for payment unless otherwise agreed upon in writing for the entire project or any portion thereof, by the Owner, Architect/Engineer and Contractor.

- 3.5.3. In addition to the one (1) calendar year warranty and guarantee specified in this herein above, the Contractor warrants and guarantees all materials and workmanship for the roofing system for a period of two (2) calendar years from the date of Final Acceptance. This warranty shall cover all labor and materials for roof and roofing finish systems (e.g. flashing, terminations, parapet caps, etc.) repairs from moisture penetration and/or defects in workmanship.
- 3.5.4. Manufacturer and product warranties and guarantees, as provided by the manufacturer or as specified in the Contract Documents, are in addition to the Contractor's warranty.

3.6. **TAXES**

- 3.6.1. The Contractor is responsible for and shall pay all sales, consumer, use, and similar taxes for the Work provided by the Contractor which are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.
- 3.6.2. In compliance with 15-50-206 MCA, the Contractor will have 1% of his **gross** receipts withheld by the Owner from all payments due and sent to the Montana Department of Revenue. Each subcontractor who performs work greater than \$80,000 shall have 1% of its gross receipts withheld by the Contractor and sent to the Montana Department of Revenue. The Contractor shall notify the Department of Revenue on the Department's prescribed form.

3.7. **PERMITS, FEES, AND NOTICES**

- 3.7.1. Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit and other permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work which are customarily secured after execution of the Contract, including but not limited to, the building permit fee, electrical, plumbing, sewer connection fee and mechanical permit fee, and any required impact fees and which are legally required when bids are received or negotiations concluded.
- 3.7.2. The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authorities applicable to performance of the Work.
- 3.7.3. If the Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, and rules and regulations, and does so without providing notice to the Architect/Engineer and Owner, the Contractor shall assume responsibility for such Work and shall bear the costs attributable to correction. The Contractor shall be solely responsible to insure that all work it performs is in full compliance with all prevailing and applicable codes and regulations.
- 3.7.4. Incident Reporting: The Contractor shall immediately notify the Owner and Architect/Engineer, both orally and in writing, of the nature and details of all incidents which may adversely affect the quality or progress of the Work, including, but not limited to, union disputes, accidents, delays, damages to Work, and other significant occurrences. Such notices are in addition to any other notices required regarding claims.

3.8. **ALLOWANCES**

- 3.8.1. The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct.
- 3.8.2. Unless otherwise provided in the Contract Documents:
 - 3.8.2.1. allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

3.8.2.2. Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included by the Contractor in the Contract Sum but not in the allowances;

3.8.2.3. whenever costs are more than or less than stated allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect: (1) the difference between actual costs and the allowances under Clause 3.8.2.1; and, (2) changes in Contractor's costs under Clause 3.8.2.2.

3.8.3. Materials and equipment under an allowance shall be selected by the Owner.

3.9. **CONTRACTOR'S PERSONNEL**

3.9.1. The Contractor shall employ competent personnel, supervisors, project managers, project engineers, project superintendent, and all others who shall be assigned to the Work throughout its duration. Contractor's personnel extend to those employed by the Contractor whether at the site or not. The Owner shall have right to review and approve or reject all replacement of Contractor's personnel. All personnel assigned by the Contractor to the Work shall possess the requisite experience, skills, abilities, knowledge, and integrity to perform the Work.

3.9.2. The superintendent and others as assigned shall be in attendance at the Project site during the performance of any and all Work. The superintendent shall represent the Contractor. All communications given to the Contractor's personnel such as the project manager or the superintendent, whether verbal, electronic or written, shall be as binding as if given to the Contractor.

3.9.3. It is the Contractor's responsibility to appropriately staff, manage, supervise and direct the Work which is inclusive of the performance, acts, and actions of his personnel and subcontractors. As such, the Contractor further agrees to indemnify and hold harmless the Owner and the Architect/Engineer, and to protect and defend both from and against all claims, attorneys' fees, demands, causes of action of any kind or character, including the cost of defense thereof, arising in favor of or against the Owner, Architect/Engineer, Contractor, their agents, employees, or any third parties on account of the performance, behavior, acts or actions of the Contractor's personnel or subcontractors.

3.9.4. Prior to the commencement of any work, the Contractor shall prepare and submit a personnel listing and organizational chart in a format acceptable to the Owner which lists by name, phone number (including cell phone), job category, and responsibility the Contractor's key/primary personnel who will work on the Project. The Contractor shall promptly inform the Owner in writing of any proposed replacements, the reasons therefore, and the name and qualifications of any proposed replacements. The Owner shall have the right to reject any proposed replacements without cost or claim being made by the Contractor. The chart shall be provided to the Owner at the time of the pre-construction conference.

3.9.5. The Contractor shall immediately remove for the duration of the Project, any person making an inappropriate racial, sexual, or ethnic comment, statement, joke, or gesture toward any other individual.

3.9.6. The Contractor shall immediately remove for the duration of the Project, any person who is incompetent, careless, disruptive, or not working in harmony with others.

3.10. **CONSTRUCTION SCHEDULES**

3.10.1. The Contractor shall, promptly after being awarded the Contract, prepare and submit for the Owner's and Architect/Engineer's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and per the requirements of the Contract Documents, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work. The Contractor's schedule shall be in the "Critical Path Method" and shall show the Critical Path of the Work in sufficient detail to evaluate the Contractor's progress. A request for time extension by the Contractor will not be allowed unless a change in the Work is approved by the Owner and materially affects the Critical Path. It is the Contractor's responsibility to demonstrate that any time extensions requests materially affect the Critical Path.

- 3.10.2. The Contractor shall prepare and keep current, for the Architect/Engineer's approval, a schedule of submittals which is coordinated with the Contractor's Construction Schedule and allows the Architect/Engineer reasonable time to review submittals.
- 3.10.3. The Contractor shall perform the Work in accordance with the most recent schedule submitted to the Owner and Architect/Engineer.
- 3.10.4. The Contractor's operations (including but not limited to the Contractor's forces employed, sequences of operations, and methods of operation) at all times during the performance of the contract shall be: (a) subject to the review of the Owner or the Architect/Engineer; and, (b) sufficient to insure the completion of the Work within the specified performance period.
- 3.10.5. The Critical Path Method Construction Schedule prepared by the Contractor must be in a form that is acceptable to both the Architect/Engineer and the Owner.
 - 3.10.5.1. The Schedule shall show the estimated progress of the entire Project through the individual time periods allowed for completion of each discipline, trade, phase, section, and aspect of the Work.
 - 3.10.5.2. The Schedule shall show percent complete, progress to date, project work, and projected time to complete the work for all activities. The percent complete and minor schedule changes, including additions of activities, change orders, construction change directives, changes to sequences of activities and significant changes in activity demands must be shown by a revised Schedule. A written report providing details about the changes and what actions are anticipated to get the work completed in the contractual time period shall be submitted with the revised schedule.
 - 3.10.5.3. The Construction Schedule shall include coordinate dates for performance of all divisions of the Work, including shipping and delivery, off-site requirements and tasks, so the Work can be completed in a timely and orderly fashion consistent with the required dates of Substantial Completion and Final Acceptance.
 - 3.10.5.4. The Construction Schedule shall include: (i) the required commencement date, the required dates of Substantial Completion(s) and Final Acceptance for the complete Project and all phases (if any); (ii) any guideline and milestone dates required by the Owner or the Contract Documents; (iii) subcontractor and supplier schedules; (iv) a submittal schedule which allows sufficient time for review and action by the Architect/Engineer; (v) the complete sequence of all construction activities with start and completion dates; and, (vi) required decision dates.
 - 3.10.5.5. By receiving, reviewing, and/or commenting on the Construction Schedule or any portion thereof (including logic and resource loading), neither the Owner or Architect/Engineer assume any of the Contractor's responsibility or liability that the Schedule be coordinated or complete, or for timely and orderly completion of the Work.
 - 3.10.5.6. Receiving, reviewing, and/or commenting on the Schedule, any portion thereof, or any revision thereof, does not constitute an approval, acknowledgement, or acceptance of any duration, dates, milestones, or performance indicated therein.
 - 3.10.5.7. A printout of the Schedule's logic showing all activities is required with the Schedule and with all updates to the Schedule.
- 3.10.6. The Contractor shall review and compare, at a minimum on a weekly basis, the actual status of the Work against its Construction Schedule.
- 3.10.7. The Contractor shall routinely, frequently, and periodically (but not less than monthly) update and/or revise its Construction Schedule to show actual progress of the Work through the date of the update or revision, projected level of completion of each remaining activity, activities modified since the previous update or revision, and major changes in scope or logic. The updated/revised Schedule shall be accompanied by a narrative report which: (1) states and explains any modifications of the critical path, if

any, including any changes in logic; (2) defines problem areas and lists areas of anticipated delays; (3) explains the anticipated impact the change in the critical path or problems and delays will have on the entire Schedule and the completion of the Work; (4) provides corrective action taken or proposed; and, (5) states how problems or delays will be resolved in order to deliver the Work by the required phasing milestones (if any), Substantial Completion(s), and Final Acceptance dates.

- 3.10.8. Delay in Performance: If at any time the Contractor anticipates that performance of the Work will be delayed or has been delayed, the Contractor shall: (1) immediately notify the Architect/Engineer by separate and distinct correspondence of the probable cause and effect of the delay, and possible alternatives to minimize the delay; and, (2) take all corrective action reasonably necessary to deliver the Work by the required dates. Nothing in this paragraph or the Contract Documents shall be construed by the Contractor as a granting by the Architect/Engineer or Owner of constructive acceleration. The results of failure to anticipate delays, or to timely notify the Owner and Architect/Engineer of an anticipated or real delay, are entirely the responsibility of the Contractor whether compensable or not.
- 3.10.9. Early Completion: The Contractor may attempt to achieve Substantial Completion(s) on or before the date(s) required in the Contract. However, such early completion shall be for the Contractor's sole convenience and shall not create any real or implied additional rights to Contractor or impose any additional obligations on the Owner or Architect/Engineer. The Owner will not be liable for nor pay any additional compensation of any kind to the Contractor for achieving Substantial Completion(s) or Final Acceptance prior to the required dates as set forth in the Contract. The Owner will not be liable for nor pay any additional compensation of any kind should there be any cause whatsoever that the Contractor is not able to achieve Substantial Completion(s) earlier than the contractually required dates of Substantial Completion(s) or Final Acceptance.
- 3.10.10. Float in Schedule. Any and all float time in the Contractor's schedule, regardless of the path or activity, shall accrue to the benefit of the Owner and the Work, and not to the Contractor. Float also includes any difference shown between any early completion dates shown on the Contractor's Schedule for any phasing milestone(s), Substantial Completion(s) or Final Acceptance and the dates or durations as required by the Contract Documents.
- 3.10.11. Modification of Required Substantial Completion(s) or Final Acceptance Dates: Modification of the required dates shall be accomplished only by duly authorized, accepted, and approved change orders stating the new date(s) with specificity on the change order form. All rights, duties, and obligations, including but not limited to the Contractor's liability for actual, delay, and/or liquidated damages, shall be determined in relation to the date(s) as modified.

3.11. **DOCUMENTATION AND AS-BUILT CONDITIONS AT THE SITE**

- 3.11.1. The Contractor shall maintain at the site for the Owner one record copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and accurately marked to record current field changes and selections made during construction, and one record copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect/Engineer or Owner at any time and shall be delivered to the Architect/Engineer for submittal to the Owner upon completion of the Work.
- 3.11.2. The Owner shall not be required to process final payment until all documentation and data required by the Contract Documents is submitted to and approved by the Architect/Engineer including, but not limited to, the As-Built Drawings. The Owner will not process any final request for payment until the Architect/Engineer has received and verified that the Contractor has performed the requirements pertaining to the as-built drawings.
- 3.11.3. The as-built drawings shall be neatly and clearly marked during construction to record all deviations, variations, changes, and alterations as they occur during construction along with such supplementary notes and details necessary to clearly and accurately represent the as-built condition. The as-built drawings shall be available at all times to the Owner, Architect/Engineer and Architect/Engineer's consultants.

3.12. **SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**

3.12.1. Definitions:

3.12.1.1. Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

3.12.1.2. Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

3.12.1.3. Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

3.12.2. Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the Architect/Engineer is subject to the limitations of Subparagraph 4.2.7. Informational submittals upon which the Architect/Engineer is not expected to take responsive action may be so identified in the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect/Engineer without action.

3.12.3. The Contractor shall review, approve, and submit to the Architect/Engineer, Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents within sixty (60) calendar days of being issued the Notice To Proceed unless noted otherwise and shall do so in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Any and all items submitted by the Contractor which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor, or in the opinion of the Architect/Engineer, have not been reviewed for compliance by the Contractor even if marked as such, may be returned by the Architect/Engineer without action and shall not result in any accusation or claim for delay or cost by the Contractor. Any submittal that, in the opinion of the Architect/Engineer, is incomplete in any area or detail may be rejected and returned to the Contractor. It is the responsibility of and incumbent upon the Contractor to ensure and confirm that all submittals are complete, accurate, and in conformance to the Contract Documents prior to submission.

3.12.4. By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents and guarantees to the Architect/Engineer and Owner that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

3.12.5. The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect/Engineer. Should the Contractor, Subcontractors or Sub-subcontractors install, construct, erect or perform any portion of the Work without approval of any requisite submittal, the Contractor shall bear the costs, responsibility, and delay for removal, replacement, and/or correction of any and all items, material, and /or labor.

3.12.6. The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect/Engineer's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect/Engineer in writing of such deviation at the time of submittal and: (1) the Architect/Engineer has given written approval to the specific deviation as a minor change in the Work; or, (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect/Engineer's approval thereof.

3.12.7. The Contractor shall direct specific attention, in writing or on re-submitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect/Engineer on previous submittals. In the absence of such written notice the Architect/Engineer's approval of a re-submission shall not apply to such revisions.

- 3.12.8. The Contractor shall not be required to provide professional services which constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect/Engineer will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect/Engineer. The Owner and the Architect/Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided the Owner and Architect/Engineer have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this subparagraph, the Architect/Engineer will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents but shall be responsible and held liable for review and verification of all performance or design criteria as required by Paragraph 3.2.
- 3.12.9. Unless noted otherwise in the Contract Documents, the Contractor shall submit to the Architect/Engineer within sixty (60) days from the date of the Notice To Proceed electronic copies of all shop/setting drawings, schedules, cut sheets, products, product data, and samples required for the complete Work. Copies shall be reviewed, marked, stamped and approved on each and every copy by the Contractor prior to submission to the Architect/Engineer or they shall be returned without review or action. The Architect/Engineer shall review with reasonable promptness, making corrections, rejections, or other actions as appropriate. The Architect/Engineer's approval or actions on shop/setting drawings, schedules, cut sheets, products, product data, or samples shall not relieve the Contractor from responsibility for, nor deviating from, the requirements of the plans and specifications. Any deviations from the plans and specifications requested or made by the Contractor shall be brought promptly to the attention of the Architect/Engineer.
- 3.12.10. Cost for Re-Submissions: the Contractor is responsible for ensuring that all shop drawings, product data, samples, and submittals contain all information required by the Contract Documents to allow the Architect/Engineer to take action. The costs and expenses to the Architect/Engineer for making exhaustive reviews of each Shop Drawing, Product Data item, sample, or submittal of the Contractor may be billed by the Architect/Engineer directly to the Contractor or, if otherwise agreed by the Owner in writing, may be reimbursed by the Owner to the Architect/Engineer and deducted from the Contractor's contract via change order by the Owner. The Owner will not be liable to the Architect/Engineer for multiple reviews.

3.13. **USE OF SITE**

- 3.13.1. The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.
- 3.13.2. The Contractor shall not damage, endanger, compromise or destroy any part of the Project or the site, including but not limited to work performed by others, monuments, stakes, bench marks, survey points, utilities, existing features or structures. The Contractor shall be fully and exclusively responsible for and bear all costs and delays (including and costs of delay) for any damage, endangerment, compromise, or destruction of any part of the Project or site.

3.14. **CUTTING AND PATCHING**

- 3.14.1. The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.
- 3.14.2. The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

3.15. **CLEAN UP AND SITE CONTROL**

- 3.15.1. The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract during performance of the Work and at the direction of the Owner or Architect/Engineer. At completion of the Work, the Contractor shall remove from and about the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials.
- 3.15.2. If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.

3.16. **ACCESS TO WORK**

- 3.16.1. The Contractor shall provide the Owner and Architect/Engineer access to the Work at all times wherever located.

3.17. **ROYALTIES, PATENTS AND COPYRIGHTS**

- 3.17.1. The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect/Engineer harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect/Engineer. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect/Engineer.

3.18. **INDEMNIFICATION**

- 3.18.1. To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect/Engineer, Architect/Engineer's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph. The Contractor agrees that it will defend, protect, indemnify and save harmless the State of Montana and the Owner against and from all claims, liabilities, demands, causes of action, judgments (including costs and reasonable attorneys' fees), and losses from any cause whatever (including patent, trademark and copyright infringement) except the Owner's sole or partial negligence. This includes any suits, claims, actions, losses, costs, damages of any kind, including the State and Owner's legal expenses, arising out of, in connection with, or incidental to the Contract, but does not include any such suits, claims, actions, losses, costs or damages which are the result of the negligent acts, actions, losses, costs, or damages which are acts, omissions or misconduct of the Owner if they do not arise out of, depend upon or relate to a negligent act, omission or misconduct of the Contractor in whole or in part.
- 3.18.2. In claims against any person or entity indemnified under this Paragraph 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts

they may be liable, the indemnification obligation under Subparagraph 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 – ADMINISTRATION OF THE CONSTRUCTION CONTRACT

4.1. THE ARCHITECT/ENGINEER

- 4.1.1. The Architect/Engineer is the person lawfully licensed to practice or an entity lawfully practicing identified as such in the Agreement with the Owner and is referred to throughout the Contract Documents as if singular in number. The term "Architect/Engineer" means the Architect/Engineer's duly authorized representative.
- 4.1.2. Duties, responsibilities and limitations of authority of the Architect/Engineer as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner.
- 4.1.3. If the employment of the Architect/Engineer is terminated, the Owner shall employ a new Architect/Engineer at the sole choice and discretion of the Owner, whose status under the Contract Documents shall be that of the former Architect/Engineer.

4.2. ARCHITECT/ENGINEER'S ADMINISTRATION OF THE CONSTRUCTION CONTRACT

- 4.2.1. The Architect/Engineer will provide administration of the Contract as described in the Contract Documents, and will be an Owner's representative throughout the complete duration of the Project, including the warranty period. The Architect/Engineer will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with the Architect/Engineer Contract.
- 4.2.2. The Architect/Engineer, as a representative of the Owner, will visit the site at intervals appropriate to the stage of the Contractor's operations to: (1) become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work completed; (2) endeavor to guard the Owner against defects and deficiencies in the Work; and, (3) to determine in general if the Work is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Owner and Architect/Engineer will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Contractor's Work. The Owner and Architect/Engineer will neither have control over or charge of, nor be responsible for, the construction means, methods, techniques, sequences or procedures, for the safety of any person involved in the work, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.
- 4.2.3. The Architect/Engineer will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect/Engineer will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.
- 4.2.4. Communications Facilitating Contract Administration. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect/Engineer about matters arising out of or relating to the Contract. Communications by and with the Architect/Engineer's consultants shall be through the Architect/Engineer. Communications by and with Subcontractors and material suppliers shall be through the Contractor to the Architect/Engineer. Communications by and with separate contractors shall be through the Owner to the Architect/Engineer.
- 4.2.5. Based on the Architect/Engineer's evaluations of the Contractor's Applications for Payment, the Architect/Engineer will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts. The Contractor is fully aware that the Owner (i.e. the State of Montana) has established a billing cycle for processing payments in Article 9 of these General Conditions. The Contractor and all Subcontractors are subject to all provisions of Title 28, Chapter 2, Part 21 MCA regarding all aspects of the Work.

- 4.2.6. The Architect/Engineer will have authority to reject Work that does not conform to the Contract Documents. Whenever the Architect/Engineer considers it necessary or advisable, the Architect/Engineer will have authority to require inspection or testing of the Work in accordance with the General Conditions and any applicable technical specification requirements, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect/Engineer nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect/Engineer to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.
- 4.2.7. The Architect/Engineer will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect/Engineer's action will be taken with such reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time in the Architect/Engineer's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect/Engineer's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Paragraphs 3.3, 3.5 and 3.12. The Architect/Engineer's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect/Engineer, of any construction means, methods, techniques, sequences or procedures. The Architect/Engineer's approval of a specific item shall not indicate approval of an assembly of which the item is a component.
- 4.2.8. The Architect/Engineer will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Paragraph 7.4.
- 4.2.9. The Architect/Engineer will conduct inspections to determine the date or dates of Substantial Completion(s) and the date of Final Acceptance, will receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor, and will issue a final Certificate for Payment upon compliance with the requirements of the Contract Documents.
- 4.2.10. If the Owner and Architect/Engineer agree, the Architect/Engineer will provide one or more project representatives to assist in carrying out the Architect/Engineer's responsibilities. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in the Owner's Agreement with the Architect/Engineer.
- 4.2.11. The Architect/Engineer will interpret and decide matters concerning performance under and requirements of the Contract Documents on written request of either the Owner or Contractor. The Architect/Engineer's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If no agreement is made concerning the time within which interpretations required of the Architect/Engineer shall be furnished in compliance with this Paragraph 4.2, then delay shall not be recognized on account of failure by the Architect/Engineer to furnish such interpretations until 15 days after written request is made for them.
- 4.2.12. Interpretations and decisions of the Architect/Engineer will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and initial decisions, the Architect/Engineer will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will render such interpretations and decisions in good faith.
- 4.2.13. The Architect/Engineer's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.
- 4.2.14. The Architect/Engineer's or Owner's observations or inspections do not alleviate any responsibility on the part of the Contractor. The Architect/Engineer and the Owner reserves the right to observe and inspection

the work and make comment. Action or lack of action following observation or inspection is not to be construed as approval of Contractor's performance.

4.3. **CLAIMS AND DISPUTES**

4.3.1. Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extensions of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes, controversies, and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be initiated by written notice. The responsibility to substantiate Claims shall rest solely with the party making the Claim.

4.3.1.1. Time Limits on Claims. Claims by either party must be initiated within 21 calendar days after occurrence of the event giving rise to such claim. The following shall apply to the initiation of a claim:

4.3.1.1.1. A written notice of a claim must be provided to the Architect/Engineer and the other party within 21 calendar days after the occurrence of the event or the claim is waived by the claiming party and void in its entirety.

4.3.1.1.2. Claims must be initiated by separate, clear, and distinct written notice within the 21 calendar day time frame to the Architect/Engineer and the other party and must contain the notarized statement in Sub-Paragraph 4.3.1.5 when the claim is made by the Contractor. Discussions in any form with the Architect/Engineer or Owner, whether at the site or not, do not constitute initiation of a claim. Notes in project meeting minutes, email correspondence, change order proposals, or any other form of documentation does not constitute initiation of a claim. The written notice must be a separate and distinct correspondence provided in hardcopy to both the Architect/Engineer and Owner and must delineate the specific event and outline the causes and reasons for the claim whether or not cost or time have been fully determined. Written remarks or notes of a generic nature are invalid in their entirety. Comments made at progress meetings, project site visits, inspections, emails, voice mails, and other such communications do not meet the requirement of providing notice of claim.

4.3.1.1.3. Physical Injury or Physical Damage. Should the Owner or Contractor suffer physical injury or physical damage to person or property because of any error, omission, or act of the other party or others for whose acts the other party is legally and contractually liable, claim will be made in writing to the other party within a reasonable time of the first observance of such physical injury or physical damage but in no case beyond 30 calendar days of the first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter. The provisions of this paragraph shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or repose. In all such cases, the indemnification provisions of the Contract shall be effectual and the Contractor's insurance shall be primary and in full effect.

4.3.1.2. All Claims must contain sufficient justification and substantiation with the written notice or they may be rejected without consideration by the Architect/Engineer or other party with no additional impact or consequence to the Contract Sum, Contract Time, or matter(s) in question in the Claim.

4.3.1.3. If additional compensation is claimed, the exact amount claimed and a breakdown of that amount into the following categories shall be provided with each and every claim:

4.3.1.3.1. Direct costs (as listed in Subparagraph 7.3.9.1 through 7.3.9.5);

4.3.1.3.2. Indirect costs (as defined in Paragraph 7.2.5); and,

4.3.1.3.3. Consequential items (i.e. time extensions, credits, logic, reasonableness, impacts, disruptions, dilution) for the change.

4.3.1.4. If additional time is claimed the following shall be provided with each and every claim:

- 4.3.1.4.1. The specific number of days and specific dates for which the additional time is sought;
- 4.3.1.4.2. The specific reasons, causes, and/or effects whereby the Contractor believes that additional time should be granted; and,
- 4.3.1.4.3. The Contractor shall provide analyses, documentation, and justification of its claim for additional time in accordance with the latest Critical Path Method schedule in use at the time of event giving rise to the claim.

4.3.1.5. With each and every claim, the Contractor shall submit to the Architect/Engineer and Owner a notarized statement containing the following language:

"Under penalty of law (including perjury and/or false/fraudulent claims against the State), the undersigned,

_____	_____
(Name)	(Title)
Of _____	_____
(Company)	(Date)

hereby certifies, warrants, and guarantees that this claim made for Work on this Contract is a true statement of the costs, adjustments and/or time sought and is fully documented and supported under the contract between the parties.

_____	_____
(Signature)	(Date)"

4.3.2. Continuing Contract Performance.

4.3.2.1. Pending final resolution of a Claim except as otherwise agreed in writing or as provided in Subparagraph 9.7.1 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents on the portion of the Work not involved in a Claim.

4.3.3. Claims for Cost or Time for Concealed or Unknown Conditions.

4.3.3.1. If conditions are encountered at the site which are: (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents; or, (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the observing party shall be given to the other party promptly before conditions are disturbed.

4.3.3.2. The Architect/Engineer will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect/Engineer determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect/Engineer shall so notify the Owner and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 21 days after the date of the Architect/Engineer's decision.

4.3.3.3. If the conditions encountered are materially different, the Contract Sum and Contract Time shall be equitably adjusted, but if the Owner and Contractor cannot agree on an adjustment in the Contract Sum or Contract Time, the adjustment shall be referred to the Architect/Engineer for initial determination, subject to further proceedings pursuant to Paragraph 4.4.

4.3.3.4. Nothing in this paragraph shall relieve the Contractor of its obligation to adequately and sufficiently investigate, research, and examine the site, the site survey, topographical

information, and the geotechnical information available whether included by reference or fully incorporated in the Contract Documents.

4.3.4. Claims for Additional Cost.

4.3.4.1. If the Contractor wishes to make Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Paragraph 10.6.

4.3.4.2. If the Contractor believes additional cost is involved for reasons including but not limited to: (1) a written interpretation from the Architect/Engineer; (2) an order by the Owner to stop the Work solely for the Owner's convenience or where the Contractor was not at least partially at fault; (3) a written order for a minor change in the Work issued by the Architect/Engineer; (4) failure of payment by the Owner per the terms of the Contract; (5) termination of the Contract by the Owner; or, (6) other reasonable grounds, Claim must be filed in accordance with this Paragraph 4.3.

4.3.5. Claims for Additional Time

4.3.5.1. If the Contractor wishes to make Claim for an increase in the Contract Time, written notice as specified in these General Conditions shall be provided along with the notarized certification. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay for the same event or cause only one Claim is necessary. However, separate and distinct written notice is required for each separate event.

4.3.5.2. Weather Delays:

4.3.5.2.1. If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction activities.

4.3.5.2.2. Inclement or adverse weather shall not be a prima facie reason for the granting of an extension of time, and the Contractor shall make every effort to continue work under prevailing conditions. The Owner may grant an extension of time if an unavoidable delay occurs as a result of inclement/severe/adverse weather and such shall then be classified as a "Delay Day". Any and all delay days granted by the Owner are and shall be non-compensable in any manner or form. The Contractor shall comply with the notice requirements concerning instances of inclement/severe/adverse weather before the Owner will consider a time extension. Each day of inclement/severe/adverse weather shall be considered a separate instance or event and as such, shall be subject to the notice requirements.

4.3.5.2.3. An "inclement", "severe", or "adverse" weather delay day is defined as a day on which the Contractor is prevented by weather or conditions caused by weather resulting immediately there from, which directly impact the current controlling critical-path operation or operations, and which prevent the Contractor from proceeding with at least 75% of the normal labor and equipment force engaged on such critical path operation or operations for at least 60% of the total daily time being currently spent on the controlling operation or operations.

4.3.5.2.4. The Contractor shall consider normal/typical/seasonal weather days and conditions caused by normal/typical/seasonal weather days for the location of the Work in the planning and scheduling of the Work to ensure completion within the Contract Time. No time extensions will be granted for the Contractor's failure to consider and account for such weather days and conditions caused by such weather for the Contract Time in which the Work is to be accomplished.

4.3.5.2.5. A "normal", "typical", or "seasonal" weather day shall be defined as weather that can be reasonably anticipated to occur at the location of the Work for each particular month involved in the Contract Time. Each month involved shall not be

considered individually as it relates to claims for additional time due to inclement/adverse/severe weather but shall consider the entire Contract Time as it compares to normal/typical/seasonal weather that is reasonably anticipated to occur. Normal/typical/seasonal weather days shall be based upon U.S. National Weather Service climatic data for the location of the Work or the nearest location where such data is available.

4.3.5.2.6. The Contractor is solely responsible to document, prepare and present all data and justification for claiming a weather delay day. Any and all claims for weather delay days shall be tied directly to the current critical-path operation or operations on the day of the instance or event which shall be delineated and described on the Critical-Path Schedule and shall be provided with any and all claims. The Contractor is solely responsible to indicate and document why the weather delay day(s) claimed are beyond those weather days which are reasonably anticipated to occur for the Contract Time. Incomplete or inaccurate claims, as determined by the Architect/Engineer or Owner, may be returned without consideration or comment.

4.3.5.3. Where the Contractor is prevented from completing any part of the Work with specified durations or phases due to delay beyond the control of both the Owner and the Contractor, an extension of the contract time or phase duration in an equal amount to the time lost due to such delay shall be the Contractor's sole and exclusive remedy for such delay.

4.3.5.4. Delays attributable to and/or within the control of subcontractors and suppliers are deemed to be within the control of the Contractor.

4.3.5.5. In no event shall the Owner be liable to the Contractor, any subcontractor, any supplier, Contractor's surety, or any other person or organization, for damages or costs arising out of or resulting from: (1) delays caused by or within the control of the Contractor which include but are not limited to labor issues or labor strikes on the Project, federal, state, or local jurisdiction enforcement actions related directly to the Contractor's Work (e.g. safety or code violations, etc.); or, (2) delays beyond the control of both parties including but not limited to fires, floods, earthquakes, abnormal weather conditions, acts of God, nationwide material shortages, actions or inaction by utility owners, emergency declarations by federal, state, or local officials enacted in the immediate vicinity of the project, or other contractors performing work for the Owner.

4.3.6. Claims for Consequential Damages

4.3.6.1. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes:

4.3.6.1.1. damages incurred by the Owner for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and,

4.3.6.1.2. damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, income, and for loss of profit.

4.3.6.2. This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this waiver of consequential damages shall be deemed to preclude an award of liquidated or actual damages, when applicable, in accordance with the requirements of the Contract Documents.

4.4. **RESOLUTION OF CLAIMS, DISPUTES, AND CONTROVERSIES**

4.4.1. Decision of Architect/Engineer. Claims, including those alleging an error or omission by the Architect/Engineer, shall be referred initially to the Architect/Engineer for decision. A decision by the Architect/Engineer shall be required as a condition precedent to mediation, arbitration or litigation of all Claims between the Contractor and Owner arising prior to the date of Final Acceptance, unless 30 days have passed after the Claim has been referred to the Architect/Engineer with no decision having been rendered by the Architect/Engineer. The Architect/Engineer will not decide disputes between the

Contractor and persons or entities other than the Owner. Any Claim arising out of or related to the Contract, except those already waived in Subparagraphs 4.3.6, 7.2.6, 7.3.8, 9.10.4 and 9.10.5 shall, pending compliance with Subparagraph 4.4.5, be subject to mediation, arbitration, or the institution of legal or equitable proceedings. Claims waived in Subparagraphs 4.3.6, 7.2.6, 7.3.8, 9.10.4, and 9.10.5 are deemed settled, resolved, and completed.

- 4.4.2. The Architect/Engineer will review Claims and within ten (10) days of the receipt of the Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party; (2) reject the Claim in whole or in part; (3) approve the Claim; (4) suggest a compromise; or (5) advise the parties that the Architect/Engineer is unable to resolve the Claim if the Architect/Engineer lacks sufficient information to evaluate the merits of the Claim or if the Architect/Engineer concludes that, in the Architect/Engineer's sole discretion, it would be inappropriate for the Architect/Engineer to resolve the Claim.
- 4.4.3. If the Architect/Engineer requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond within ten (10) days after receipt of such request and shall either provide a response on the requested supporting data, advise the Architect/Engineer when the response or supporting data will be furnished, or advise the Architect/Engineer that no supporting data will be furnished. Upon either no response or receipt of the response or supporting data, the Architect/Engineer will either reject or approve the Claim in whole or in part.
- 4.4.4. The Architect/Engineer will approve or reject Claims by written decision, which shall state the reasons therefore and which shall notify the parties of any change in the Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Architect/Engineer shall be final and binding on the parties but subject to mediation and arbitration.
- 4.4.5. When 30 days have passed upon submission of a Claim without decision or action by the Architect/Engineer, or the Architect/Engineer has rendered a decision or taken any of the actions identified in Subparagraph 4.4.2, a demand for arbitration of a Claim covered by such decision or action must be made within 30 days after the date of expiration of Subparagraph 4.4.1 or within 30 days of the Architect/Engineer's decision or action. Failure to demand arbitration within said 30 day period shall result in the Architect/Engineer's decision becoming final and binding upon the Owner and Contractor whenever such decision is rendered.
- 4.4.6. If the Architect/Engineer renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence but shall not supersede arbitration proceedings unless the decision is acceptable to all parties concerned.
- 4.4.7. Upon receipt of a Claim against the Contractor or at any time thereafter, the Architect/Engineer or the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Architect/Engineer or the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.
- 4.4.8. A Claim subject to or related to liens or bonds shall be governed by applicable law regarding notices, filing deadlines, and resolution of such Claim prior to any resolution of such Claim by the Architect/Engineer, by mediation, or by arbitration, except for claims made by the Owner against the Contractor's bonds.

4.5. **MEDIATION**

- 4.5.1. Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Subparagraphs 4.3.6, 7.2.6, 7.3.8, 9.10.4 and 9.10.5 shall, after initial decision by the Architect/Engineer or 30 days after submission of the Claim to the Architect/Engineer, be subject to mediation as a condition precedent to arbitration or the institution of legal or equitable proceedings by either party.
- 4.5.2. The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect and/or those rules specified in the contract documents or separately agreed upon between the parties. Construction Industry Mediation Rule M-2 (filing with AAA)

is void. The parties shall mutually agree upon a mediator who shall then take the place of AAA in the Construction Industry Mediation Rules. The parties must mutually agree to use AAA and no filing of a request for mediation shall be made to AAA by either party until such mutual agreement has been made. Request for mediation shall be filed in writing with the other party to the Contract and with the American Arbitration Association. The request may be made concurrently with the filing of a demand for arbitration but, in such event, mediation shall proceed in advance of arbitration or legal or equitable proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order.

4.5.3. The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

4.6. **ARBITRATION**

4.6.1. Any controversy or Claim arising out of or related to this Contract or the breach thereof shall be settled by arbitration in accordance with the Montana Uniform Arbitration Act (MUAA). To the extent it does not conflict with the MUAA, the Construction Industry Arbitration Rules of the American Arbitration Association shall apply except as modified herein. The parties to the arbitration shall bear their own costs and expenses for participating in the arbitration. Costs of the Arbitration panel shall be borne equally between the parties except those costs awarded by the Arbitration panel (including costs for the arbitration itself).

4.6.2. Prior to the arbitration hearing all parties to the arbitration may conduct discovery subject to the provisions of Montana Rules of Civil Procedure. The arbitration panel may award actual damages incurred if a party fails to provide full disclosure under any discovery request. If a party claims a right of information privilege protected by law, the party must submit that claim to the arbitration panel for a ruling, before failing to provide information requested under discovery or the arbitration panel may award actual damages.

4.6.3. The venue for all arbitration proceedings required by this Contract shall be the seat of the county in which the work occurs or the First Judicial District, Lewis & Clack County, as determined solely by the Owner. Arbitration shall be conducted by a panel comprised of three members with one selected by the Contractor, one selected by the Owner, and one selected by mutual agreement of the Owner and the Contractor.

4.6.4. Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Subparagraphs 4.3.6, 7.2.6, 7.3.8, 9.10.4 and 9.10.5, shall, after decision or action by the Architect/Engineer or 30 days after submission of the Claim to the Architect/Engineer, be subject to arbitration provided a demand for arbitration is made within the time frame provided in Subparagraph 4.4.5. If such demand is not made with the specified time frame, the Architect/Engineer's decision or action is final. Prior to arbitration, the parties shall endeavor to resolve disputes by mediation in accordance with the provisions of Paragraph 4.5.

4.6.5. Claims not resolved by mediation shall be decided by arbitration which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association currently in effect and/or those rules specified in the Contract Documents or separately agreed upon between the parties. Construction Industry Arbitration Rule R-3 (filing with AAA) is void. The parties shall mutually agree upon an arbitrator or arbitrators who shall then take the place of AAA in the Construction Industry Arbitration Rules. The parties must mutually agree to use AAA and no filing of a demand for arbitration shall be made to AAA by either party until such mutual agreement has been made. The demand for arbitration shall be filed in writing with the other party to the Contract and a copy shall be filed with the Architect/Engineer.

4.6.6. A demand for arbitration shall be made within the time limits specified in Subparagraphs 4.4.5 and in no event shall it be made after the date when institution of legal or equitable proceedings based on such Claim would be barred by the applicable statute of limitations as determined pursuant to Paragraph 13.7.

4.6.7. Pending final resolution of a Claim including arbitration, unless otherwise mutually agreed in writing, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract on Work or amounts not in dispute.

- 4.6.8. **Limitation on Consolidation or Joinder.** Arbitration arising out of or relating to the Contract may include by consolidation or joinder the Architect/Engineer, the Architect/Engineer's employees or consultants, except by written consent containing specific reference to the Agreement and signed by the Architect/Engineer, Owner, Contractor and any other person or entity sought to be joined. No arbitration shall include, by consolidation or joinder or in any other manner, parties other than the Owner, Architect/Engineer, Contractor, a separate contractor as described in Article 6 and other persons substantially involved in a common question of fact or law whose presence is required if complete relief is to be accorded in arbitration. No person or entity other than the Owner, Architect/Engineer, Contractor or a separate contractor as described in Article 6 shall be included as an original third party or additional third party to an arbitration whose interest or responsibility is insubstantial. The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.
- 4.6.9. **Claims and Timely Assertion of Claims.** The party filing a demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.
- 4.6.10. **Judgment on Final Award.** The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof. The parties agree that the costs of the arbitrator(s)' compensation and expenses shall be borne equally. The parties further agree that the arbitrator(s) shall have authority to award to either party some or all of the costs and expenses involved, including attorney's fees.

ARTICLE 5 – SUBCONTRACTORS

5.1. DEFINITIONS

- 5.1.1. A Subcontractor is a person or entity who has a direct or indirect contract at any tier or level with the Contractor or any Subcontractor to the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

5.2. AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

- 5.2.1. Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract and in no instance later than (30) days after award of the Contract, shall furnish in writing to the Owner through the Architect/Engineer the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect/Engineer will promptly reply to the Contractor in writing stating whether or not the Owner or the Architect/Engineer, after due investigation, has reasonable objection to any such proposed person or entity.
- 5.2.2. The Contractor shall not contract with a proposed person or entity to which the Owner or Architect/Engineer has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.
- 5.2.3. If the Owner or Architect/Engineer has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect/Engineer has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.
- 5.2.4. The Contractor shall not change a Subcontractor, person or entity previously selected if the Owner or Architect/Engineer makes reasonable objection to such substitute. The Contractor shall not change or

substitute for a Subcontractor who was required to be listed on the bid without first getting the approval of the Owner.

- 5.2.5. Buy-Safe Montana Provision: Before commencement of each subcontractor's portion of the Work, the Contractor shall obtain each subcontractor's incidence rate, experience modification rate, and loss ratio. The Contractor shall endeavor--but is not required--to use subcontractors whose incidence rate is less than the latest average for non-residential building construction for Montana as established by the Federal Bureau of Labor Statistics for the prior year; whose experience modification rating (EMR) is less than 1.0; and whose loss ratio is less than 100%. Contractor shall require any of its subcontractors who, based on the safety information that the Contractor obtains, have greater-than-average incidence rate, an EMR greater than 1.0, and a loss ratio of more than 100%, to schedule and obtain a Comprehensive Safety Consultation from the Montana Department of Labor & Industry, Employment Relations Division, Safety Bureau before substantial completion of each such subcontractor's portion of the Work. For assistance in obtaining the Comprehensive Safety Consultation, visit <http://erd.dli.mt.gov/safety-health/onsite-consultation>.

5.3. **SUBCONTRACTUAL RELATIONS**

- 5.3.1. By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect/Engineer. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect/Engineer under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement which may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.
- 5.3.2. Upon written request by the Owner, the Contractor shall require its subcontractors to provide to it performance and payment securities for their portion of the Work in the types and form defined in statute (18-2-201 and 18-2-203 MCA) for all sub-contractual agreements.
- 5.3.3. The Contractor shall prepare a Subcontractors' and Suppliers' chart in CSI division format acceptable to the Owner which lists by name, all contact information, job category, and responsibility the Contractor's Subcontractors (at all tiers or levels) and Suppliers with a pecuniary interest in the Project of greater than \$5,000.00. The Contractor shall not enter into any agreement with any subcontractor or supplier to which the Owner raises a timely objection. The Contractor shall promptly inform the Owner in writing of any proposed replacements, the reasons therefore, and the name and qualifications of any proposed replacements. The Owner shall have the right to reject any proposed replacements without cost or claim being made by the Contractor. The chart shall be provided to the Owner at the time of the pre-construction conference but no less than 30 days after award of the Contract.
- 5.3.4. All Contractors and Subcontractors to this contract must comply with all Montana Department of Labor and Industry requirements, regulations, rules, and statutes.
- 5.3.5. In accordance with 39-51-1104 MCA, any Contractor who is or becomes an employer under the provisions of Title 39, Chapter 51 of Montana Code Annotated, who contracts with any Subcontractor who also is or becomes an employer under the provisions of Title 39, Chapter 51 of Montana Code Annotated, shall withhold sufficient money on the contract to guarantee that all taxes, penalties, and interest are paid upon completion of the contract.

5.3.5.1. It is the duty of any Subcontractor who is or becomes an employer under the provisions of Title 39, Chapter 51 of Montana Code Annotated, to furnish the Contractor with a certification issued by the Montana Department of Labor and Industry, prior to final payment stating that said Subcontractor is current and in full compliance with the provisions of Montana Department of Labor and Industry.

5.3.5.2. Failure to comply shall render the Contractor directly liable for all taxes, penalties, and interest due from the Subcontractor, and the Montana Department of Labor and Industry has all of the remedies of collection against the Contractor under the provisions of Title 39, Chapter 51 of Montana Code Annotated, as though the services in question were performed directly for the Contractor.

5.3.6. In compliance with state statutes (15-50-206 MCA), the Contractor will have the 1% Gross Receipts Tax withheld from all payments. Each "Public Contractor" includes all Subcontractors with contracts greater than \$80,000 each. The Contractor and all Subcontractors will withhold said 1% from payments made to all Subcontractors with contracts greater than \$80,000.00 and make it payable to the Montana Department of Revenue. The Contractor and all Subcontractors shall also submit documentation of all contracts greater than \$80,000.00 to the Montana Department of Revenue on the Department's prescribed form.

5.3.7. Construction Contractor Registration: All Subcontractors at any tier or level are required to be registered with the Department of Labor and Industry under 39-9-201 and 39-9-204 MCA prior to the Contract being executed by the Owner. Subcontractors shall demonstrate to the Contractor that it has registered or promises that it will register immediately upon notice of award and prior to the commencement of any work.

5.4. **CONTINGENT ASSIGNMENT OF SUBCONTRACTS**

5.4.1. Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner provided that:

5.4.1.1. assignment is effective only after termination of the Contract by the Owner for cause pursuant to Paragraph 14.2 and only for those subcontract agreements which the Owner accepts by notifying the Subcontractor and Contractor in writing; and,

5.4.1.2. assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

5.4.2. Upon such assignment, if the Work has been suspended for more than 30 days as a result of the Contractor's default, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension. Such adjustment shall be at the expense of the Contractor.

5.4.3. The Contractor shall engage each of its subcontractors and suppliers with written contracts that preserve and protect the rights of the Owner and include the acknowledgement and agreement of each subcontractor and supplier that the Owner is a third-party beneficiary of their sub-contractual and supplier agreements. The Contractor's agreements shall require that in the event of default by the Contractor or termination of the Contractor, and upon request of the Owner, the Contractor's subcontractors and suppliers will perform services for the Owner.

5.4.4. Construction Contractor Registration: All Subcontractors at any tier or level are required to be registered with the Department of Labor and Industry under 39-9-201 and 39-9-204 MCA prior to the Contract being executed by the Owner. Subcontractors shall demonstrate to the Contractor that it has registered or promises that it will register immediately upon notice of award and prior to the commencement of any work.

ARTICLE 6 – CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1. **OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS**

- 6.1.1. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Paragraph 4.3.
- 6.1.2. When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.
- 6.1.3. The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.
- 6.1.4. Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights which apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

6.2. **MUTUAL RESPONSIBILITY**

- 6.2.1. The Contractor shall afford the Owner and separate contractors reasonable opportunity' for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.
- 6.2.2. If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect/Engineer apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.
- 6.2.3. The Owner shall be reimbursed by the Contractor for costs incurred by the Owner which are payable to a separate contractor because of delays, improperly timed activities or defective construction of the Contractor. The Owner shall be responsible to the Contractor for costs incurred by the Contractor because of delays, improperly timed activities, damage to the Work or defective construction of a separate contractor.
- 6.2.4. The Contractor shall promptly remedy damage wrongfully caused by the Contractor to completed or partially completed construction or to property of the Owner or separate contractors as provided in Paragraph 12.2.
- 6.2.5. The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Subparagraph 3.14.

6.3. **OWNER'S RIGHT TO CLEAN UP**

- 6.3.1. If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect/Engineer will determine the responsibility of those involved and allocate the cost accordingly.

ARTICLE 7 – CHANGES IN THE WORK

7.1. GENERAL

- 7.1.1. Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive, or order for a minor change in the Work subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents. Minor changes as ordered by the Architect/Engineer has the definition provided in Paragraph 7.4
- 7.1.2. A Change Order shall be based upon agreement among the Owner, Contractor, and Architect/Engineer; a Construction Change Directive requires agreement by the Owner and Architect/Engineer and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect/Engineer alone.
- 7.1.3. Changes in the Work shall be performed under applicable provisions of the Contract Documents and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.
- 7.1.4. No act, omission, or course of dealing, shall alter the requirement that Change Orders or Construction Change Directives shall be in writing and signed by the Owner, and that Change Orders and Construction Change Directives are the exclusive method for effecting any adjustment to the Contract. The Contractor understands and agrees that neither the Contract Sum nor the Contract Time can be changed by implication, oral agreement, verbal directive, or unsigned Change Order.

7.2. CHANGE ORDERS

- 7.2.1. A Change Order is a written instrument prepared by the Architect/Engineer and signed by the Owner, Contractor and Architect/Engineer, stating their agreement upon all of the following:
 - 7.2.1.1. change in the Work;
 - 7.2.1.2. the amount of the adjustment, if any, in the Contract Sum; and,
 - 7.2.1.3. the extent of the adjustment, if any, in the Contract Time.
- 7.2.2. The cost or credit to the Owner resulting from a change in the Work shall be determined as follows:
 - 7.2.2.1. Per the limitations of this Subparagraph, plus a 5% allowance for overhead and a 10% allowance for profit. The allowances for overhead and for profit are limited to the percentages as specified herein unless they are determined to be unreasonable by the Architect/Engineer (not the Contractor) per Subparagraph 7.3.9 for each Change Order or Construction Change Directive; or,
 - 7.2.2.2. By one of the methods in Subparagraph 7.3.4, or as determined by the Architect/Engineer per Subparagraph 7.3.9, plus a 5% allowance for overhead and a 10% allowance for profit. The allowances for overhead and for profit are limited to the percentages as specified herein unless they are determined to be unreasonable by the Architect/Engineer (not the Contractor) per Subparagraph 7.3.9 for each Change Order or Construction Change Directive.
 - 7.2.2.3. The Contractor's proposed increase or decrease in cost shall be limited to costs listed in Subparagraph 7.3.9.1 through 7.3.9.5.
- 7.2.3. The Contractor shall not submit any Change Order, response to requested cost proposals, or requested changes which are incomplete and do not contain full breakdown and supporting documentation in the following three areas:
 - 7.2.3.1. Direct costs (only those listed in Subparagraph 7.3.9.1 through 7.3.9.5 are allowable);
 - 7.2.3.2. Indirect costs (limited as a percentage on each Change Order per Paragraph 7.2.2); and

7.2.3.3. Consequential items (e.g. time extensions, credits, logic, reasonableness, impacts, disruptions, dilution).

7.2.4. Any Change Order, responses to requested proposals, or requested changes submitted by the Contractor which, in the opinion of the Architect/Engineer, are incomplete, may be rejected and returned to the Contractor without comment. It is the responsibility of and incumbent upon the Contractor to ensure and confirm that all Change Orders, responses to requested proposals, or requested changes are complete prior to submission.

7.2.5. Overhead, applicable to all areas and sections of the Contract Documents, means "Indirect Costs" as referenced in Subparagraph 7.2.3.2. Indirect costs are inclusive of, but not limited to, the following: home office overhead; off-site supervision; home office project management; change order and/or proposal preparation, design, research, negotiation and associated travel; effects of disruption and dilution of management and supervision off-site; time delays; coordination of trades; postage and shipping; and, effective increase in guarantee and warranty durations. Indirect costs applicable to any and all changes in the work, either through Change Order or Construction Change Directive, are limited to the percentage allowance for overhead in Subparagraph 7.2.2.

7.2.6. By signature on any Change Order, the Contractor certifies that the signed Change Order is complete and includes all direct costs, indirect costs and consequential items (including additional time, if any) and is free and clear of all claims or disputes (including, but not limited to, claims for additional costs, additional time, disruptions, and/or impacts) in favor of the Contractor, subcontractors, material suppliers, or other persons or entities concerning the signed change order and on all previously contracted Work and does release the Owner from such claims or demands.

7.2.7. Any and all changes or adjustments to the Contract Time requested or claimed by the Contractor as a result of a Change Order shall require documentation and justification for the adjustment by a Critical Path Method analysis of the Contractor's most recent Critical Path Schedule in use prior to the change. Changes which affect or concern activities containing float or slack time (i.e. not on the critical path) and which can be accomplished within such float or slack time, shall not result in an increase in the Contract Time.

7.2.8. Supervision means on-site, field supervision and not home office overhead, off-site management or off-site supervision.

7.2.9. Labor means those persons engaged in construction occupations as defined in Montana Prevailing Wage Rates for Building Construction or Heavy/Highway as bound in the Contract Documents and does not include design, engineering, superintendence, management, on-site field supervision, home office or other off-site management, off-site supervision, office or clerical work.

7.3. **CONSTRUCTION CHANGE DIRECTIVES**

7.3.1. A Construction Change Directive is a written order prepared by the Architect/Engineer directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

7.3.2. Any and all changes or adjustments to the Contract Time requested or claimed by the Contractor as a result of a Construction Change Directive, shall require documentation and justification for the adjustment by a Critical Path Method analysis of the Contractor's most recent Critical Path Schedule in use prior to the change. Changes that affect or concern activities containing float or slack time (i.e. not on the critical path) and which can be accomplished within such float or slack time shall not result in an increase in the Contract Time.

7.3.3. A Construction Change Directive shall be used in the absence of agreement on the terms of a Change Order.

7.3.4. If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- 7.3.4.1. mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
 - 7.3.4.2. unit prices stated in the Contract Documents or subsequently agreed upon;
 - 7.3.4.3. cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee;
 - 7.3.4.4. By actual cost as shown by the Contractor's and Subcontractor's itemized invoices; or
 - 7.3.4.5. as provided in Subparagraph 7.3.9.
- 7.3.5. Costs shall be limited to the following: cost of materials, including cost of delivery; cost of labor, including social security, old age and unemployment insurance and fringe benefits under collective bargaining agreements; workers' compensation insurance; bond premiums; and rental value of power tools and equipment.
- 7.3.6. Overhead and profit allowances shall be limited on all Construction Change Directives to those identified in 7.2.2.
- 7.3.7. Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect/Engineer of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.
- 7.3.8. A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.
- 7.3.9. If the Contractor does not respond or disagrees with the method for adjustment in the Contract Sum in writing within seven (7) calendar days, the method and the adjustment made shall be determined by the Architect/Engineer on the basis of reasonable expenditures and/or savings of those performing the Work directly attributable to the change including, in the case of an increase in the Contract Sum, plus an allowance for overhead and profit as listed under Subparagraph 7.2.2. In such case, and also under Clause 7.3.4.3, the Contractor shall keep and present, in such form as the Architect/Engineer may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Subparagraph 7.3.9 shall be limited to the following:
- 7.3.9.1. costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance as determined by the Prevailing Wage Schedules referenced in the Contract Documents;
 - 7.3.9.2. costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
 - 7.3.9.3. rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
 - 7.3.9.4. costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
 - 7.3.9.5. additional costs of field supervision and field office personnel directly attributable to the change.
- 7.3.10. The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect/Engineer plus markups in subparagraph 7.2.2. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net change, if any, with respect to that change.

- 7.3.11. Pending final determination of the total cost of a Construction Change Directive to the Owner, amounts not in dispute for such changes in the Work shall be included in Applications for Payment accompanied by a Change Order indicating the parties' agreement with part or all of such costs. For any portion of such cost that remains in dispute, the Architect/Engineer will make an interim determination for purposes of monthly certification for payment for those costs. That determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a claim in accordance with Article 4.
- 7.3.12. When the Owner and Contractor agree with the determination made by the Architect/Engineer concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and shall be recorded by preparation and execution of an appropriate Change Order.

7.4. **MINOR CHANGES IN THE WORK**

- 7.4.1. The Architect/Engineer will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

ARTICLE 8 – TIME

8.1. **DEFINITIONS**

- 8.1.1. Time is of the essence in performance, coordination, and completion of the Work contemplated herein. The Owner may suffer damages if the Work is not completed as specified herein. When any duration or time period is referred to in the Contract Documents by days, the first day shall be determined as the day following the current day of any event or notice starting a specified duration.
- 8.1.2. Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.
- 8.1.3. The date of commencement of the Work is the date established in the NOTICE TO PROCEED AS ISSUED BY THE OWNER.
- 8.1.4. The date the Contractor reaches Substantial Completion is the date certified by the Architect/Engineer in accordance with Paragraph 9.8.
- 8.1.5. The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.
- 8.1.6. Liquidated Damages. The Owner may suffer loss if the project is not substantially complete on the date set forth in the contract documents. The Contractor and his surety shall be liable for and shall pay to the Owner the sums hereinafter stipulated as liquidated damages for each calendar day of delay until the work is substantially complete: **As indicated in the instructions to bidders.**
- 8.1.7. The Contractor shall not be charged liquidated or actual damages when delay in completion of the Work is due to:
- 8.1.7.1. Any preference, priority or allocation order issued by the government;
- 8.1.7.2. Unforeseeable cause beyond the control and without the fault or negligence of the Contractor, such as acts of God or of the public enemy, fires, floods, epidemics, quarantine restrictions, freight embargoes, and unusually severe weather. All such occurrences resulting in delay must be documented and approved by Change Order; or,
- 8.1.7.3. Any delays of Subcontractors or suppliers occasioned by any of the causes specified in 8.1.7.1 and 8.1.7.2 of this article.

- 8.1.8. The Contractor is completely obligated and responsible to provide written notice of each day of delay as provided for in Paragraph 4.3.
- 8.1.9. Contract Time. All work shall reach Substantial Completion by: Dates provided in Instructions to bidders and Invitation to bid documents. The Owner will issue a written NOTICE TO PROCEED and finalized contract.

8.2. PROGRESS AND COMPLETION

- 8.2.1. Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Contract, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.
- 8.2.2. The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the date on the Notice to Proceed and in no case prior to the effective date of insurance required by Article 11 to be furnished by the Contractor. The date of commencement of the Work shall not be changed by the effective date of such insurance.
- 8.2.3. The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.
- 8.2.4. If the Contractor falls behind the latest construction schedule by more than 14 calendar days through its own actions or inaction, neglect, inexperience, lack of oversight and management of the Work including that of any Subcontractors, written notice to the Owner and Architect/Engineer shall be provided within three (3) days with explanation of how the Contractor intends to get back on schedule. Response to getting back on schedule consists of providing a sufficient number of qualified workers and/or proper materials or an acceptably reorganized schedule to regain the lost time in a manner acceptable to the Owner.

8.3. DELAYS AND EXTENSIONS OF TIME

- 8.3.1. If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect/Engineer, or of an employee of either, or of a separate contractor employed by the Owner, or by changes ordered in the Work, or by fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control, or by delay authorized by the Owner pending mediation and arbitration, or by other causes which the Architect/Engineer determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect/Engineer may determine.
- 8.3.2. Claims relating to time shall be made in accordance with applicable provisions of Paragraph 4.3.
- 8.3.3. This Paragraph 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

PAYMENTS AND COMPLETION

9.1. CONTRACT SUM

- 9.1.1. The Contract Sum is stated in the Contract and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

9.2. SCHEDULE OF VALUES

- 9.2.1. Before the first Application for Payment, the Contractor shall submit to the Architect/Engineer a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Architect/Engineer may require. This schedule, unless objected to by the Architect/Engineer, shall be used as a basis for reviewing the Contractor's Applications for Payment.

9.3. APPLICATIONS FOR PAYMENT

- 9.3.1. The Contractor shall submit to the Architect/Engineer an itemized Application for Payment for operations completed in accordance with the Schedule of Values. Such application shall be signed and supported by such data substantiating the Contractor's right to payment as the Owner or Architect/Engineer may require, such as copies of requisitions from Subcontractors and material suppliers, and reflecting retainage if provided for in the Contract Documents.
- 9.3.2. NOTICE OF APPROVAL OF PAYMENT REQUEST PROVISION. Per Title 28, Chapter 2, Part 21, this contract allows the Owner to change the number of days to approve a Contractor's payment request. This contract allows the Owner to approve the Contractor's payment request within thirty-five (35) calendar days after it is received by the Owner without being subject to the accrual of interest.
- 9.3.3. As provided in Subparagraph 7.3.11, such applications may include requests for payment on account of changes in the Work which have been properly authorized by Construction Change Directives, or by interim determinations of the Architect/Engineer, but not yet included in Change Orders.
- 9.3.4. Applications for payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay to a Subcontractor or material supplier.
- 9.3.5. Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.
- 9.3.6. The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.
- 9.3.7. Until the work is complete, the Owner will pay 95% of the amount due the Contractor on account of progress payments.
- 9.3.7.1. If the Work and its progress are not in accordance with all or any part, piece, or portion of the Contract Documents, the Owner may, at its sole discretion and without claim by the Contractor, increase the amount held as retainage to whatever level deemed necessary to effectuate performance and progress of the Work, for anticipated repairs, warranties or completion of the Work by the Contractor or through the letting of other contracts. The Contractor will not be entitled to additional costs, expenses, fees, time, and such like, in the event the Owner increases the amount held as retainage due to non-compliance and/or non-performance with all or any part, piece, or portion of the Contract Documents.
- 9.3.7.2. Prior to the first application for payment, the Contractor shall submit the following information on the appropriate forms:
- 9.3.7.2.1. Schedule of Amounts for Contract Payment (Form 100): This form shall contain a breakdown of the labor, material and other costs associated with the various portions of the work and shall be the basis for the progress payments to the Contractor. The use of electronic method shall be in the Owner's format.
- 9.3.7.2.2. Project/Progress Schedule: If no Schedule (or revised Schedule) is provided with each and every Periodic Estimates for Partial Payment, the Architect/Engineer and/or Owner may return the pay request, or hold it, and may choose not pay for any portion of the Work until the appropriate Schedule, indicating all changes, revisions and updates, is provided. No claim for additional costs or interests will

be made by the Contractor or any subcontractor on account of holding or non-payment of the Periodic Estimate for Partial Payment request.

9.3.7.3. Progress Payments

9.3.7.3.1. Periodic Estimates for Partial Payment shall be on a form provided by the Owner (Form 101) and submitted to the Architect/Engineer for payment by the Owner. Payment shall be requested for the labor and material incorporated in the work to date and for materials suitably stored, less the aggregate of previous payments, the retainage, and the 1% gross receipts tax.

9.3.7.3.2. The Contractor, by submission of any partial pay request, certifies that every request for partial payment is correct, true and just in all respects and that payment or credit had not previously been received. The Contractor further warrants and certifies, by submission of any partial pay request, that all previous work for which payment has been received is free and clear of all liens, disputes, claims, security interests, encumbrances, or causes of action of any type or kind in favor of the Contractor, subcontractors, material suppliers or other persons or entities and does release the Owner from such.

9.3.7.3.3. Progress payments do not constitute official acceptance of any portion of the work or materials whether stored on or off-site.

9.3.7.3.4. In compliance with 15-50-206 MCA, the Contractor will have 1% of his gross receipts withheld by the Owner from all payments due. Each subcontractor who performs work greater than \$80,000 shall have 1% of its gross receipts withheld by the Contractor. The Contractor shall notify the Department of Revenue on the department's prescribed forms.

9.3.7.4. The Contractor may submit obligations/securities in a form specified in 18-1-301 Montana Code Annotated (MCA) to be held by a Financial Institution in lieu of retainage by the Owner. The Owner will establish the amount that would otherwise be held as retainage. Should the Contractor choose to submit obligations/securities in lieu of retainage, the Owner will require the Financial Institution to execute the Owner's "Account Agreement for Deposit of Obligations Other Than Retainage" (Form 120) prior to submission of any obligations/securities in accordance with 18-1-302 MCA. The Contractor must extend the opportunity to participate in all obligations/securities in lieu of retainage on a pro rata basis to all subcontractors involved in the project and shall be solely responsible for the management and administration of same. The Owner assumes no liability or responsibility from or to the Contractor or Subcontractors regarding the latter's participation.

9.3.7.5. The Contractor shall maintain a monthly billing cycle.

9.4. **CERTIFICATES FOR PAYMENT**

9.4.1. The Architect/Engineer will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect/Engineer determines is properly due, or notify the Contractor and Owner in writing of the Architect/Engineer's reasons for withholding certification in whole or in part as provided in Subparagraph 9.5.1. For the purposes of this paragraph regarding certification of payment, electronic mail and/or notes provided through the use of an electronic approval system shall constitute written notice.

9.4.2. The issuance of a Certificate for Payment will constitute a representation by the Architect/Engineer to the Owner, based on the Architect/Engineer's evaluation of the Work and the data comprising the Application for Payment, that the Work has progressed to the point indicated and that, to the best of the Architect/Engineer's knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect/Engineer. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect/Engineer has: (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work;

(2) reviewed construction means, methods, techniques, sequences or procedures; (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or, (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

9.5. **DECISIONS TO WITHHOLD CERTIFICATION**

9.5.1. The Architect/Engineer may withhold or reject a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect/Engineer's opinion the representations to the Owner required by Subparagraph 9.4.2 cannot be made. If the Architect/Engineer is unable to certify payment in the amount of the Application, the Architect/Engineer will notify the Contractor and Owner as provided in Subparagraph 9.4.1. If the Contractor and Architect/Engineer cannot agree on a revised amount, the Architect/Engineer will promptly issue a Certificate for Payment for the amount for which the Architect/Engineer is able to make such representations to the Owner. The Architect/Engineer may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect/Engineer's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Subparagraph 3.3.4, because of:

9.5.1.1. defective Work not remedied;

9.5.1.2. third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;

9.5.1.3. failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;

9.5.1.4. reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

9.5.1.5. damage to the Owner or another contractor;

9.5.1.6. reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or,

9.5.1.7. persistent failure to carry out the Work in accordance with the Contract Documents.

9.5.2. When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

9.5.3. Owner's Right to Refuse Payment: The Architect/Engineer's approval, or partial approval, of the Contractor's request for payment shall not preclude or prevent the Owner from exercising any of its remedies under this Contract. The Owner shall have right to refuse to make payment(s) to the Contractor due to:

9.5.3.1. the Contractor's failure to perform the Work in compliance with the Contract Documents;

9.5.3.2. the Contractor's failure to correct any defective or damaged Work;

9.5.3.3. the Contractor's failure to accurately represent the Work performed in the pay request;

9.5.3.4. the Contractor's performance of its Work at a rate or in a manner that, in the Owner's opinion, is likely to result in the Work, or any portion thereof, to be delayed;

9.5.3.5. the Contractor's failure to use funds previously paid to it by the Owner to pay for the Contractor's Work-related obligations including, but not limited to, subcontractors and suppliers on this Project;

9.5.3.6. claims made, or anticipated by the Owner to be made, against the Owner or its property;

- 9.5.3.7. inclusion in the pay request of any amounts in dispute or part of a claim;
- 9.5.3.8. Damage or loss caused by the Contractor, including its subcontractors and suppliers; or,
- 9.5.3.9. The Contractor's failure or refusal to perform its obligations to the Owner.

9.6. **PROGRESS PAYMENTS**

- 9.6.1. After the Architect/Engineer has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents or the Owner may take any action the Owner deems necessary under Subparagraph 9.5.3.
- 9.6.2. The Contractor shall promptly pay each Subcontractor in accordance with Title 28, Chapter 2, Part 21, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of such Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.
- 9.6.3. The Contractor is prohibited from holding higher amounts in retainage on any Subcontractor than the Owner is holding from the Contractor.
- 9.6.4. The Architect/Engineer will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect/Engineer and Owner on account of portions of the Work done by such Subcontractor.
- 9.6.5. Neither the Owner nor Architect/Engineer shall have an obligation to pay, or to see to the payment of, money to a Subcontractor except as may otherwise be required by law.
- 9.6.6. Payment to material suppliers shall be treated in a manner similar to that provided in Subparagraphs 9.6.2, 9.6.3, 9.6.4, and 9.6.5.
- 9.6.7. A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.
- 9.6.8. Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

9.7. **FAILURE OF PAYMENT**

- 9.7.1. If the Owner does not approve payment to the Contractor within thirty-five (35) calendar days after the receipt of a certified Application for Payment, then the Contractor may, upon seven additional days' written notice to the Owner and Architect/Engineer, suspend the Work until payment of the amount owing has been received. Nothing in the Subparagraph shall limit the Owner's rights and options as provided in Subparagraph 9.5.3. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

9.8. **SUBSTANTIAL COMPLETION**

- 9.8.1. Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

- 9.8.2. When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect/Engineer a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.
- 9.8.3. Upon receipt of the Contractor's list, the Architect/Engineer will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect/Engineer's Inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect/Engineer. In such case, the Contractor shall then submit a request for another inspection by the Architect/Engineer to determine Substantial Completion.
- 9.8.4. The Contractor shall ensure the project is substantially complete prior to requesting any inspection by the Architect/Engineer so that no more than one (1) inspection is necessary to determine Substantial Completion for all or any portion of the Work. If the Contractor does not perform adequate inspections to develop a comprehensive list as required in Subparagraph 9.8.2 and does not complete or correct such items upon discovery or notification, the Contractor shall be responsible and pay for the costs of the Architect/Engineer's additional inspections to determine Substantial Completion.
- 9.8.5. When the Work or designated portion thereof is substantially complete, the Architect/Engineer will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion and which shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance. After issuance of the Certificate of Substantial Completion, the Contractor shall finish and complete all remaining items within thirty (30) calendar days of the date on the Certificate. The Architect/Engineer shall identify and fix the time for completion of specific items which may be excluded from the thirty (30) calendar day time limit. Failure to complete any items within the specified time frames may be deemed by the Owner as default of the contract on the part of the Contractor.
- 9.8.6. The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety if there are claims or past payment issues, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

9.9. **PARTIAL OCCUPANCY OR USE**

- 9.9.1. The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect/Engineer as provided under Subparagraph 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect/Engineer.
- 9.9.2. Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect/Engineer shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work. Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

- 9.9.3. Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

9.10. **FINAL COMPLETION AND FINAL PAYMENT**

- 9.10.1. Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect/Engineer will promptly make such inspection and, when the Architect/Engineer finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect/Engineer will approve the Contractor's final Certificate for Payment stating that to the best of the Architect/Engineer's knowledge, information and belief, and on the basis of the Architect/Engineer's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect/Engineer's signature on the Contractor's final Certificate for Payment will constitute a further representation that conditions listed in Subparagraph 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.
- 9.10.2. Neither final payment nor any remaining retainage shall become due until the Contractor submits to the Architect/Engineer:
- 9.10.2.1. completed Contractor's Affidavit of Completion, Payment of Debts and Claims, and Release of Liens (Form 106) that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied;
- 9.10.2.2. a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner;
- 9.10.2.3. a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents
- 9.10.2.4. Consent of Surety Company to Final Payment (Form 103); and,
- 9.10.2.5. if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner.
- 9.10.3. The Contractor and his surety accepts and assumes responsibility, liability, and costs for and agrees to defend and hold harmless the Owner for and against any and all actions as a result of the Owner making final payment.
- 9.10.4. By submitting any Application for Payment to the Architect/Engineer the Contractor and his surety certify and declare that all bills for materials, supplies, utilities and for all other things furnished or caused to be furnished by the Contractor and all Subcontractors and used in the execution of the Contract will be fully paid upon receipt of Final Payment and that there are no unpaid obligations, liens, claims, security interests, encumbrances, liabilities and/or demands of State Agencies, subcontractors, suppliers, mechanics, laborers or any others resulting from or arising out of any work done, caused to be done or ordered to be done by the Contractor under the contract.
- 9.10.5. In consideration of the prior payments and the final payment made and all payments made for authorized changes, the Contractor releases and forever discharges the Owner from any and all obligations, liens, claims, security interests, encumbrances and/or liabilities arising by virtue of the contract and authorized changes between the parties, either verbal or in writing, and any and all claims and demands of every kind and character whatsoever against the Owner, arising out of or in any way relating to the contract and authorized changes.
- 9.10.6. The date of Final Payment by the Owner shall constitute Final Acceptance of the Work. The determining date for the expiration of the warranty period shall be as specified in Paragraphs 3.5 and 12.2.2.

- 9.10.7. If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect/Engineer so confirms, the Owner shall, upon application by the Contractor and certification by the Architect/Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect/Engineer prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.
- 9.10.8. The making of final payment shall constitute a waiver of Claims by the Owner except those arising from:
- 9.10.8.1. liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- 9.10.8.2. failure of the Work to comply with the requirements of the Contract Documents; or,
- 9.10.8.3. terms of special warranties required by the Contract Documents.
- 9.10.9. Acceptance of final payment by the Contractor, a Subcontractor, or material supplier, shall constitute a waiver of any and all obligations, liens, claims, security interests, encumbrances and/or liabilities against the Owner except those previously made in writing per the requirements of Paragraph 4.3 and as yet unsettled at the time of submission of the final Application for Payment.
- 9.10.10. The Owner's issuance of Final Payment does not constitute a waiver or release of any kind regarding any past, current, or future claim the Owner may have against the Contractor and/or the surety.

ARTICLE 10 – PROTECTION OF PERSONS AND PROPERTY

10.1. SAFETY

- 10.1.1. **Importance of Safety.** The Contractor and all Subcontractors (at any tier or level) recognize that safety is paramount at all times. The Contractor shall perform the work in a safe manner with the highest regard for safety of its employees and all other individuals and property at the work site. Contractor shall maintain its tools, equipment, and vehicles in a safe operating condition and take all other actions necessary to provide a safe working environment for performance of work required under this Contract. The Contractor is solely responsible for the means, methods, techniques, sequences and procedures for coordinating and constructing the Work, including all site safety, safety precautions, safety programs, and safety compliance with OSHA and all other governing bodies.
- 10.1.2. **Particular Safeguards.** (a). The Contractor shall erect and maintain, as required by Paragraphs 10.1.1 and 10.1.3, safeguards for safety and protection, including posting danger signs and other warnings against hazards, installing suitable barriers and lighting, promulgating safety regulations, and providing notification to all parties who may be impacted by the Contractor's operations. (b) When use or storage of explosives or other Hazardous Materials/Substances (defined below) or equipment are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel. (c) The Contractor shall not encumber or load or permit any part of the construction site to be encumbered or loaded so as to endanger the safety of any person(s).
- 10.1.3. **Compliance with Safety Laws.** Contractor represents and warrants to Owner that it knows and understands all federal, state and local safety statutes, rules, and regulations (Laws) related to the work under this Contract. Contractor shall comply with these Laws. Contractor shall keep all material data safety sheets on site and available at all times.
- 10.1.4. **Remedy property damage.** The Contractor shall promptly remedy damage and loss to property caused in whole or in part by the Contractor, a Subcontractor of any tier or level, or anyone employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Paragraph 3.18.

- 10.1.5. **Designation of Safety Representative.** Unless the Contractor designates, in writing to the Owner and the Architect/Engineer, another responsible member of the Contractor's organization as the Safety Representative, the Contractor's superintendent is the Safety Representative. The Safety Representative is defined as that member of the Contractor's organization responsible for all safety under this Contract.
- 10.1.6. **Release/Indemnity of Owner and Architect/Engineer.** The Contractor agrees that the Owner and Architect/Engineer are not responsible for safety at the work site and releases them from all obligations and liability regarding safety at the work site. The Contractor shall indemnify and defend the Owner and the Architect/Engineer against and from all claims, liabilities, fines, penalties, orders, causes of action, judgments, losses, costs and expenses (including but not limited to court costs and reasonable attorney fees), arising from injuries and death to any persons and damage to real and personal property arising from, in connection with, or incidental to Contractor's safety responsibilities under this Contract.

10.2. **HAZARDOUS MATERIALS/SUBSTANCES**

- 10.2.1. "Hazardous Materials/Substances" means any substance: (a) the presence of which requires investigation, or remediation under any federal, state or local statute, rule, regulation, ordinance, order, policy or common law; (b) that is or becomes defined as "hazardous waste," "hazardous substance," pollutant, or contaminant under any federal, state or local statute, rule, regulation, or ordinance or amendments thereto; (c) that is toxic, explosive, corrosive flammable, or otherwise hazardous and is or becomes regulated by any government authority, agency, board, commission or instrumentality of the United States, the state of Montana or any political subdivision thereof; (d) gasoline, diesel fuel or other petroleum hydrocarbons; (e) containing contains polychlorinated biphenyls (PCBs) or asbestos; or (f) the presence of which causes or threatens to cause a nuisance or trespass on the work site or adjacent property.
- 10.2.2. The Contractor is solely responsible for all compliance with all regulations, requirements, and procedures governing Hazardous Materials/Substances at the Work Site or that Contractor brings on the site. The Contractor is solely responsible for remediation, costs, damages, loss, and/or expenses for all Hazardous Materials/Substances brought to the site. The Contractor shall not and is strictly prohibited from purchasing and/or installing any asbestos-containing materials or products as part of the Work. Should the Contractor do so, the Contractor shall be solely responsible for the immediate remediation and all costs, damages, loss, and/or expenses per Paragraphs 10.1.6, 10.2.2, 10.2.3, and 10.2.4.
- 10.2.3. If the Contractor encounters Hazardous Materials/Substances during the course of the Work, whether or not identified in the Contract Documents, Work, the Contractor agrees that:
- 10.2.3.1. Encountering any Hazardous Materials/Substances during performance of the Work does not necessarily mean a change in conditions has occurred, nor is it evidence that the Contractor is due additional Contract Time or an increase in the Contract Sum. If encountering Hazardous Materials/Substances is determined to be a change in conditions to the Contract Documents, Paragraph 4.3 and Article 7 apply in determining any additional compensation or extension of time claimed by the Contractor.
- 10.2.3.2. The Contractor is solely responsible for securing the Work in accordance with this Article 10 involving any Hazardous Materials/Substances against unlawful, unregulated, or improper intrusion, disturbance, or removal. The Contractor shall implement protections and take protective actions throughout the performance of the Work to prevent exposure to workers, occupants, and contamination of the site or area.
- 10.2.3.3. If the Contractor is unable to or fails to properly secure the Work against unlawful, unregulated, or improper intrusion, disturbance, or removal of Hazardous Materials/Substances, the Contractor shall immediately implement protections and take protective actions, up to and including stopping Work in the area or on the item affected, to prevent exposure to workers, occupants, and contamination of the site or area. The Contractor shall immediately notify the Owner and Architect in writing giving details of the failure and the corrective actions taken. If the condition is an emergency and notice cannot be provided in writing, then Contractor shall orally and immediately notify the Owner and Architect/Engineer of the condition followed by a full written explanation. In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss.

10.2.3.4. If the Contractor notifies the Owner and takes precautions in accordance with this Article 10 upon encountering materials/substances suspected of containing asbestos or polychlorinated biphenyls that are unidentified in the Contract Documents, the Owner shall verify if the unidentified material or substance contains asbestos or polychlorinated biphenyls and shall arrange for the removal or other measures as necessary to allow the Contractor to proceed with the Work. The Contract Time may be extended as appropriate if the Work affected is on the critical path and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs as provided in Article 7. Should the Contractor fail to notify the Owner upon encountering asbestos, polychlorinated biphenyls, or materials/substances suspected of containing asbestos or polychlorinated biphenyls, that are unidentified in the Contract Documents, the Contractor is solely responsible for all mitigation in accordance with Paragraphs 10.1.6, 10.2.2, 10.2.3, and 10.2.4.

10.2.4. The Contractor shall indemnify, hold harmless, and defend the Owner from and against all claims, liabilities, fines, penalties, orders, causes of action, judgments, losses, costs and expenses, including but not limited to court costs and reasonable attorneys' fees, arising from, in connection with, or incidental to the Contractor's handling, disposal, encountering, or release of Hazardous Materials/Substances.

10.3. **UTILITIES**

10.3.1. Underground Utilities: Buried utilities, including, but not limited to, electricity, gas, steam, air, water, telephone, sewer, irrigation, broadband coaxial computer cable, and fiber optic cables are very vulnerable and damage could result in loss of service. The telephone, broadband and fiber optic cables are especially sensitive and the slightest damage to these components will result in disruption of the operations of the campus.

10.3.2. "One Call" must be notified by phone and in writing at least 72 hours (3 business days) prior to digging to arrange and assist in the location of buried utilities in the field. (Dial 811). The Contractor shall mark the boundary of the work area. The boundary area shall be indicated with white paint and white flags. In winter, pink paint and flags will be accepted.

10.3.3. After buried utilities have been located, the Contractor shall be responsible for any utilities damaged while digging. Such responsibility shall include all necessary care including hand digging. Contractor's responsibility shall also include maintaining markings after initial locate. The area for such responsibility, unless otherwise indicated, shall extend 24 inches to either side of the marked center line of a buried utility line.

10.3.4. The Contractor's responsibility shall include repair or replacement of damaged utilities. The Contractor will also be responsible for all costs associated with reterminations and recertification.

10.3.5. Any buried utilities exposed by the operations of the Contractor shall be marked on the plans and adequately protected by the Contractor. If any buried utilities not located are exposed, the Contractor shall immediately contact the Owner and the Architect/Engineer. If, after exposing an unlocated buried utility, the Contractor continues digging without notifying Owner and Architect/Engineer and further damages the utility, the Contractor will be fully and solely responsible.

10.3.6. Damage to irrigation systems during seasons of no irrigation that are not immediately and adequately repaired and tested will require the Contractor to return when the system is in service to complete the repair.

10.3.7. In the event of a planned interruption of any existing utility service, the Contractor shall make arrangements with Owner at least 72 hours (3 business days) in advance. Shutdowns of the broadband or fiber optic cables will normally require 5 working days' notice to the Owner. The Contractor shall bear all costs associated with the interruptions and restorations of service.

ARTICLE 11 - INSURANCE AND BONDS

11.1. **CONTRACTOR'S LIABILITY INSURANCE**

- 11.1.1. The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the State of Montana with a rating no less than "A-", such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:
 - 11.1.1.1. claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;
 - 11.1.1.2. claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
 - 11.1.1.3. claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
 - 11.1.1.4. claims for damages insured by usual personal injury liability coverage;
 - 11.1.1.5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting there from;
 - 11.1.1.6. claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
 - 11.1.1.7. claims for bodily injury or property damage arising out of completed operations; and,
 - 11.1.1.8. claims involving contractual liability insurance applicable to the Contractor's obligations under Paragraph 3.18.
- 11.1.2. The insurance required by Subparagraph 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until termination of any coverage required to be maintained after final payment.
- 11.1.3. Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These certificates and the insurance policies except Workers Compensation required by this Paragraph 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire at any time prior to Final Acceptance and then not until at least 30 days' prior written notice has been given to the Owner. The Workers Compensation policy will not be canceled or allowed to expire at any time prior to Final Acceptance and then not until at least 30 days' prior written notice has been given to the Owner by the Contractor. If any of the foregoing insurance coverages are required to remain in force after final payment, an additional certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment as required by Subparagraph 9.10.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief.
- 11.1.4. At the request of the Owner, the Contractor shall provide copies of all insurance policies to the Owner.

11.2. **INSURANCE, GENERAL REQUIREMENTS**

- 11.2.1. The Contractor shall maintain for the duration of the contract, at its cost and expense, insurance against claims for injuries to persons or damages to property, including contractual liability, which may arise from or in connection with the performance of the Work by the Contractor, its agents, employees, representatives, assigns, or subcontractors. The Contractor is responsible for all deductibles regardless of policy or level of coverage. The Owner reserves the right to demand, and the Contractor agrees to provide, copies of any and all policies at any time.

- 11.2.2. Hold Harmless and Indemnification: The Contractor shall protect, defend, and save the state, its elected and appointed officials, agents, and employees, while acting within the scope of their duties as such, harmless from and against all claims, liabilities, demands, causes of action, and judgments whatsoever (including the cost of defense and reasonable attorney fees): 1) arising in favor of or asserted by third parties on account of damage to property, personal injury, or death which injury, death, or damage; or, 2) arising out of or resulting from performance or failure to perform, or omissions of services, or in any way results from the negligent acts or omissions of the Contractor, its agents, agents, or subcontractors.
- 11.2.3. Contractor's Insurance: insurance required under all sections herein shall be in effect for the duration of the contract that extends through the warranty period. Insurance required herein shall be provided by insurance policies issued only by insurance companies currently authorized to do business in the state of Montana. No Contractor or Sub-contractor shall commence any Work under this contract until all required insurance has been obtained. During the term of this contract, the Contractor shall, not less than thirty days prior to the expiration date of any policy for which a certificate of insurance is required, deliver to the Owner a certificate of insurance with respect to the renewal insurance policy. The Contractor shall furnish one copy of insurance certificates of insurance herein required, which shall specifically set forth evidence of all coverage required by these contract documents and which shall be signed by authorized representatives of the insurance company or companies evidencing that insurance as required herein is in force with the exception of Workers Compensation and will not be canceled, limited or restricted without thirty days' written notice by certified mail to the contractor and the Owner. The Workers Compensation policy will not be canceled or allowed to expire at any time prior to Final Acceptance and then not until at least 30 days' prior written notice has been given to the Owner by the Contractor. The Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending coverage or limits. Additionally, all certificates shall include the project name and A/E project number.
- 11.2.4. Certificates of Insurance and Endorsements. All certificates of insurance and the additional insured endorsements are to be received by the state prior to issuance of the Notice to Proceed. The contractor is responsible to ensure that all policies and coverages contain the necessary endorsements for the State being listed as an additional insured. The state reserves the right to require complete copies of all insurance policies at any time to verify coverage. The contractor shall notify the state within 30 days of any material change in coverage.

11.3. **WORKERS' COMPENSATION INSURANCE**

- 11.3.1. The Contractor shall carry **Workers' Compensation Insurance**. Such Workers' Compensation Insurance shall protect the Contractor from claims made by his own employees, the employees of any Sub-contractor, and also claims made by anyone directly or indirectly employed by the Contractor or Sub-contractor. The Contractor shall require each Sub-contractor similarly to provide Workers' Compensation Insurance.

11.4. **COMMERCIAL GENERAL LIABILITY INSURANCE**

- 11.4.1. Each Contractor shall carry per occurrence coverage **Commercial General Liability Insurance** including coverage for premises; operations; independent contractor's protective; products and completed operations; products and materials stored off-site; broad form property damage and comprehensive automobile liability insurance with not less than the following limits of liability:

11.4.1.1. **\$1,000,000 per occurrence; aggregate limit of \$2,000,000;**

- 11.4.2. The **Commercial General and Automobile Liability Insurance** shall provide coverage for both bodily injury, including accidental death, sickness, disease, occupational sickness or disease, personal injury liability coverage and property damage which may arise out of the work under this contract, or operations incidental thereto, whether such work and operations be by the Contractor or by any Subcontractor or by anyone directly or indirectly employed by the Contractor or by Sub-contractor, or by anyone for whose acts any of them may be liable. The Contractor shall maintain the liability insurance required herein for a period of not less than one year after final payment or anytime the Contractor goes on to the location of the project.

- 11.4.3. The Contractor's liability insurance policies shall list the STATE OF MONTANA as an additional insured. **AN ADDITIONAL INSURED ENDORSEMENT DOCUMENT SHALL BE SUBMITTED WITH THE CERTIFICATES OF INSURANCE.** The STATE OF MONTANA includes its officers, elected and appointed officials, employees and volunteers and political subdivisions thereof. Should the Contractor not be able to list the state as an additional insured, the Contractor shall purchase a per occurrence Owner's/Contractor's Protective Policy (OCP) with the STATE OF MONTANA as the insured party in the same occurrence and aggregate limits as that indicated above for the Contractor's Commercial General Liability Policy.
- 11.4.4. Property damage liability insurance shall be written without any exclusion for injury to or destruction of any building, structure, wires, conduits, pipes, or other property above or below the surface of the ground arising out of the blasting, explosion, pile driving, excavation, filling, grading or from the moving, shoring, underpinning, raising, or demolition of any building or structure or structural support thereof.
- 11.4.5. The Contractor's insurance coverage shall be PRIMARY insurance as respects the State, its officers, elected and appointed officials, employees and volunteers. Any insurance or self-insurance maintained by the state, its officers, elected and appointed officials, employees and volunteers shall be excess of the Contractor's insurance and shall not contribute to it. NO WAIVERS OF SUBROGATION OR ENDORSEMENTS LIMITING, TRANSFERRING, OR OTHERWISE INDEMNIFYING LIABLE OR RESPONSIBLE PARTIES OF THE CONTRACTOR OR ANY SUBCONTRACTOR WILL BE ACCEPTED.

11.5. **PROPERTY INSURANCE (ALL RISK)**

- 11.5.1. New Construction (for projects involving new construction): At its sole cost and expense, the contractor shall keep the building and all other improvements on the premises insured throughout the term of the agreement against the following hazards:
- 11.5.1.1. Loss or damage by fire and such other risks (including earthquake damage for those areas with a shaking level at 10g or above as indicated on the seismic map, [NEHRP.pdf \(mt.gov\).pdf](#) in an amount sufficient to permit such insurance to be written at all times on a replacement cost basis. This may be insured against by attachment of standard form extended coverage endorsement to fire insurance policies. Certificates of Insurance MUST indicate earthquake coverage if coverage is required per the above referenced map.
- 11.5.1.2. Loss or damage from leakage or sprinkler systems now or hereafter installed in any building on the premises.
- 11.5.1.3. Loss or damage by explosion of steam boilers, pressure vessels, and oil or gasoline storage tanks, or similar apparatus now or hereafter installed in a building or buildings on the premises.
- 11.5.2. Building Renovation (for projects involving building renovation or remodeling):
- 11.5.2.1. The contractor shall purchase and maintain Builder's Risk/Installation insurance on a "special causes of loss" form (so called "all risk") for the cost of the work and any subsequent modifications and change orders. The contractor is not responsible for insuring the existing structure for Builder's Risk/Installation insurance.
- 11.5.2.2. At its sole cost and expense, the contractor shall insure all property construction on the premises throughout the term of the agreement against the following hazards:
- 11.5.2.2.1. Loss or damage by fire and such other risks (including earthquake damage for those areas with a shaking level at 10g or above as indicated on the seismic map at <http://rmtd.mt.gov/Portal/62/aboutus/publications/files/NEHRP.pdf> in an amount sufficient to permit such insurance to be written at all times on a replacement cost basis. This may be insured against by attachment of standard form extended coverage endorsement to fire policies. Certificates of Insurance MUST indicate earthquake coverage if coverage is required per the above referenced map.
- 11.5.2.2.2. Loss or damage from leakage or sprinkler systems now or hereafter installed in any building on the premises.

- 11.5.2.2.3. Loss or damage by explosion of steam boilers, pressure vessels, oil or gasoline storage tanks, or similar apparatus now or hereafter installed in a building or buildings on the premises.

11.6. **ASBESTOS ABATEMENT INSURANCE**

- 11.6.1. If Asbestos Abatement is identified as part of the Work under this contract, the Contractor or any subcontractor involved in asbestos abatement shall purchase and maintain **Asbestos Liability Insurance** for coverage of bodily injury, sickness, disease, death, damages, claims, errors or omissions regarding the asbestos portion of the work ***in addition to*** the CGL Insurance by reason of any negligence in part or in whole, error or omission committed or alleged to have been committed by the Contractor or anyone for whom the Contractor is legally liable.
- 11.6.2. Such insurance shall be in "per occurrence" form and shall clearly state on the certificate that asbestos work is included in the following limits:
 - 11.6.2.1. **\$1,000,000 per occurrence; aggregate limit of \$2,000,000.**
- 11.6.3. Asbestos Liability Insurance as carried by the asbestos abatement subcontractor in these limits in lieu of the Contractor's coverage is acceptable provided the Contractor and the State of Montana are named as additional insureds and that the abatement subcontractor's insurance is PRIMARY as respects both the Owner and the Contractor. If the Contractor or any other subcontractor encounters asbestos, all operations shall be suspended until abatement with the associated air monitoring clearances are accomplished. The certificate of coverage shall be provided by the asbestos abatement subcontractor to both the Contractor and the Owner.

11.7. **PERFORMANCE BOND AND LABOR & MATERIAL PAYMENT BOND (BOTH ARE REQUIRED ON PROJECTS EXCEEDING \$150,000.00 IN VALUE)**

- 11.7.1. The Contract shall furnish a Performance Bond in the amount of 100% of the contract price as security for the faithful performance of his contract (18-2-201 MCA). The Contractor shall also furnish a Labor and Material Payment Bond in the amount of 100% of the contract price as security for the payment of all persons performing labor and furnishing materials in connection therewith (18-2-201MCA). The bonds shall be executed on forms furnished by the Owner and no other forms or endorsements will be acceptable. The bonds shall be signed in compliance with state statutes (33-17-1111 MCA). Bonds shall be secured from a state licensed bonding company. Power of Attorney is required with each bond. Attorneys-in-fact who sign contract bonds must file with each bond a certified and effectively dated copy of their power of attorney:
 - 11.7.1.1. one original copy shall be furnished with each set of bonds.
 - 11.7.1.2. Others furnished with a set of bonds may be copies of that original.
- 11.7.2. The Owner reserves the right at any time during the performance of Work to require bonding of Subcontractors provided by the General Contractor. Should this occur, the Owner will cover the direct cost. This shall not be construed as to in any way affect the relationship between the General Contractor and his Subcontractors.
- 11.7.3. Surety must have an endorsement stating that their guarantee of Contractor's performance automatically covers the additional contract time added to a Contractor's contract by Change Order.
- 11.7.4. A change in the Contractor's organization shall not constitute grounds for Surety to claim a discharge of their liability and requires an endorsement from Surety so stating.
- 11.7.5. Except as noted below, the Contractor is required to notify Surety of any increase in the contract amount resulting from a Change Order within 48 hours of signing and submitting a Change Order and shall submit a copy of Surety's written acknowledgment and consent to Owner before a Change Order can be approved. The Surety's written acknowledgment and consent on the Change Order form shall also satisfy this consent requirement.

- 11.7.5.1. Surety consent shall not be required on Change Order(s) which, in the aggregate total amount of all Changes Orders, increase the original contract amount by less than 10%. However, the Contractor is still required to notify Surety of any increase in contract amount resulting from a Change Order(s) within 48 hours of signing and submitting every Change Order.
- 11.7.5.2. Surety is fully obligated to the Owner for the full contract amount, inclusive of all Change Orders, regardless of whether or not written acknowledgement and consent is received and regardless of whether or not the aggregate total of all Change Orders is more or less than 10% of the original contract amount.
- 11.7.5.3. A fax with hard copy to follow of Surety's written acknowledgment and consent is acceptable. If hard copy is not received by Owner before Application for Payment on any portion or all of said Change Order, it will not be accepted by Owner for payment.
- 11.7.6. The Surety must take action within 30 days of notice of default on the part of the Contractor or of any claim on bonds made by the Owner or any Subcontractor or supplier.

ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK

12.1. UNCOVERING OF WORK

- 12.1.1. If a portion of the Work is covered contrary to the Architect/Engineer's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Architect/Engineer, be uncovered for the Architect/Engineer's examination and be replaced at the Contractor's expense without change in the Contract Time.
- 12.1.2. If a portion of the Work has been covered which the Architect/Engineer has not specifically requested to examine prior to it being covered, the Architect/Engineer may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

12.2. CORRECTION OF WORK

12.2.1. BEFORE OR AFTER SUBSTANTIAL COMPLETION

- 12.2.1.1. The Contractor shall promptly correct Work that fails to conform to the requirements of the Contract Documents or that is rejected by the Architect/Engineer, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections and compensation for the Architect/Engineer's services and expenses made necessary thereby, shall be at the Contractor's expense. The Contractor is responsible to discover and correct all defective work and shall not rely upon the Architect/Engineer's or Owner's observations.
- 12.2.1.2. Rejection and Correction of Work in Progress. During the course of the Work, the Contractor shall inspect and promptly reject any Work that:
 - 12.2.1.2.1. does not conform to the Construction Documents; or,
 - 12.2.1.2.2. does not comply with any applicable law, statute, building code, rule or regulation of any governmental, public and quasi-public authorities, and agencies having jurisdiction over the Project.
- 12.2.1.3. The Contractor shall promptly correct or require the correction of all rejected Work, whether observed before or after Substantial Completion. The Contractor shall bear all costs of correcting such Work, including additional testing, inspections, and compensation for all services and expenses necessitated by such corrective action.

12.2.2. AFTER SUBSTANTIAL COMPLETION AND AFTER FINAL ACCEPTANCE

12.2.2.1. In addition to the Contractor's obligations under Paragraph 3.5, if, within one year after the date of Final Acceptance of the Work or designated portion thereof or after the date for commencement of warranties, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect/Engineer, the Owner may correct it in accordance with Paragraph 2.3.

12.2.2.1.1. The Contractor shall remedy any and all deficiencies due to faulty materials or workmanship and pay for any damage to other work resulting there from, which shall appear within the period of Substantial Completion through one (1) year from the date of Final Acceptance in accordance with the terms and conditions of the Contract and with any special guarantees or warranties provided in the Contract Documents. The Owner shall give notice of observed deficiencies with reasonable promptness. All questions, claims or disputes arising under this Article shall be decided by the Architect/Engineer. All manufacturer, product and supplier warranties are in addition to this Contractor warranty.

12.2.2.1.2. The Contractor shall respond within seven (7) days after notice of observed deficiencies has been given and he shall proceed to immediately remedy these deficiencies.

12.2.2.1.3. Should the Contractor fail to respond to the notice or not remedy those deficiencies; the Owner shall have this work corrected at the expense of the Contractor.

12.2.2.1.4. Latent defects shall be in addition to those identified above and shall be the responsibility of the Contractor per the statute of limitations for a written contract (27-2-208 MCA) starting from the date of Final Acceptance.

12.2.2.2. The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work.

12.2.2.3. The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Paragraph 12.2.

12.2.3. The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

12.2.4. The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

12.2.5. Nothing contained in this Paragraph 12.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the one-year period for correction of Work as described in Subparagraph 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

12.3. ACCEPTANCE OF NONCONFORMING WORK

- 12.3.1. If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

13.1. GOVERNING LAW

- 13.1.1. The Contract shall be governed by the laws of the State of Montana and venue for all legal proceedings shall be the First Judicial District, Lewis & Clark County.

13.2. SUCCESSORS AND ASSIGNS

- 13.2.1. The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempt to make such assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

13.3. WRITTEN NOTICE

- 13.3.1. Written notice shall be deemed to have been duly served if delivered in person to the individual or a member of the firm or entity or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified mail to the last business address known to the party giving notice.

13.4. RIGHTS AND REMEDIES

- 13.4.1. Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.
- 13.4.2. No action or failure to act by the Owner, Architect/Engineer or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

13.5. TESTS AND INSPECTIONS

- 13.5.1. Quality Control (i.e. ensuring compliance with the Contract Documents) and Quality Assurance (i.e. confirming compliance with the Contract Documents) are the responsibility of the Contractor. Testing, observations, and/or inspections performed or provided by the Owner are solely for the Owner's own purposes and are for the benefit of the Owner. The Owner is not liable or responsible in any form or fashion to the Contractor regarding quality control or assurance or extent of such assurances. The Contractor shall not, under any circumstances, rely upon the Owner's testing or inspections as a substitute or in lieu of its own Quality Control or Assurance programs.
- 13.5.2. Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect/Engineer timely notice of when and where tests and inspections are to be made so that the Architect/Engineer may be present for such procedures. The Owner shall bear costs of tests, inspections or approvals which do not become requirements until after bids are received or negotiations concluded.
- 13.5.3. If the Architect/Engineer, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Subparagraph 13.5.2, the Architect/Engineer will, upon written authorization from the Owner, instruct the Contractor to make

arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect/Engineer of when and where tests and inspections are to be made so that the Architect/Engineer may be present for such procedures. Such costs, except as provided in Subparagraph 13.5.4 shall be at the Owner's expense.

- 13.5.4. If such procedures for testing, inspection or approval under Subparagraphs 13.5.2 and 13.5.3 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect/Engineer's services and expenses shall be at the Contractor's expense.
- 13.5.5. Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect/Engineer.
- 13.5.6. If the Architect/Engineer is to observe tests, inspections or approvals required by the Contract Documents, the Architect/Engineer will do so promptly and, where practicable, at the normal place of testing.
- 13.5.7. Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

13.6. **INTEREST**

- 13.6.1. Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

13.7. **COMMENCEMENT OF STATUTORY LIMITATION PERIOD**

- 13.7.1. As between the Owner and Contractor:

- 13.7.1.1. **Before Substantial Completion.** As to acts or failures to act occurring prior to the relevant date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such date of Substantial Completion;
- 13.7.1.2. **Between Substantial Completion and Final Certificate for Payment.** As to acts or failures to act occurring subsequent to the relevant date of Substantial Completion and prior to issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate for Payment; and,
- 13.7.1.3. **After Final Payment.** As to acts or failures to act occurring after the relevant date of issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act or failure to act by the Contractor pursuant to any Warranty provided under Paragraph 3.5, the date of any correction of the Work or failure to correct the Work by the Contractor under Paragraph 12.2, or the date of actual commission of any other act or failure to perform any duty or obligation by the Contractor or Owner, whichever occurs last.

13.8. **PAYROLL AND BASIC RECORDS**

- 13.8.1. Payrolls and basic records pertaining to the project shall be kept on a generally recognized accounting basis and shall be available to the Owner, Legislative Auditor, the Legislative Fiscal Analyst or his authorized representative at mutually convenient times. Accounting records shall be kept by the Contractor for a period of three years after the date of the Owner's Final Acceptance of the Project.

ARTICLE 14 – TERMINATION OR SUSPENSION OF THE CONTRACT

14.1. **TERMINATION BY THE CONTRACTOR**

- 14.1.1. The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:
 - 14.1.1.1. issuance of an order of a court or other public authority having jurisdiction which requires all Work to be stopped; or,
 - 14.1.1.2. an act of government, such as a declaration of national emergency which requires all Work to be stopped.
- 14.1.2. The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Paragraph 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.
- 14.1.3. If one of the reasons described in Subparagraph 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect/Engineer, terminate the Contract and recover from the Owner payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead and profit but not damages.
- 14.1.4. If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has persistently failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect/Engineer, terminate the Contract and recover from the Owner as provided in Subparagraph 14.1.3.

14.2. **TERMINATION BY THE OWNER FOR CAUSE**

- 14.2.1. The Owner may terminate the Contract if the Contractor:
 - 14.2.1.1. persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
 - 14.2.1.2. fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
 - 14.2.1.3. persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction; or,
 - 14.2.1.4. otherwise is guilty of any breach of a provision of the Contract Documents.
- 14.2.2. When any of the above reasons exist, the Owner, upon certification by the Architect/Engineer that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:
 - 14.2.2.1. take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
 - 14.2.2.2. accept assignment of subcontracts pursuant to Paragraph 5.4; and,
 - 14.2.2.3. finish the Work by whatever reasonable method the Owner may deem expedient. Upon request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

- 14.2.3. When the Owner terminates the Contract for one of the reasons stated in Subparagraph 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.
- 14.2.4. If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect/Engineer's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Architect/Engineer, upon application, and this obligation for payment shall survive termination of the Contract.

14.3. SUSPENSION BY THE OWNER FOR CONVENIENCE

- 14.3.1. The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.
- 14.3.2. The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Subparagraph 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:
 - 14.3.2.1. that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or,
 - 14.3.2.2. that an equitable adjustment is made or denied under another provision of the Contract.

14.4. TERMINATION BY THE OWNER FOR CONVENIENCE

- 14.4.1. The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.
- 14.4.2. Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall:
 - 14.4.2.1. cease operations as directed by the Owner in the notice;
 - 14.4.2.2. take actions necessary, or that the Owner may direct, for the protection and preservation of the Work, and;
 - 14.4.2.3. except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.
- 14.4.3. In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination. The Contractor shall provide a full and complete itemized accounting of all costs.

ARTICLE 15 – EQUAL OPPORTUNITY

- 15.1. The Contractor and all Sub-contractors shall not discriminate against any employee or applicant for employment because of race, color, sex, pregnancy, childbirth or medical conditions related to pregnancy or childbirth, political or religious affiliation or ideas, culture, creed, social origin or condition, genetic information, sexual orientation, gender identity or expression, national origin, ancestry, age, disability, military service or veteran status, or marital status, or physical or mental disability and shall comply with all Federal and State laws concerning fair labor standards and hiring practices. The Contractor shall ensure that applicants are employed, and that employees are treated during employment, without regard to race, color, sex, pregnancy, childbirth or medical conditions related to pregnancy or childbirth, political or religious affiliation or ideas, culture, creed, social origin or condition, genetic information, sexual orientation, gender identity or expression, national origin, ancestry, age, disability, military service or veteran status, or marital status, or physical or mental disability.
- 15.2. Such action shall include, but not be limited to the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and

selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

15.3. The Contractor and all Sub-contractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, color, sex, pregnancy, childbirth or medical conditions related to pregnancy or childbirth, political or religious affiliation or ideas, culture, creed, social origin or condition, genetic information, sexual orientation, gender identity or expression, national origin, ancestry, age, disability, military service or veteran status, or marital status, or physical or mental disability.

15.4. The contractor shall not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association, and the Contractor shall not discriminate during the term of the contract against a firearm entity or firearm trade association. This section shall be construed in accordance with 30-20-301, MCA.

15.4.1. The provisions of 30-20-301, MCA apply only to a contract that:

15.4.1.1. is between a governmental entity and a company with at least 10 full-time employees; and

15.4.1.2. has a value of at least \$100,000 that is paid wholly or partly from public funds of the governmental entity.

15.4.2. By the signing the contract, the Contractor certifies and affirms:

15.4.2.1. Contractor does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association during the term of this contract; and

15.4.2.2. Contractor will not discriminate against a firearm entity or firearm trade association during the term of this contract.

15.4.3. The contractor's certification is made in compliance with and in reference to 30-20-301, MCA, and the terms defined therein. If the contractor determines the provisions of 30-20-301, MCA don't apply to the contract, the Contractor shall submit a statement set forth in details the basis for such determination.

[END OF GENERAL CONDITIONS]

SUPPLEMENTAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

(REVISED NOVEMBER 2023)

FOR STATE OF MONTANA GENERAL CONDITIONS

ARTICLE 1 – GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.3 SPECIFICATIONS

1.1.3.1 ADD: “Approved”: When used to convey Architect’s/Engineer’s action on Contractor’s submittals, applications, and requests, “approved” is limited to Architect’s/Engineer’s duties and responsibilities as stated in the Conditions of the Contract.

1.1.3.2 ADD: “Directed”: A command or instruction by Architect/Engineer. Other terms including “requested,” “authorized,” “selected,” “required,” and “permitted” have the same meaning as “directed.”

1.1.3.3 ADD: “Indicated”: Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including “shown,” “noted,” “scheduled,” and “specified” have the same meaning as “indicated.”

1.1.3.4 ADD: “Regulations”: Laws ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

1.1.3.5 ADD: “Furnish”: Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

1.1.3.6 ADD: “Install”: Operations at Project site including unloading, temporarily shoring, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

1.1.3.7 ADD: “Provide”: Furnish and install, complete and ready for the intended use.

1.1.3.8 ADD: “Project site”: Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land or portion of the building on which the Project is to be built.

1.6.1 Insert in the sixth line: “All documents which constitute the instruments of service are the property of the Owner.” In lieu of the phrase “Unless otherwise indicated, the Architect/Engineer and the Architect/Engineer’s consultants shall be deemed the authors of them... except as defined in the Owner’s Contract with the Architect/Engineer.”

ARTICLE 2 – THE OWNER

2.1 THE STATE OF MONTANA

2.1.1.1 ADD: The State of Montana includes its officers, elected and approved officials, employees and volunteers, and political subdivisions thereof. The State of Montana and Montana State University are synonymous throughout the contract documents.

ARTICLE 3 – THE CONTRACTOR

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.6 ADD: PRODUCT DELIVERY, STORAGE AND HANDLING

3.3.6.1 ADD: Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer’s written instructions.

3.3.6.2 ADD: DELIVERY AND HANDLING:

3.3.6.2.1 ADD: Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

3.3.6.2.2 ADD: Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3.3.6.2.3 ADD: Deliver products to Project site in an undamaged condition in manufacturer’s original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

3.3.6.2.4 ADD: Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and property protected.

3.3.6.3 ADD: STORAGE

3.3.6.3.1 ADD: Store products to allow for inspection and measurement of quantity or counting of units

3.3.6.3.2 ADD: Store materials in a manner that will not endanger Project structure.

3.3.6.3.3 ADD: Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

3.3.6.3.4 ADD: Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

3.3.6.3.5 ADD: Comply with product manufacturer’s written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

3.3.6.3.6 ADD: Protect stored products from damage and liquids from freezing.

3.10 CONSTRUCTION SCHEDULES

3.10.1.1 ADD: A pre-construction meeting will be held at a time mutually agreed upon by the Owner, Architect/Engineer and Contractor at Campus Planning, Design and Construction, Montana State University, Bozeman, Montana. The contractor shall confirm the Contractor’s Construction Schedule for the Work. Coordination of operating requirements of the affected buildings, and surrounds, schedule of activities and Owner requirements will be discussed, as well as the order in which the Contractor intends to pursue the work. This schedule will be reviewed and must be mutually agreed upon by the Architect, Contractor and Owner.

3.11 DOCUMENTATION AND AS-BUILT CONDITIONS AT THE SITE

3.11.4 ADD: The contractor shall maintain at the site two (2) construction reference sets of all specifications, drawings, approved shop drawings, change orders and other modifications, addenda, schedules and instructions, in good order.

3.11.4.1 ADD: The record drawings shall be two (2) sets of black (or blue) and white prints of the drawings on which the contractor must record all “red line” changes during the course of construction and will include references to change order numbers, field directives, etc., and their dates. This record set shall be maintained separate and apart from documents used for construction reference. This set will be available for review by the project consultant, architect, engineer and MSU project manager at all times.

3.11.4.2 ADD: All as-built conditions shall be kept current and the contractor shall not permanently conceal or cover any work until all required information has been recorded.

3.11.4.3 ADD: All survey and exterior underground utilities shall be recorded using the spatial reference, Montana State Plane, NAD 83, CORS 96, Lambert Conformal Conic. The National Geodetic Survey publishes NAD 83

coordinates in the metric system (i.e., meters). The conversion factor that should be used to convert between English and metric systems is the international conversion factor of 1 ft. = 0.3048 m. coordinate system.

3.11.4.4 ADD: In marking any as-built conditions, the contractor shall ensure that such drawings indicate by measured dimension to building corners or other permanent monuments the exact locations of all piping, conduit or utilities concealed in concrete slabs, behind walls or ceilings or underground. Record drawings shall be made to scale and shall also include exact locations of valves, pull boxes and similar items as required for maintenance or repair service.

3.11.4.5 ADD: The contractor shall prepare and maintain a binder with all project warranty information. This will be provided to the project consultant, architect or engineer at final acceptance.

3.12.1 DEFINITIONS:

3.12.1.4 ADD: Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term “product” includes the terms “material,” “equipment,” “system,” and terms of similar intent.

3.12.1.5 ADD: Named Products: Items identified by manufacturer’s product name, including make or model number or other designation shown or listed in manufacturer’s published product literature that is current as of date of the Contract Documents.

3.12.1.6 ADD: New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

3.12.1.7 ADD: Comparable Products: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

3.12.1.8 ADD: Basis-of-Design Product Specification: A specification in which a specific manufacturer’s product is named and accompanied by the words “basis-of-design product,” including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specifications.

3.13. USE OF SITE

3.13.3 ADD: MSU BOZEMAN Vehicle Regulations state:

“All students, faculty, staff, and visitors must register any motor vehicle they park on the University campus, for any reason. A visitor is anyone not defined as student, staff or faculty.”

All Contractor and Contractor employees shall comply with Montana State University parking regulations. MSU parking permits can be purchased at the Huffman Building at Seventh Avenue and Kagy Boulevard. Contractor should call University Police at 994-2121 for permit information. Violators of MSU Bozeman Vehicle Regulations may be ticketed and towed.

Unless otherwise indicated on the drawings, all Contractor and Contractor employee vehicles on campus shall be parked in designated parking lots. If allowed on the drawings, vehicles to a maximum number stated, may be parked in project site areas designated and shall only be Contractor vehicles with company signs clearly visible. No personal vehicles shall be parked at the project site in any case. If a driver of a vehicle not allowed to be parked at the project site must unload equipment, tools, or materials, the vehicle must be immediately thereafter moved to a designated lot or leave campus. Vehicles parked in the project site, other than those allowed on the drawings, may be ticketed and towed.

Access to the project site shall be only by the route designated on the drawings. In cases where a different route must be used for a specific purpose, permission must be obtained from MSU Facilities Services. In no case will vehicles be used on the Centennial Mall paving. Access routes are for delivery of equipment, tools, and not for parking.

Site staging areas for materials and equipment if permitted, will be designated on the drawings if permitted. If not designated, staging is intended to be in the construction area boundaries. Staged materials and equipment must be secured on the ground surface or in trailers. Site staging areas shall be fenced.

3.13.4 ADD: The Contractor shall coordinate his operations with the Owner in order that the Owner will have maximum use of existing facilities surrounding the area of the Work, as agreed upon, at all times during normal working hours. Contractor further agrees to coordinate his operations so as to avoid interference with the Owner's normal operations to as great an extent as possible.

3.13.5 ADD: By acceptance of MSU Building Keys the Contractor agrees with the following: University keys are the property of Montana State University. Fabricating, duplicating or modifying University keys is prohibited. Doors must remain locked at all times. The use of these keys to allow unauthorized persons to enter the above areas is prohibited. Loss of any key must be reported immediately to the Director, Office of Facilities Services and University Police, if the loss of keys results in re-keying costs, these costs will be charged to the Contractor. **See attached Estimated Re-Keying Costs.**

3.13.6 ADD: The Montana Legislature decreed that the "right to breath smoke-free air has priority over the desire to smoke" (MCA 20-40-102). It is the policy of MSU to promote the health, wellness and safety of all employees, students, guests, visitors, and contractors while on campus. Therefore, the campus will be free of tobacco-use effective August 1, 2012. The use of tobacco (including cigarettes, cigars, pipes, smokeless tobacco and all other tobacco products) by students, faculty, staff, guests, visitors, and contractors is prohibited on all properties owned or leased by MSU.

Littering any university property, whether owned or leased, with the remains of tobacco products is prohibited.

All university employees, students, visitors, guests, and contractors are required to comply with this policy, which shall remain in effect at all times. Refusal to comply with this policy may be cause for disciplinary action in accordance with employee and student conduct policies. Refusal to comply with the policy by visitors, guests and contractors may be grounds for removal from campus. (http://www2montana.edu/policy/smoking_facilities/)

3.13.7 ADD: The Contractor may use the University's toilet facilities only as directed by the Owner.

ARTICLE 4 – ADMINISTRATION OF THE CONSTRUCTION CONTRACT

4.6. ARBITRATION

4.6.3 Insert in the second line "the Eighteenth Judicial District, Gallatin County" in lieu of "First Judicial District, Lewis & Clark County."

4.6.11 ADD: In responding to a claim brought by a Contractor, the Owner shall have a minimum of forty-five (45) days in which to respond to a revised claim prior to the arbitration hearing.

ARTICLE 7 – CHANGES IN WORK

7.2 CHANGE ORDERS

7.2.2.1 Insert the word "maximum" before "5%" and insert the word "maximum" before "10%".

7.2.2.4 ADD: Total Change Order markup shall not exceed (cost of the work) x 1.15.

7.2.3.1 Insert at the beginning of the first sentence the word "Itemized".

7.2.3.2 Insert at the beginning of the first sentence the word "Itemized".

7.2.3.3 Insert at the beginning of the first sentence the word "Itemized".

7.2.3.4 ADD: The Contractor shall provide a complete description summarizing all work involved.

ARTICLE 8 - TIME

8.1. DEFINITIONS

8.1.8.1 ADD: The Owner will issue a written Notice to Proceed on satisfactory receipt of the signed Contract and all required bonds, insurance and other required submittals. Work commenced before receipt of the Notice to Proceed will be entirely at the Contractor's risk.

8.2. PROGRESS AND COMPLETION

8.2.5 ADD: Completion of the work within the stated time and/or by the date stated on the Notice to Proceed is of the essence of this Contract and failure to complete, without approved time extension, may be considered default of the Contract. At the time for completion as stated on the Notice to Proceed or as extended by approved change order, if the work is not substantially complete, the Owner may notify the Contractor and the Contractor's surety company in writing of the recourse the Owner intends to take, within the Contract, to assess liquidated damages and /or cause the work to be completed.

8.3. DELAYS AND EXTENSIONS OF TIME

8.3.4 ADD: By the act of signing the Contract, the Contractor signifies that he/she and all subcontractors can perform the work within the stated schedule and that subcontractors, manufacturers, suppliers, and deliverers are known to be able to support the schedule. Time extension may be granted for unforeseen conditions or events out of the Contractor's control causing delay in delivery of materials or causing delay in the Contractor's ability to perform the work within the Contract Documents. The Contractor is expected to take all possible measures and bear all reasonable costs in order to anticipate, control, counteract, and expedite such delay-causing conditions, including finding alternative sources of materials, equipment, shipping, and labor. Notification of any claim for schedule delay must be made in writing to the Owner within one week of the causing event or of first knowledge of a known delay causing condition with supporting documentation as required by the Owner. The Owner will respond in writing within one week to claims of delay. No claims of delay will be entertained after the date of completion as stated on the Notice to Proceed or as extended by previously approved delay claims.

ARTICLE 9 – PAYMENTS AND COMPLETION

9.3. APPLICATIONS FOR PAYMENT

9.3.7.2.1. Insert in the first line "Schedule of Values" in lieu of "Schedule of Amounts for Contract Payment".

9.3.7.2.3 ADD: Subcontractor's List: The Contractor shall list all subcontractors doing work in excess of \$5,000.

9.8. SUBSTANTIAL COMPLETION

9.8.4.1 ADD: Prior to the inspection, the Contractor shall complete the final clean-up of the project site which, unless otherwise stated in the Contract Documents, shall consist of:

9.8.4.1.1 Removal of all debris and waste. All construction debris and waste shall be removed from the campus grounds. Use of the University trash containers will not be permitted.

9.8.4.1.2 Removal of all stains, smears, marks of any kind from surfaces including existing surfaces if said damage is the result of the work.

9.8.4.1.3 Removal of all temporary structures and barricades.

9.10. FINAL COMPLETION AND FINAL PAYMENT

9.10.2.4 Insert in the first line after the word "(Form 103)": "for contracts greater than or equal to \$150,000"

ARTICLE 10 – PROTECTIONS OF PERSONS AND PROPERTY

10.1. SAFETY

10.1.2 Insert in the second line before the word "safeguards": "and as approved by Owner,"

10.1.2.1 ADD: The Contractor recognizes that the Work will be conducted in and around buildings and areas that are occupied and will continue to function for the purposes of the University. The Contractor shall conduct a project safety meeting prior to the start of the Work, with the Owner's representative and all others that the Owner's representative deems necessary. The purpose of the meeting shall be to produce project specific rules and guidelines pertaining to but not restricted to: safety of persons in and around the area of the Work including type and location of fencing, guards, signage, etc.; closing of existing campus circulation routes and designation of alternate routes,

including creation of temporary routes of access as required; creation and location of temporary signage as required to maintain accessible routes for handicapped access to and around the site of the Work. The Contractor shall be solely responsible for implementing all required means and methods for site safety and security that may be agreed upon in this meeting.

10.1.2.2 ADD: Contractor shall notify Owner any time his operations will disrupt use of and access to existing accessible routes. Contractor is solely responsible for maintaining existing accessible routes in the area of the project with the exception of temporary interruptions lasting one day or less. Contractor is responsible for erecting signage identifying temporary re-routing of accessible routes. Such re-routing shall be coordinated with Owner in advance.

10.3. UTILITIES

10.3.1 ADD: Underground Utilities: Buried utilities, including, but not limited to, electricity, gas, steam, air, water, telephone, sewer, irrigation, broadband coaxial computer cable, and fiber optic cables are very vulnerable and damage could result in loss of service. The telephone, broadband and fiber optic cables are especially sensitive and the slightest damage to these components will result in disruption of the operations of the campus.

10.3.2 ADD: "One Call" must be notified by phone and in writing at least 72 hours (3 business days) prior to digging to arrange and assist in the location of buried utilities in the field. (Dial 811). The Contractor shall mark the boundary of the work area. The boundary area shall be indicated with white paint and white flags. In winter, pink paint and flags will be accepted.

10.3.3 ADD: After buried utilities have been located, the Contractor shall be responsible for any utilities damaged while digging. Such responsibility shall include all necessary care including hand digging. Contractor's responsibility shall also include maintaining markings after initial locate. The area for such responsibility, unless otherwise indicated, shall extend 24 inches to either side of the marked center line of a buried utility line. In cases of multiple or overlapping utilities or inconclusive electronic locating signals, MSU Project Manager may specifically indicate a wider area for Contractor's responsibility.

10.3.4 ADD: The Contractor's responsibility shall include repair or replacement of damaged utilities. In the event of damage to the 15 KV electrical distribution system, the broadband or fiber optic cables, repair will consist of replacement from termination to termination. Facilities Services and the MSU Information Technology Center will verify repair and recertification. The Contractor will also be responsible for all costs associated with re-terminations and recertification.

10.3.5 ADD: Any buried utilities exposed by the operations of the Contractor shall be marked on the plans and adequately protected by the Contractor. If any buried utilities not located are exposed, the Contractor shall immediately contact Facilities Services at the numbers above. If, after exposing an unlocated buried utility, the Contractor continues digging without notifying Facilities Services and further damages the utility, the Contractor will be responsible.

10.3.6 ADD: Damage to irrigation systems during seasons of no irrigation that are not immediately and adequately repaired and tested will require the Contractor to return when the system is in service to complete the repair.

10.3.7 ADD: In the event of a planned interruption of any existing utility service, the Contractor shall make arrangements with Facilities Services at least 72 hours (3 business days) in advance. Shutdowns of the broadband or fiber optic cables will normally require 5 working days notice to Facilities Services and the Information Technology Center. The Contractor shall bear all costs associated with the interruptions and restorations of service.

10.3.8 ADD: The Owner allows the contractor to use the Owner's utilities (water, heat, electricity) services without charge for procedures necessary for the completion of the work.

ARTICLE 11 - INSURANCE AND BONDS

11.4. COMMERCIAL GENERAL LIABILITY INSURANCE

11.4.1.3. Insert in the first line after "State of Montana": ", Montana State University".

11.7. PERFORMANCE BOND AND LABOR & MATERIAL PAYMENT BOND (BOTH ARE REQUIRED ON THIS PROJECT)

11.7.1. Insert in the first line at the beginning of the sentence "For contracts equal to or greater than \$150,000".

11.8. CANCELLATION

11.8 ADD All Certificates shall contain a provision that coverage provided by the policies will not be cancelled without at least thirty (30) days prior notice to the Owner.

ARTICLE 13 – MISCELLANEOUS PROVISIONS

13.1. GOVERNING LAW

13.1.1. Insert in the second line “The Eighteenth Judicial District, Gallatin County” in lieu of “First Judicial District, Lewis and Clark County”.

13.9 EMERGENCY AND PUBLIC SAFETY

Montana State University has an Emergency and Public Safety Alert System that warns the campus community in the event of an emergency or public safety event. Because contractors, consultants, and vendors are considered members of the campus community when working on campus, they must be familiar with the alert system and understand when the system is used. Montana State University requires all contractors, consultants, vendors, and their employees working on or entering the MSU-Bozeman campus to register for the Emergency and Public Safety Alert System. The link to register is: <http://www.montana.edu/msualert/>.

END OF SUPPLEMENTARY GENERAL CONDITIONS

Cost Estimate to Re-key Buildings

Access to campus buildings is controlled for safety and security reasons. As a key holder the contractor is responsible for following processes associated with maintaining the integrity of our access control program. If a key is lost the contractor is liable for costs associated with ensuring access control is maintained. In some cases that requires re-keying an entire building or key sequence. Cost can range from \$2,000 to over \$200,000 depending on building and key hierarchy.

MONTANA
PREVAILING WAGE RATES FOR BUILDING CONSTRUCTION SERVICES 2023

Effective: January 14, 2023

*Greg Gianforte, Governor
State of Montana*

*Laurie Esau, Commissioner
Department of Labor & Industry*

To obtain copies of prevailing wage rate schedules, or for information relating to public works projects and payment of prevailing wage rates, visit ERD at erd.dli.mt.gov/labor-standards or contact:

Employment Standards Division
Montana Department of Labor and Industry
P. O. Box 8011
Helena, MT 59601
Phone 406-444-6543

The department welcomes questions, comments, and suggestions from the public. In addition, we'll do our best to provide information in an accessible format, upon request, in compliance with the Americans with Disabilities Act.

MONTANA PREVAILING WAGE REQUIREMENTS

The Commissioner of the Department of Labor and Industry, in accordance with Sections 18-2-401 and 18-2-402 of the Montana Code Annotated (MCA), has determined the standard prevailing rate of wages for the occupations listed in this publication.

The wages specified herein control the prevailing rate of wages for the purposes of Section 18-2-401, et seq., MCA. It is required each employer pay (as a minimum) the rate of wages, including fringe benefits, travel allowance, zone pay and per diem applicable to the district in which the work is being performed as provided in the attached wage determinations.

All Montana Prevailing Wage Rates are available on the internet at erd.dli.mt.gov/labor-standards or by contacting the department at (406) 444-6543.

In addition, this publication provides general information concerning compliance with Montana's Prevailing Wage Law and the payment of prevailing wages. For detailed compliance information relating to public works contracts and payment of prevailing wage rates, please consult the regulations on the internet at erd.dli.mt.gov/labor-standards or contact the department at (406) 444-6543.

LAURIE ESAU
Commissioner
Department of Labor and Industry
State of Montana

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A. Date of Publication January 14, 2023

B. Definition of Building Construction

For the purposes of Prevailing Wage, the Commissioner of Labor and Industry has determined that building construction occupations are defined to be those performed by a person engaged in a recognized trade or craft, or any skilled, semi-skilled, or unskilled manual labor related to the construction, alteration, or repair of a public building or facility, and does not include engineering, superintendence, management, office or clerical work.

The Administrative Rules of Montana (ARM), 24.17.501(2) – 2(a), states *“Building construction projects generally are the constructions of sheltered enclosures with walk-in access for housing persons, machinery, equipment, or supplies. It includes all construction of such structures, incidental installation of utilities and equipment, both above and below grade level, as well as incidental grading, utilities and paving.”*

Examples of building construction include, but are not limited to, alterations and additions to buildings, apartment buildings (5 stories and above), arenas (closed), auditoriums, automobile parking garages, banks and financial buildings, barracks, churches, city halls, civic centers, commercial buildings, court houses, detention facilities, dormitories, farm buildings, fire stations, hospitals, hotels, industrial buildings, institutional buildings, libraries, mausoleums, motels, museums, nursing and convalescent facilities, office buildings, out-patient clinics, passenger and freight terminal buildings, police stations, post offices, power plants, prefabricated buildings, remodeling buildings, renovating buildings, repairing buildings, restaurants, schools, service stations, shopping centers, stores, subway stations, theaters, warehouses, water and sewage treatment plants (buildings only), etc.”

C. Definition of Public Works Contract

Section 18-2-401(11)(a), MCA defines “public works contract” as *“...a contract for construction services let by the state, county, municipality, school district, or political subdivision or for nonconstruction services let by the state, county, municipality, or political subdivision in which the total cost of the contract is in excess of \$25,000...”*.

D. Prevailing Wage Schedule

This publication covers only Building Construction occupations and rates. These rates will remain in effect until superseded by a more current publication. Current prevailing wage rate schedules for Heavy Construction, Highway Construction, and Nonconstruction Services occupations can be found on the internet at www.mtwagehoubopa.com or by contacting the department at (406) 444-6543.

E. Rates to Use for Projects

ARM, 24.17.127(1)(c), states *“The wage rates applicable to a particular public works project are those in effect at the time the bid specifications are advertised.”*

F. Wage Rate Adjustments for Multiyear Contracts

Section 18-2-417, MCA states:

“(1) Any public works contract that by the terms of the original contract calls for more than 30 months to fully perform must include a provision to adjust, as provided in subsection (2), the standard prevailing rate of wages to be paid to the workers performing the contract.

(2) The standard prevailing rate of wages paid to workers under a contract subject to this section must be adjusted 12 months after the date of the award of the public works contract. The amount of the adjustment must be a 3% increase. The adjustment must be made and applied every 12 months for the term of the contract.

(3) Any increase in the standard rate of prevailing wages for workers under this section is the sole responsibility of the contractor and any subcontractors and not the contracting agency.”

G. Fringe Benefits

Section 18-2-412, MCA states:

“(1) To fulfill the obligation...a contractor or subcontractor may:

(a) pay the amount of fringe benefits and the basic hourly rate of pay that is part of the standard prevailing rate of wages directly to the worker or employee in cash;

(b) make an irrevocable contribution to a trustee or a third person pursuant to a fringe benefit fund, plan, or program that meets the requirements of the Employee Retirement Income Security Act of 1974 or that is a bona fide program approved by the U. S. department of labor; or

(c) make payments using any combination of methods set forth in subsections (1)(a) and (1)(b) so that the aggregate of payments and contributions is not less than the standard prevailing rate of wages, including fringe benefits and travel allowances, applicable to the district for the particular type of work being performed.

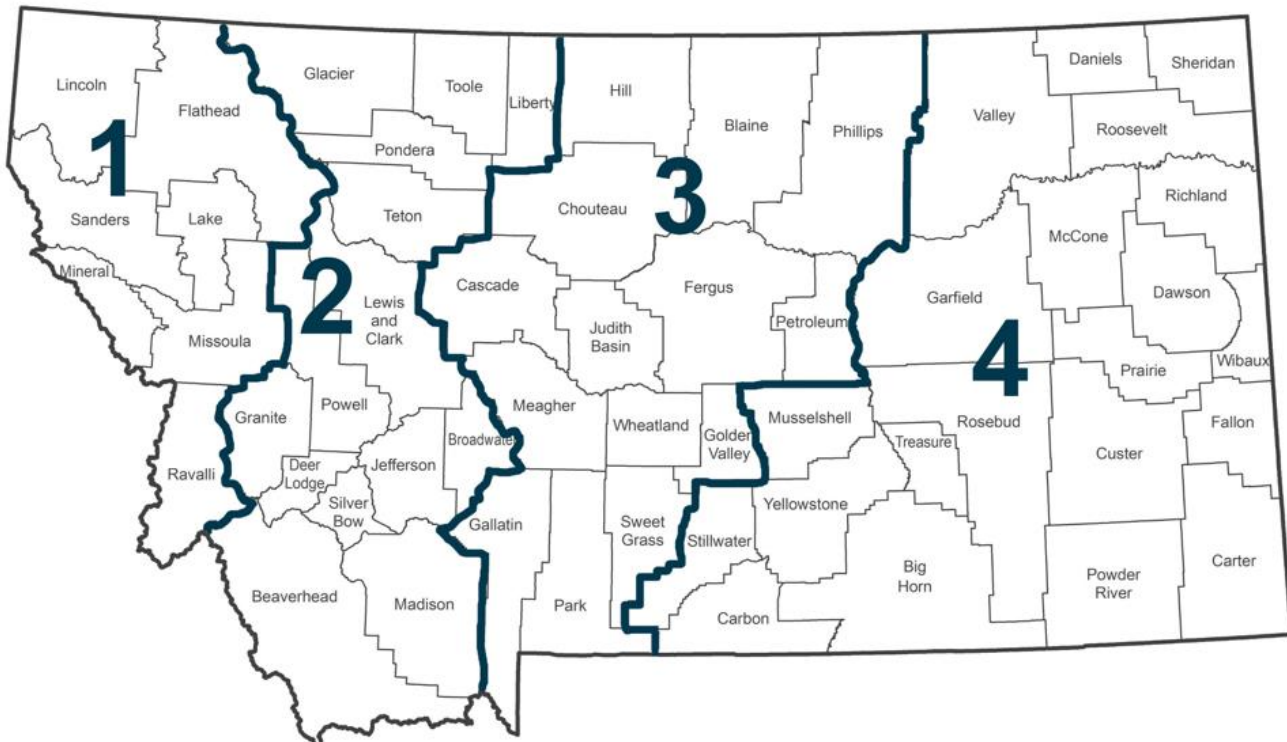
(2) The fringe benefit fund, plan, or program described in subsection (1)(b) must provide benefits to workers or employees for health care, pensions on retirement or death, life insurance, disability and sickness insurance, or bona fide programs that meet the requirements of the Employee Retirement Income Security Act of 1974 or that are approved by the U. S. department of labor.”

Fringe benefits are paid for all hours worked (straight time and overtime hours). However, fringe benefits are not to be considered a part of the hourly rate of pay for calculating overtime, unless there is a collectively bargained agreement in effect that specifies otherwise.

H. Prevailing Wage Districts

Montana counties are aggregated into 4 districts for the purpose of prevailing wage. The prevailing wage districts are composed of the following counties:

Montana Prevailing Wage Districts



I. Dispatch City

ARM, 24.17.103(11), defines dispatch city as “...*the courthouse in the city from the following list which is closest to the center of the job: Billings, Bozeman, Butte, Great Falls, Helena, Kalispell, Miles City, Missoula and Sidney.*” A dispatch city shall be considered the point of origin only for jobs within the counties identified in that district (as shown below):

District 1 – Kalispell and Missoula: includes Flathead, Lake, Lincoln, Mineral, Missoula, Ravalli, and Sanders;

District 2 – Butte and Helena: includes Beaverhead, Broadwater, Deer Lodge, Glacier, Granite, Jefferson, Lewis and Clark, Liberty, Madison, Pondera, Powell, Silver Bow, Teton, and Toole;

District 3 – Bozeman and Great Falls: includes Blaine, Cascade, Chouteau, Fergus, Gallatin, Golden Valley, Hill, Judith Basin, Meagher, Park, Petroleum, Phillips, Sweet Grass, and Wheatland;

District 4 – Billings, Miles City and Sidney: includes Big Horn, Carbon, Carter, Custer, Daniels, Dawson, Fallon, Garfield, McCone, Musselshell, Powder River, Prairie, Richland, Roosevelt, Rosebud, Sheridan, Stillwater, Treasure, Valley, Wibaux, and Yellowstone.

J. Zone Pay

Zone pay is not travel pay. ARM, 24.17.103(25), defines zone pay as “...*an amount added to the base pay; the combined sum then becomes the new base wage rate to be paid for all hours worked on the project. Zone pay must be determined by measuring the road miles one way over the shortest practical maintained route from the dispatch city to the center of the job.*” See section I above for a list of dispatch cities.

K. Computing Travel Benefits

ARM, 24.17.103(23), states “ ‘*Travel pay,*’ also referred to as ‘*travel allowance,*’ is and must be paid for travel both to and from the job site, except those with special provisions listed under the classification. The rate is determined by measuring the road miles one direction over the shortest practical maintained route from the dispatch city or the employee’s home, whichever is closer, to the center of the job.” See section I above for a list of dispatch cities.

L. Per Diem

ARM, 24.17.103(19), states “ ‘*Per diem*’ typically covers costs associated with board and lodging expenses. *Per diem* is paid when an employee is required to work at a location outside the daily commuting distance and is required to stay at that location overnight or longer.”

M. Apprentices

Wage rates for apprentices registered in approved federal or state apprenticeship programs are contained in those programs. Additionally, Section 18-2-416(2), MCA states “...*The full amount of any applicable fringe benefits must be paid to the apprentice while the apprentice is working on the public works contract.*” Apprentices not registered in approved federal or state apprenticeship programs will be paid the appropriate journey level prevailing wage rate when working on a public works contract.

N. Posting Notice of Prevailing Wages

Section 18-2-406, MCA provides that contractors, subcontractors and employers who are “...*performing work or providing construction services under public works contracts, as provided in this part, shall post in a prominent and accessible site on the project or staging area, not later than the first day of work and continuing for the entire duration of the project, a legible statement of all wages and fringe benefits to be paid to the employees.*”

O. Employment Preference

Sections 18-2-403 and 18-2-409, MCA requires contractors to give preference to the employment of bona fide Montana residents in the performance of work on public works contracts.

P. Projects of a Mixed Nature

Section 18-2-408, MCA states:

“(1) The contracting agency shall determine, based on the preponderance of labor hours to be worked, whether the public works construction services project is classified as a highway construction project, a heavy construction project, or a building construction project.

“(2) Once the project has been classified, employees in each trade classification who are working on that project must be paid at the rate for that project classification”

Q. Occupations Definitions

You can find definitions for these occupations on the following Bureau of Labor Statistics website:

http://www.bls.gov/oes/current/oes_stru.htm

R. Welder Rates

Welders receive the rate prescribed for the craft performing an operation to which welding is incidental.

S. Foreman Rates

Rates are no longer set for foremen. However, if a foreman performs journey level work, the foreman must be paid at least the journey level rate.

WAGE RATES

BOILERMAKERS

No Rate Established

Duties Include:

Construct, assemble, maintain, and repair stationary steam boilers, boiler house auxiliaries, process vessels, and pressure vessels.

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Travel and Per Diem:

All Districts

No travel or per diem established.

BRICK, BLOCK, AND STONE MASONS

	Wage	Benefit
District 1	\$32.32	\$16.78
District 2	\$32.32	\$16.78
District 3	\$32.32	\$16.78
District 4	\$32.32	\$16.78

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Travel:

All Districts

0-70 mi. free zone

>70-90 mi. \$60.00/day

>90 mi. \$80.00/day

CARPENTERS

	Wage	Benefit
District 1	\$26.12	\$12.00
District 2	\$26.50	\$14.07
District 3	\$26.50	\$14.07
District 4	\$26.50	\$14.07

Duties Include:

Install roll and batt insulation, and hardwood floors.

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Zone Pay:

All Districts

0-30 mi. free zone

>30-60 mi. base pay + \$4.00/hr.

>60 mi. base pay + \$6.00/hr.

CARPET INSTALLERS

No Rate Established

Duties Include:

Lay and install carpet from rolls or blocks on floors. Install padding and trim flooring materials.

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Travel and Per Diem:

All Districts

No travel or per diem established.

CEMENT MASONS AND CONCRETE FINISHERS

	Wage	Benefit
District 1	\$24.00	\$8.85
District 2	\$22.63	\$7.36
District 3	\$21.17	\$3.67
District 4	\$20.57	\$3.67

Duties Include:

Smooth and finish surfaces of poured concrete, such as floors, walks, sidewalks, or curbs. Align forms for sidewalks, curbs, or gutters.

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Travel and Per Diem:

All Districts

No travel or per diem established.

CONSTRUCTION EQUIPMENT OPERATORS GROUP 1

	Wage	Benefit
District 1	\$25.47	\$12.92
District 2	\$28.21	\$12.92
District 3	\$28.21	\$12.92
District 4	\$28.21	\$12.92

This group includes but is not limited to:

Air Compressor; Auto Fine Grader; Belt Finishing; Boring Machine (Small); Cement Silo; Crane, A-Frame Truck Crane; Crusher Conveyor; DW-10, 15, and 20 Tractor Roller; Farm Tractor; Forklift; Form Grader; Front-End Loader, under 1 cu. yd; Oiler, Herman Nelson Heater; Mucking Machine; Oiler, All Except Cranes/Shovels; Pumpman.

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Zone Pay:

All Districts

0-30 mi. free zone

>30-60 mi. base pay + \$3.50/hr.

>60 mi. base pay + \$5.50/hr.

CONSTRUCTION EQUIPMENT OPERATORS GROUP 2

	Wage	Benefit
District 1	\$26.95	\$ 9.50
District 2	\$33.32	\$ 9.44
District 3	\$27.99	\$12.92
District 4	\$29.33	\$12.92

This group includes but is not limited to:

Air Doctor; Backhoe\Excavator\Shovel, up to and incl. 3 cu. yds; Bit Grinder; Bituminous Paving Travel Plant; Boring Machine, Large; Broom, Self-Propelled; Concrete Travel Batcher; Concrete Float & Spreader; Concrete Bucket Dispatcher; Concrete Finish Machine; Concrete Conveyor; Distributor; Dozer, Rubber-Tired, Push, & Side Boom; Elevating Grader\Gradall; Field Equipment Serviceman; Front-End Loader, 1 cu. yd up to and incl. 5 cu. yds; Grade Setter; Heavy Duty Drills, All Types; Hoist\Tugger, All; Hydralift Forklifts & Similar; Industrial Locomotive; Motor Patrol (except finish); Mountain Skidder; Oiler, Cranes\Shovels; Pavement Breaker, EMSCO; Power Saw, Self-Propelled; Pugmill; Pumpcrete\Grout Machine; Punch Truck; Roller, other than Asphalt; Roller, Sheepsfoot (Self-Propelled); Roller, 25 tons and over; Ross Carrier; Rotomill, under 6 ft; Trenching Machine; Washing /Screening Plant.

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Zone Pay:

All Districts

0-30 mi. free zone

>30-60 mi. base pay + \$3.50/hr.

>60 mi. base pay + \$5.50/hr.

CONSTRUCTION EQUIPMENT OPERATORS GROUP 3

	Wage	Benefit
District 1	\$25.81	\$12.92
District 2	\$29.75	\$12.92
District 3	\$29.75	\$12.92
District 4	\$29.75	\$12.92

This group includes but is not limited to:

Asphalt Paving Machine; Asphalt Screed; Backhoe\Excavator\Shovel, over 3 cu. yds; Cableway Highline; Concrete Batch Plant; Concrete Curing Machine; Concrete Pump; Cranes, Creter; Cranes, Electric Overhead; Cranes, 24 tons and under; Curb Machine\Slip Form Paver; Finish Dozer; Front-End Loader, over 5 cu. yds; Mechanic\Welder; Pioneer Dozer; Roller Asphalt (Breakdown & Finish); Rotomill, over 6 ft; Scraper, Single, Twin, or Pulling Belly-Dump; YO-YO Cat.

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Zone Pay:

All Districts

0-30 mi. free zone

>30-60 mi. base pay + \$3.50/hr.

>60 mi. base pay + \$5.50/hr.

CONSTRUCTION EQUIPMENT OPERATORS GROUP 4

	Wage	Benefit
District 1	\$26.70	\$12.92
District 2	\$29.62	\$14.21
District 3	\$30.75	\$12.92
District 4	\$30.75	\$12.92

This group includes but is not limited to:

Asphalt\Hot Plant Operator; Cranes, 25 tons up to and incl. 44 tons; Crusher Operator; Finish Motor Patrol; Finish Scraper.

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Zone Pay:

All Districts

0-30 mi. free zone

>30-60 mi. base pay + \$3.50/hr.

>60 mi. base pay + \$5.50/hr.

CONSTRUCTION EQUIPMENT OPERATORS GROUP 5

	Wage	Benefit
District 1	\$31.75	\$12.92
District 2	\$31.75	\$12.92
District 3	\$30.33	\$15.08
District 4	\$31.75	\$12.92

This group includes but is not limited to:

Cranes, 45 tons up to and incl. 74 tons.

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Zone Pay:

All Districts

0-30 mi. free zone

>30-60 mi. base pay + \$3.50/hr.

>60 mi. base pay + \$5.50/hr.

CONSTRUCTION EQUIPMENT OPERATORS GROUP 6

	Wage	Benefit
District 1	\$32.75	\$12.92
District 2	\$32.75	\$12.92
District 3	\$32.75	\$12.92
District 4	\$32.75	\$12.92

This group includes but is not limited to:

Cranes, 75 tons up to and incl. 149 tons; Cranes, Whirley (All).

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Zone Pay:

All Districts

0-30 mi. free zone

>30-60 mi. base pay + \$3.50/hr.

>60 mi. base pay + \$5.50/hr.

CONSTRUCTION EQUIPMENT OPERATORS GROUP 7

	Wage	Benefit
District 1	\$33.75	\$12.92
District 2	\$33.75	\$12.92
District 3	\$33.75	\$12.92
District 4	\$33.75	\$12.92

This group includes but is not limited to:

Cranes, 150 tons up to and incl. 250 tons; Cranes, over 250 tons—add \$1.00 for every 100 tons over 250 tons; Crane, Tower (All); Crane Stiff-Leg or Derrick; Helicopter Hoist.

Zone Pay:

All Districts

0-30 mi. free zone
>30-60 mi. base pay + \$3.50/hr.
>60 mi. base pay + \$5.50/hr.

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CONSTRUCTION LABORERS GROUP 1/FLAG PERSON FOR TRAFFIC CONTROL

	Wage	Benefit
District 1	\$23.55	\$11.82
District 2	\$23.55	\$11.82
District 3	\$23.55	\$11.82
District 4	\$23.55	\$11.82

Zone Pay:

All Districts

0-15 mi. free zone
>15-30 mi. base pay + \$0.65/hr.
>30-50 mi. base pay + \$0.85/hr.
>50 mi. base pay + \$1.25/hr.

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CONSTRUCTION LABORERS GROUP 2

	Wage	Benefit
District 1	\$21.63	\$ 7.43
District 2	\$20.07	\$ 9.82
District 3	\$22.91	\$11.82
District 4	\$20.71	\$ 7.93

Zone Pay:

All Districts

0-15 mi. free zone
>15-30 mi. base pay + \$0.65/hr.
>30-50 mi. base pay + \$0.85/hr.
>50 mi. base pay + \$1.25/hr.

This group includes but is not limited to:

General Labor; Asbestos Removal; Burning Bar; Bucket Man; Carpenter Tender; Caisson Worker; Cement Mason Tender; Cement Handler (dry); Chuck Tender; Choker Setter; Concrete Worker; Curb Machine-lay Down; Crusher and Batch Worker; Heater Tender; Fence Erector; Landscape Laborer; Landscaper; Lawn Sprinkler Installer; Pipe Wrapper; Pot Tender; Powderman Tender; Rail and Truck Loaders and Unloaders; Riprapper; Sign Erection; Guardrail and Jersey Rail; Spike Driver; Stake Jumper; Signalman; Tail Hoseman; Tool Checker and Houseman and Traffic Control Worker.

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CONSTRUCTION LABORERS GROUP 3

	Wage	Benefit
District 1	\$24.55	\$11.82
District 2	\$24.55	\$11.82
District 3	\$24.55	\$11.82
District 4	\$24.55	\$11.82

This group includes but is not limited to:

Concrete Vibrator; Dumpman (Grademan); Equipment Handler; Geotextile and Liners; High-Pressure Nozzleman; Jackhammer (Pavement Breaker) Non-Riding Rollers; Pipelayer; Posthole Digger (Power); Power Driven Wheelbarrow; Rigger; Sandblaster; Sod Cutter-Power and Tamper.

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Zone Pay:

All Districts

0-15 mi. free zone
>15-30 mi. base pay + \$0.65/hr.
>30-50 mi. base pay + \$0.85/hr.
>50 mi. base pay + \$1.25/hr.

CONSTRUCTION LABORERS GROUP 4

	Wage	Benefit
District 1	\$23.09	\$11.82
District 2	\$24.60	\$11.82
District 3	\$22.44	\$12.22
District 4	\$21.38	\$12.22

This group includes but is not limited to:

Hod Carrier***; Water Well Laborer; Blaster; Wagon Driller; Asphalt Raker; Cutting Torch; Grade Setter; High-Scaler; Power Saws (Faller & Concrete) Powderman; Rock & Core Drill; Track or Truck Mounted Wagon Drill and Welder incl. Air Arc.

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Zone Pay:

All Districts

0-15 mi. free zone
>15-30 mi. base pay + \$0.65/hr.
>30-50 mi. base pay + \$0.85/hr.
>50 mi. base pay + \$1.25/hr.

***Hod Carriers will receive the same amount of travel and/or subsistence pay as bricklayers when requested to travel.

DRYWALL APPLICATORS

	Wage	Benefit
District 1	\$26.50	\$14.07
District 2	\$26.50	\$14.07
District 3	\$26.50	\$14.07
District 4	\$26.50	\$14.07

Duties Include:

Drywall and ceiling tile installation.

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Zone Pay:

All Districts

0-30 mi. free zone
>30-60 mi. base pay + \$4.00/hr.
>60 mi. base pay + \$6.00/hr.

ELECTRICIANS: INCLUDING BUILDING AUTOMATION CONTROL

	Wage	Benefit
District 1	\$33.22	\$15.91
District 2	\$32.18	\$16.93
District 3	\$32.56	\$14.56
District 4	\$36.69	\$15.98

Duties Include:

Electrical wiring; equipment and fixtures; street lights; electrical control systems. Installation and/or adjusting of building automation controls also during testing and balancing, commissioning and retro-commissioning.

Travel:

District 1

No mileage due when traveling in employer's vehicle.

The following travel allowance is applicable when traveling in employee's vehicle:

- 0-15 mi. free zone
- >15-45 mi. \$0.625/mi. in excess of the free zone
- >45 mi. \$75.00/day

Districts 2 and 3

No mileage due when traveling in employer's vehicle.

The following travel allowance is applicable when traveling in employee's vehicle:

- 0-08 mi. free zone
- >08-50 mi. federal mileage rate/mi. in excess of the free zone.
- >50 mi. \$71.57/day

District 4

No mileage due when traveling in employer's vehicle.

The following travel allowance is applicable when traveling in employee's vehicle:

- 0-18 mi. free zone
- >18-60 mi. federal mileage rate/mi.
- >60 mi. \$75.00/day

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ELEVATOR CONSTRUCTORS

	Wage	Benefit
District 1	\$59.70	\$44.11
District 2	\$59.70	\$44.11
District 3	\$59.70	\$44.11
District 4	\$59.70	\$44.11

Travel:

All Districts

- 0-15 mi. free zone
- >15-25 mi. \$47.85/day
- >25-35 mi. \$95.70/day
- >35 mi. \$104.54/day or cost of receipts for hotel and meals, whichever is greater.

Special Provision:

When in employees vehicle additional reimbursement of 1.5% of the prevailing wage rate is added to the amounts above.

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FLOOR LAYERS

No Rate Established

Apply blocks, strips, or sheets of shock-absorbing, sound-deadening, or decorative coverings to floors.

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Travel and Per Diem:

All Districts

No travel or per diem established.

GLAZIERS

	Wage	Benefit
District 1	\$21.44	\$4.01
District 2	\$21.88	\$4.29
District 3	\$22.31	\$3.99
District 4	\$22.04	\$3.87

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Travel and Per Diem:

All Districts

No travel or per diem established.

HEATING AND AIR CONDITIONING

	Wage	Benefit
District 1	\$33.00	\$20.73
District 2	\$33.00	\$20.73
District 3	\$33.00	\$20.73
District 4	\$33.00	\$20.73

Duties Include:

Testing and balancing, commissioning and retro-commissioning of all air-handling equipment and duct work.

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Travel:

All Districts

0-50 mi. free zone

>50 mi.

- \$0.25/mi. in employer vehicle.
- \$0.65/mi. in employee vehicle.

Per Diem:

All Districts

\$85/day

INSULATION WORKERS - MECHANICAL (HEAT AND FROST)

	Wage	Benefit
District 1	\$39.37	\$19.87
District 2	\$39.37	\$19.87
District 3	\$39.37	\$19.87
District 4	\$39.37	\$19.87

Duties Include:

Insulate pipes, ductwork or other mechanical systems.

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Travel:

All Districts

0-30 mi. free zone

>30-40 mi. \$25.00/day

>40-50 mi. \$35.00/day

>50-60 mi. \$50.00/day

>60 mi. \$60.00/day plus

- \$0.56/mi. if transportation is not provided.
 - \$0.20/mi. if in company vehicle.
- >60 mi. \$105.00/day on jobs requiring an overnight stay plus
- \$0.56/mi. if transportation is not provided.
 - \$0.20/mi. if in company vehicle.

IRONWORKERS – REINFORCING IRON AND REBAR WORKERS

	Wage	Benefit
District 1	\$30.53	\$27.91
District 2	\$29.54	\$24.49
District 3	\$29.54	\$24.49
District 4	\$29.54	\$24.99

Duties Include:

Cut, bend, tie, and place rebar.

Travel:

District 1

0-45 mi. free zone
>45-60 mi. \$50.00/day
>60-100 mi. \$75.00/day
>100 mi. \$95.00/day

Special Provision:

When the employer provides transportation, travel will not be paid. However, when an employee is required to travel over 70 miles one way, the employee may elect to receive the travel pay in lieu of the transportation.

Districts 2, 3 & 4

0-45 mi. free zone
>45-85 mi. \$70.00/day
>85 mi. \$100.00/day

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IRONWORKERS – STRUCTURAL IRON AND STEEL WORKERS

	Wage	Benefit
District 1	\$30.53	\$27.91
District 2	\$29.54	\$24.49
District 3	\$29.54	\$24.49
District 4	\$29.54	\$24.49

Duties Include:

Structural steel erection; assemble prefabricated metal buildings; energy producing windmill type towers; metal bleacher seating; handrail fabrication and ornamental steel.

Travel:

District 1

0-45 mi. free zone
>45-60 mi. \$50.00/day
>60-100 mi. \$75.00/day
>100 mi. \$95.00/day

Special Provision:

When the employer provides transportation, travel will not be paid. However, when an employee is required to travel over 70 miles one way, the employee may elect to receive the travel pay in lieu of the transportation.

Districts 2, 3 & 4

0-45 mi. free zone
>45-85 mi. \$70.00/day
>85 mi. \$100.00/day

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MILLWRIGHTS

	Wage	Benefit
District 1	\$42.43	\$14.52
District 2	\$42.43	\$14.52
District 3	\$42.43	\$14.52
District 4	\$42.43	\$14.52

Zone Pay:

All Districts

0-30 mi. free zone
>30-60 mi. base pay + \$4.00/hr.
>60 mi. base pay + \$6.00/hr.

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PAINTERS: INCLUDING PAPERHANGERS

	Wage	Benefit
District 1	\$24.20	\$7.61
District 2	\$23.10	\$7.61
District 3	\$22.59	\$8.31
District 4	\$22.56	\$7.37

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Travel and Per Diem:

All Districts

No travel or per diem established.

PILE BUCKS

	Wage	Benefit
District 1	\$33.50	\$14.07
District 2	\$33.50	\$14.07
District 3	\$33.50	\$14.07
District 4	\$33.50	\$14.07

Duties Include:

Set up crane; set up hammer; weld tips on piles; set leads; insure piles are driven straight with the use of level or plum bob. Give direction to crane operator as to speed and direction of swing. Cut piles to grade.

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Zone Pay:

All Districts

0-30 mi. free zone

>30-60 mi. base pay + \$4.00/hr.

>60 mi. base pay + \$6.00/hr.

PILOT CAR DRIVERS

No Rate Established

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Zone Pay:

All Districts

No zone pay established.

PLASTERERS

No Rate Established

Duties Include:

All materials beyond the substrate, such as a moisture barrier, any type of drainage installation between the moisture barrier and insulation or EPS board, the attachment of the EPS board, installation of fiberglass mesh embedded in the base coat, any water-resistant coat that is applied on top of the insulation to serve as a weather barrier, and the application of the finish coat.

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Travel and Per Diem:

All Districts

No travel or per diem established.

PLUMBERS, PIPEFITTERS, AND STEAMFITTERS

	Wage	Benefit
District 1	\$36.13	\$16.01
District 2	\$37.90	\$16.45
District 3	\$37.90	\$16.45
District 4	\$35.21	\$20.21

Duties Include:

Assemble, install, alter, and repair pipe-lines or pipe systems that carry water, steam, air, other liquids or gases. Testing of piping systems, commissioning and retro-commissioning. Workers in this occupation may also install heating and cooling equipment and mechanical control systems.

Travel:

District 1

0-30 mi. free zone
>30-50 mi. \$35.00/day
>50-75 mi. \$45.00/day
>75 mi. \$100.00/day

Special Provision

If transportation is not provided, mileage at \$0.35/mi. for one trip out and one trip back is added to the amounts above. However, if the employee is traveling more than 75 miles/day, only subsistence at the rate of \$85.00/day is required.

Districts 2 & 3

0-45 mi. free zone
>45 mi.

- \$0.00/mi. in employer vehicle.
- \$0.65/mi. in employee vehicle.

Special Provision:

At the contractors' option, mileage for one trip out and one trip back per week may be paid plus subsistence at the rate of \$135.00/day.

District 4

0-70 free zone
>70 mi.

- On jobs when employees do not work consecutive days: \$0.55/mi. if employer doesn't provide transportation. Not to exceed two trips.
- On jobs when employees work any number of consecutive days: \$110.00/day.

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ROOFERS

	Wage	Benefit
District 1	\$28.22	\$13.01
District 2	\$23.01	\$10.41
District 3	\$23.01	\$10.41
District 4	\$23.00	\$ 9.16

Duties Include:

Metal roofing, covers roofs, walls and foundations with water proofing, insulation and vapor barriers in addition to metal flashings. Roofing includes shingles, low slope membranes, metal roofs, insulation, spray foam, coatings and vapor barriers. Wall coverings include metal panels, insulated metal panels and other waterproofing or rain screen systems. Foundation systems include waterproofing and insulation. Excludes prefabricated metal buildings.

Travel:

District 1

0-50 mi. free zone
>50 mi. \$0.35/mi.

District 2 and 3

0-35 mi. free zone
>35 mi. \$0.35/mi only when employer doesn't provide transportation in excess of the free zone.

District 4

0-50 mi. free zone
>50 mi. \$0.35/mi only when employer doesn't provide transportation.

Per Diem:

District 1

\$74.00/day

District 2 and 3

Employer pays for room + \$26.50/day.

District 4

Employer pays for room + \$26.50/day.
or
\$66.00/day.

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SHEET METAL WORKERS

	Wage	Benefit
District 1	\$33.00	\$20.73
District 2	\$33.00	\$20.73
District 3	\$33.00	\$20.73
District 4	\$33.00	\$20.73

Duties Include:

Testing and balancing, commissioning and retro-commissioning of all air-handling equipment and duct work. Manufacture, fabrication, assembling, installation, dismantling, and alteration of all HVAC systems, air conveyer systems, and exhaust systems. All lagging over insulation and all duct lining.

Travel:

All Districts

0-50 mi. free zone
>50 mi.

- \$0.25/mi. in employer vehicle.
- \$0.65/mi. in employee vehicle.

Per Diem:

All Districts

\$85/day

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SOLAR PHOTOVOLTAIC INSTALLERS

	Wage	Benefit
District 1	\$33.22	\$15.91
District 2	\$33.25	\$16.93
District 3	\$33.25	\$15.67
District 4	\$33.25	\$15.67

Travel:

District 1

No mileage due when traveling in employer's vehicle.

The following travel allowance is applicable when traveling in employee's vehicle:

- 0-15 mi. free zone
- >15-45 mi. \$0.625/mi. in excess of the free zone
- >45 mi. \$75.00/day

Districts 2, 3, and 4

No mileage due when traveling in employer's vehicle.

The following travel allowance is applicable when traveling in employee's vehicle:

- 0-08 mi. free zone
- >08-50 mi. federal mileage rate/mi. in excess of the free zone.
- >50 mi. \$71.57/day

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SPRINKLER FITTERS

	Wage	Benefit
District 1	\$38.66	\$24.29
District 2	\$37.96	\$24.29
District 3	\$38.66	\$24.29
District 4	\$35.66	\$24.29

Duties Include:

Duties Include but not limited to any and all fire protection systems: Installation, dismantling, inspection, testing, maintenance, repairs, adjustments, and corrections of all fire protection and fire control systems, including both overhead and underground water mains, all piping, fire hydrants, standpipes, air lines, tanks, and pumps used in connection with sprinkler and alarm systems.

Travel

All Districts

The following travel allowance is applicable when traveling in employee's vehicle.

- 0-60 mi. free zone
- >60-80 mi. \$21.00/day
- >80-100 mi. \$31.00/day
- >100 mi. \$115.00/day + the IRS rate per mile and \$8.92 for every 15 miles traveled for one trip out and one trip back

No travel allowance required when in employer's vehicle.

Per Diem

No per diem is applicable when traveling in employer's vehicle

The following per diem is applicable when traveling in employee's vehicle.

- 0-100 mi. free zone
- >100 mi. \$105.00/day + the IRS rate per mile and \$8.92 for every 15 miles traveled for one trip out and one trip back.
- >100 mi. \$115.00/day

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TAPERS

No Rate Established

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Travel and Per Diem:

All Districts

No travel or per diem established.

TELECOMMUNICATIONS EQUIPMENT INSTALLERS

	Wage	Benefit
District 1	\$25.84	\$ 3.14
District 2	\$24.60	\$11.00
District 3	\$24.60	\$11.08
District 4	\$21.25	\$11.08

Duties Include:

Install voice; sound; vision and data systems. This occupation includes burglar alarms, fire alarms, fiber optic systems, and video systems for security or entertainment

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Travel:

All Districts

The federal mileage rate/mi. in effect when travel occurs if using own vehicle.

Per Diem:

All Districts

\$75.00/day.

TERRAZZO WORKERS AND FINISHERS

No Rate Established

Duties Include:

Finish work on hard tile, marble, and wood tile to floors, ceilings, and roof decks

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Travel and Per Diem:

All Districts

No travel or per diem established.

TILE AND STONE SETTERS

No Rate Established

Duties Include:

Apply hard tile, stone, and comparable materials to walls, floors, ceilings, countertops, and roof decks.

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Travel and Per Diem:

All Districts

No travel or per diem established.

TRUCK DRIVERS

	Wage	Benefit
District 1	\$22.67	\$5.82
District 2	\$23.80	\$6.13
District 3	\$23.80	\$6.13
District 4	\$23.80	\$6.13

Truck drivers include but are not limited to:

Combination Truck & Concrete Mixer; Distributor Driver; Dry Batch Trucks; Dump Trucks & Similar Equipment; Flat Trucks; Lowboys, Four-Wheel Trailers, Float Semitrailer; Powder Truck Driver (Bulk Unloader Type); Servicemen; Service Truck Drivers, Fuel Truck Drivers, Tiremen; Trucks with Power Equipment; Truck Mechanic; Water Tank Drivers, Petroleum Product Drivers.

Zone Pay:
All Districts
No zone pay established.

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SECTION 011000 SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 PROJECT DESCRIPTION

- A. The project involves the reconstruction multiple MSU stadium parking lots, including Lot 20 (West Stadium Lot), Lot 25 (East Stadium Lot), the stadium service entrance (approximately south/southeast of the stadium), and the necessary accommodations for the future Indoor Practice Facility (a.k.a "IPF", a.k.a. "IAC"). The base bid encompasses the complete reconstruction of Lot 20 with adjacent/surrounding curb and gutter, concrete flatwork, and utility/storm drain improvements, asphalt and concrete section installation, pavement striping and marking, lighting installation, utility improvements, stormwater drainage improvements, construction of concrete plaza area, signage, fencing, landscaping and irrigation installation, and other improvements shown on the plan. Lot 25 will undergo the same reconstruction and improvements as Lot 20, with the exception of the omission of asphalt and substitution of an equivalently-thick replacement gravel section; the parking area will be a gravel section, as per the Project Plans. This paragraph generally describes the base bid—the Project Plans provide additional detail of proposed improvements that may not be specifically described in this paragraph.

1.3 SITE INFORMATION

- A. Location: The project site is located at 1 Bobcat Circle, Bozeman, Montana 59717, generally described as the "block" between 7th Avenue and 11th Avenue, south of Kagy Boulevard in Bozeman, MT.
- B. Scope of work includes but is not necessarily limited to: Lot 20 will provide approximately 655 parking spaces, while Lot 25 will provide approximately 650 spaces. Furthermore, provisions for a track/"back of house" area with approximately 64 spaces and 4 bus spaces are included. Construction of the University Indoor Practice Facility (IPF a.k.a. IAC) will be managed separately by other entities. The total area for the project spans approximately 30.5 acres.
- C. The scope explicitly excludes the construction of the indoor practice facility, athletics complex, and existing football stadium. No work to the existing irrigation pond is included, however some regrading of the northern portion of the berm adjacent to the pond with nearby fencing improvements is included.

1.4 CONTRACTS

- A. Contracts shall be under one General Contract and shall include, but not be limited to, all labor, materials, and supervision necessary to furnish and install the Work.

1.5 WORK SEQUENCE

- A. The work will be conducted in one (1) phase to provide the least possible interference to the activities of the Owner's personnel and activities.
- B. The Contractor will have access to the entire site starting May 12th, 2024.

1.6 CONTRACTOR USE OF PREMISES

- A. Work on this contract is expected to be done during regular working hours Monday through Friday. Any variation from this will require prior approval of the Consultant and Owner.
- B. All work must be coordinated with MSU at all times and MSU must be informed about any work impacting campus operations 72 hours or 3 working days in advance of work being conducted and shall require MSU approval.
- C. General: Limit use of the premises to construction activities in areas indicated; allow for Owner/MSU occupancy and use by the public. Confine operations to areas within contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.
- D. Contractor shall conduct all his work in such a manner as to minimize the inconvenience and disruption of MSU's daily schedule.
- E. Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to site rules and regulations affecting the work while engaged in project construction.
- F. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials to the areas designated on the drawings. If additional storage is necessary, obtain and pay for such storage off-site.
- G. Contractor shall establish a staging area for storage of materials and equipment.
- H. The Contractor is to coordinate with MSU for the location of the job site trailer office.
- I. Keep driveways and entrances serving the premises clear and available to MSU and MSU's employees, staff and visitors at all times, unless otherwise agreed by MSU. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

1.7 PARKING AND SITE ACCESS

(See also Supplemental Conditions of the Contract for Construction.)

- A. MSU Bozeman Vehicle Regulations state: "All students, faculty, staff, and visitors must register any motor vehicle they park on the University campus, for any reason. A visitor is anyone not defined as student, staff or faculty."
- B. All Contractor and Contractor employees shall comply with Montana State University parking regulations. MSU parking permits can be purchased at the University Police Office located in the Huffman Building at Seventh Avenue and Kagy Boulevard. Violators of MSU Bozeman Vehicle Regulations may be ticketed and towed.
- C. A maximum of three (3) Contractor Permits (or as agreed with MSU) will be made available to the Contractor for parking of essential vehicles within the designated parking lot (as designated on the Cover Sheet of the Contract Documents). Essential vehicles are vehicles used for delivery of equipment and tools required to be parked in close proximity to the construction area. All allowed vehicles only to be parked on hard surfaced areas within the Staging Area. All other Contractor and Contractor employee vehicles on campus shall be parked in designated parking lots to be agreed with MSU. No personal vehicles shall be parked at the project site in any event. If a driver of a vehicle not allowed to be parked at the project site must unload equipment, tools, or materials, the vehicle must be immediately thereafter move to a designated lot or leave campus.
- D. Access and egress to and from the project site shall be coordinated with the owner. In cases where a different route must be used for a specific purpose, permission must be obtained from MSU. Access routes are for delivery of equipment, tools, and materials and not for parking.
- E. The site Staging Areas for materials and equipment are designated on the Cover Sheet of the Contract Documents. Staged materials and equipment must be secured on the ground surface or in trailers. Site staging areas shall be fenced in accordance with the Contract Documents. Vehicles in addition to those allowed to be parked may not be used for staging of equipment, tools, or materials.

1.8 OWNER OCCUPANCY

- A. Full Owner/MSU Occupancy: The Owner/MSU will occupy the site during the entire construction period. Cooperate with MSU during construction operations to minimize conflicts and facilitate MSU usage. Perform the work so as not to interfere with MSU's operations.

1.9 SAFETY REQUIREMENTS

- A. General: The safety measures required by the Contract Documents are not meant to be inclusive. The Contractor shall be solely responsible for safety on a 24-hours-per-day, 7 days-per-week basis and shall take whatever additional measures are necessary to insure the health and safety of the buildings' occupants, or pedestrians at or near the construction site and access routes and of all other persons in all areas affected by the Contractor's activities. Prior to the start of construction, the Contractor is to submit to the Consultant a detailed written plan specifying the safety procedures that will be followed. Include (but not by way of limitation) the following: Verbiage, size and locations of warning signs; construction sequence as related to safety; use of barricades (type and location); employee policies as related to safety; and delivery of

materials as related to safety. Revise the safety plan as required during construction and resubmit to the Owner.

- B. All application, material handling, and associated equipment shall conform to and be operated in conformance with OSHA safety requirements.
- C. Comply with Federal, State, local, and the Owner's fire, health and safety requirements.
- D. Advise MSU whenever work is expected to be hazardous or inconvenient (including objectionable odors) to MSU's employees, students, visitors or the building occupants.
- E. Construction materials or equipment shall be placed so as not to endanger the work or prevent free access to all emergency devices or utility disconnects.
- F. Maintain the proper rated fire extinguishers within easy access where power tools, sanding or other equipment is being used.
- G. The Contractor shall erect and maintain, as required by law, conditions and progress of the work, warning signs, barricades and other reasonable safeguards for safety and protection.
- H. Emergency and Public Safety Alert System: Montana State University has an Emergency and Public Safety Alert System that warns the campus community in the event of an emergency or public safety event. Because contractors, consultants, and vendors are considered members of the campus community when working on campus, they must be familiar with the alert system and understand when the system is used. Montana State University requires all contractors, consultants, vendors, and their employees working on or entering the MSU-Bozeman campus to register for the Emergency and Public Safety Alert System. The link to register is: <http://www.montana.edu/msualert/>

1.10 EXISTING PREMISES CONDITION

- A. The Contractor is responsible for adequately documenting in photos the existing condition of the premises, to include external road surfaces, curbing and landscaped areas, specifically the cleanliness of areas. Any damage to the premises which is found after construction and is not so documented will be the responsibility of the Contractor to repair or replace.

1.11 DISCREPANCIES IN THE DOCUMENTS

- A. The Contractor shall bring any discrepancies between any portions of the drawings and specifications to the attention of the Owner and the Consultant in writing. The Owner and Consultant shall review the discrepancy and clarify the intent desired in the Contract Documents. Unless specifically directed otherwise, the Contractor shall be obligated to provide the greater quantity or quality without any change in contract sum or time.

END OF SECTION

**SECTION 012000
PRICE AND PAYMENT
PROCEDURES**

1.1 GENERAL

A. Related Documents

1. Drawings and general provisions of Contract, including General Conditions, Supplemental Conditions and other Division 1 Specification Sections, apply to this Section.

B. Summary

1. This Section specified administrative and procedural requirements governing the Contractor's Applications for Payment.
2. The Contractor's Construction Schedule and Submittal Schedule are included in Section "Submittals".

C. Schedule of Values

1. Coordinate preparation of the Schedule of Values, Form 100, with preparation of the Contractor's Construction Schedule.
2. Each prime Contractor shall coordinate preparation of its Schedule of Values for its part of the work with preparation of the Contractor's Construction Schedule.
3. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
 - a. Contractor's construction schedule
 - b. Application for Payment form
 - c. List of subcontractors
 - d. Schedule of allowances
 - e. Schedule of alternates
 - f. List of products
 - g. List of principal suppliers and fabricators
 - h. Schedule of submittals
 - i. Submit the Schedule of Values to the Architect at the earliest feasible date, but in no case later than seven (7) days before the date scheduled for submittal of the initial Application for Payment.
 - j. Sub-Schedules: Where the work is separated into phases that require separately phased payments, provide sub-schedules showing values correlated with each phase of payment.
4. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.
 - a. Identification: Include the following project identification on the Schedule of Values:
 - 1) Project name
 - 2) Name of the Architect
 - 3) Project number (PPA No.)
 - 4) Contractor's name and address
 - 5) Date of submittal

b. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:

- 1) Generic name
- 2) Related specification section
- 3) Name of subcontractor
- 4) Name of manufacturer or fabricator
- 5) Name of supplier
- 6) Change Orders (numbers) that have affected value
- 7) Dollar value

a) Percentage of Contract Sum in the nearest one-hundredth percent, adjusted to total 100%

c. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items.

d. Round amounts off to the nearest whole dollar; the total shall equal the Contract Sum.

e. For each part of the work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the work.

5. Margins of Cost: Show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete including its total cost and proportionate share of general overhead and profit margin.

a. At the Contractor's option, temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown as separate line items in the Schedule of Values or distributed as general overhead expense.

6. Schedule Updating: Update and resubmit the Schedule of Values when Change Orders or Construction Change Directives result in a change in the Contract Sum.

D. Applications for Payment

1. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

2. Payment Application Times: Each progress payment date is as indicated in the Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

3. Payment Application Forms: Use Montana Form 101 as the form for Application for Payment.

4. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.

- a. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
 - b. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.
5. Transmittal: Submit one (1) executed copy of each Application for Payment to the Architect by means ensuring receipt within 24 hours, including waivers of lien and similar attachments, when required.
- a. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Architect.
6. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:
- a. List of subcontractors
 - b. Schedule of Values
 - 1) Contractor's Construction Schedule (preliminary if not final)
 - c. Copies of building permits
 - 1) Copies of authorizations and licenses from governing authorities for performance of the work
 - d. Certificates of insurance and insurance policies (submitted with Contract)
 - e. Performance and payment bonds (submitted with Contract if required)
7. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; this application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the work.
8. Administrative actions and submittals that shall proceed or coincide with this application include:
- a. Occupancy permits and similar approvals
 - b. Warranties (guarantees) and maintenance agreements
 - c. Test/adjust/balance records
 - d. Maintenance instructions
 - e. Meter readings
 - f. Start-up performance reports
 - 1) Change-over information related to Owner's occupancy, use, operation and maintenance.
 - g. Final cleaning
 - 1) Application for reduction of retainage, and consent of surety

9. Final Payment Application: Administrative actions and submittals which must precede or coincide with submittal of the final Application for Payment include the following:
- a. Completion of project closeout requirements
 - 1) Completion of items specified for completion after Substantial Completion
 - b. Assurance that unsettled claims will be settled
 - 1) Assurance that work not complete and accepted will be completed without undue delay
 - 2) Transmittal of required project construction records to Owner

END OF SECTION 01200

SECTION 012200

UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices.

1.2 DEFINITIONS

- A. Unit price is an amount proposed by bidders, a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

- A. GENERAL
 1. Quantities are estimated and to be verified by Contractor.
 2. Full descriptions of Bid Alternates can be found in SECTION 012300 ALTERNATES and as shown in Project Plans.
 3. The construction contract operates on a lump sum basis. The bid documents contain a tabulation of major construction items intended to assist the Contractor in calculating their lump sum bid. However, some necessary work items may not be fully tabulated or estimated within these documents. It is the Contractor's responsibility to thoroughly review the Project Plans and supporting documents, conduct necessary takeoffs, estimations, and other calculations to formulate the

proposed lump sum bid accurately. The provided bid tabulation does not encompass a comprehensive itemized list of all work essential for project completion.

4. Unit prices will only be employed in the event of a change order, with pricing derived from the unit prices specified within these bid documents. The Contractor is accountable for itemizing and delineating the work required within each bid item labeled as 'Miscellaneous' or 'Misc.'
5. The following unit abbreviations are used throughout this manual for measurement purposes:
 - a. Each EA
 - b. Cubic Feet CF
 - c. Cubic Yard CY
 - d. Lineal Feet LF
 - e. Lump Sum LS
 - f. Square Feet SF
 - g. Square Yard SY

B. BASE BID

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
M1	MOBILIZATION & MISC WORK	LS	1		
M2	PERMITTING	LS	1		
A1	TEMPORARY TRAFFIC CONTROL	LS	1		
A2	TEMPORARY CONSTRUCTION FENCING	LS	1		
A3	SOIL EROSION AND POLLUTION CONTROL	LS	1		
A4	RECLAIM AND REUSE EXISTING ASPHALT	SY	21000		
A5	REUSE EXISTING GRAVEL	SY	300000		
A6	CLEARING AND GRUBBING	SF	60000		
A7	EARTHWORK	CY	11000		
A8	HAUL OFF/SPREAD EXISTING CUT MATERIAL	CY	6000		
A9	REMOVE TREES	EA	23		

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
A10	REMOVE EXISTING CURB & GUTTER	LF	350		
A11	REMOVE CHAIN LINK FENCING	LF	2000		
A12	REMOVE & SALVAGE SIGNAGE	EA	24		
A13	REMOVE & SALVAGE FLAG POLES & PLAQUES	EA	3		
A14	REMOVE & SALVAGE MEMORIAL BRICKS	SF	310		
A15	REMOVE & SALVAGE LIGHT POLES (including wiring, conduit, base, etc.)	EA	35		
A16	REMOVE CONCRETE LIGHT POLE BASE	EA	15		
A17	REMOVE & SALVAGE EXISTING PIN DOWN CURBS	EA	11		
A18	SAWCUT EXISTING ASPHALT PAVEMENT	LF	1000		
A19	SAWCUT EXISTING CONCRETE	LF	500		
A20	REMOVE & RELOCATE FIRE HYDRANT (+ ductile iron extension)	EA	2		
A21	REMOVE BOLLARD	EA	12		
A22	REMOVE EXISTING PARKING DIVIDER FENCE	LF	1500		
A23	REMOVE EXISTING CONCRETE DRIVEWAY	SF	750		
A24	REMOVE & SALVAGE EXISTING INLET	EA	4		
A25	REMOVE LANDSCAPE	LF	200		

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
	WALL				
A26	REMOVE CONCRETE STEPS & RAILING	EA	1		
A27	MISC. DEMOLITION WORK	EA	1		
A28	LANDSCAPE ROCK/GRAVEL MULCH	SF	13000		
A29	BASE STABILIZER TREATMENT PRODUCT (See Geotech Report)	LS	1		
A30	WOVEN GEOTEXTILE FABRIC (Mirafi 180N)	SF	560000		
A31	GRAVEL PARKING SECTION (3" Replacement of Asphalt)	SY	25400		
A32	ASPHALT PAVEMENT (light duty – 3")	SF	184000		
A33	ASPHALT PAVEMENT (heavy duty – 4")	SF	43364		
A34	PLAZA CONCRETE FLATWORK (heavy duty – 5" + fiber mesh additive)	SF	103320		
A35	PLAZA CONCRETE FLATWORK (heavy duty – 6" + fiber mesh additive)	SF	0		
A36	CONCRETE SIDEWALK	SF	1580		
A37	INSTALL CURB & GUTTER	LF	5800		
A38	INSTALL SOLID INLET COVER	EA	3		
A39	INSTALL HEEL PROOF INLET	EA	3		
A40	INSTALL CONCRETE VALLEY GUTTER (4' Wide)	LF	577		

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
A41	INSTALL CONCRETE VALLEY GUTTER (2' Wide)	LF	35		
A42	CONCRETE DRIVEWAY APPROACH (Traffic-rated pad)	EA	1		
A43	INSTALL CONCRETE WHEEL STOPS	EA	31		
A44	INSTALL REMOVABLE BOLLARDS	EA	62		
A45	INSTALL ADA PARKING SIGN & PAVEMENT MARKING	EA	31		
A46	INSTALL CHAIN LINK FENCE	LF	400		
A47	INSTALL NEW MONUMENT SIGN	EA	4		
A48	PERMANENT PAVEMENT MARKINGS ~ 4" STRIPING	LF	22000		
A49	CHAMBER SYSTEM (Lot 20)	CF	3589		
A50	CHAMBER SYSTEM (Lot 25)	CF	4685		
A51	STORM DRAIN STRUCTURE + INLET + ENVIROHOOD	EA	13		
A52	ADJUST EXISTING UTILITIES TO GRADE	EA	51		
A53	UPGRADE EXISTING UTILITIES WITHIN TRAVEL WAY TO BE TRAFFIC RATED	EA	51		
A54	ELECTRICAL SYSTEM	LS	1		
A55	12" HDPE STORM DRAIN PIPE	LF	1070		

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
A56	18" HDPE STORM DRAIN PIPE	LF	75		
A57	BIKE RACKS	EA	13		
A58	LANDSCAPE IRRIGATION	LS	1		
A59	TREES (Canopy, Evergreen, Ornamental)	EA	21		
A60	SHRUBS	EA	205		
A61	EDGING	LF	75		
A62	SEEDING & SOIL AMENDMENTS	LS	1		
A63	16" IRRIGATION VALVE	EA	1		
A64	4" HDPE IRRIGATION PIPE	LF	645		
A65	LANDSCAPE BOULDERS	EA	72		
A66	MISC. WORK	LS	1		

C. BID ALTERNATE NO. 1:

CHANGED LINE-ITEM ESTIMATED QUANTITIES, AS A RESULT OF ALTERNATE NO. 1

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	ADD/DEDUCT
A31	GRAVEL PARKING SECTION (3" Replacement of Asphalt)	SY	25400		DEDUCTION
A32	ASPHALT PAVEMENT (Light Duty – 3")	SF	159,500		ADDITION
A33	ASPHALT PAVEMENT (Heavy Duty – 4")	SF	68,936		ADDITION
A48	PERMANENT PAVEMENT MARKINGS – 4" STRIPING	LF	23000		ADDITION

D. BID ALTERNATE NO. 2:

CHANGED LINE-ITEM ESTIMATED QUANTITIES, AS A RESULT OF ALTERNATE NO. 2

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	ADD/DEDUCT
A34	PLAZA CONCRETE FLATWORK (Heavy duty 5" + fiber mesh additive)	SF	103320		DEDUCTION
A35	PLAZA CONCRETE FLATWORK (Heavy duty 6" + fiber mesh additive)	SF	103320		ADDITION

END OF SECTION 012200

**SECTION 012300
ALTERNATES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplemental Conditions and other Division 1 Specification Sections, apply to this section. See also *Instructions to Bidders 10.3 Award of Bids*.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Description of Alternates

1. Bid Alternative #1 - Option to upgrade lot 25 with asphalt section (replacing gravel section) as per Project Plans – **ADDITION**. Note that the proposed finished grades found in the project plans apply to either the base bid (gravel section) or this bid alternative #1 (asphalt section).
2. Bid Alternative #2 - Option to change structural concrete section for plaza areas in both lot 20 and lot 25, as per Project Plans – **ADDITION**. Note that the proposed finished grades found in the project plans apply to either the base bid concrete section or this bid alternative #2 (thicker) concrete section.

END OF SECTION

**SECTION 012500
SUBSTITUTION PROCEDURES**

PART 1 - GENERAL

- A. Related Documents
 - 1. Drawings and general provisions of Contract, including General Conditions, Supplemental Conditions and *Instructions to Bidders*.

- B. Substitution Procedures
 - 1. Substitutions include changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by the Contractor.
 - 2. Substitution Requests: Submit three copies of each request on MSU Substitution Request Form 099 for each consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - a. Submit requests in accordance with *Instructions to Bidders*.
 - b. Identify product to be replaced and show compliance with requirements for substitutions. Include a detailed comparison of significant qualities of proposed substitution with those of the Work specified, a list of changes needed to other parts of the Work required to accommodate proposed substitution, and any proposed changes in the Contract Sum or the Contract Time should the substitution be accepted.

- C. Architect will review proposed substitutions and notify Contractor of their acceptance or rejection. If necessary, Architect will request additional information or documentation of evaluation.
 - 1. Architect will notify Contractor of acceptance or rejection of proposed substitution within 10 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

- D. Do not submit unapproved substitutions on Shop Drawings or other submittals.

END OF SECTION 012500

SECTION 013000

SUBMITTALS

1.1 GENERAL

A. Related Documents

1. Drawings and general provisions of Contract, including General Conditions, Supplemental Conditions and other Division 1 Specification Sections, apply to this Section.

B. Summary

1. This Section specifies administrative and procedural requirements for submittals required for performance of the work, including:

- a. Contractor's construction schedule
- b. Submittal schedule
- c. Daily construction reports
- d. Shop Drawings
- e. Product data
- f. Samples

Note: All Submittals are to be both print and electronic.

2. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

- a. Permits
- b. Applications for Payment
- c. Performance and payment bonds
- d. Insurance certificates
- e. List of Subcontractors

3. The Schedule of Values submitted is included in Section "Applications for Payment".

4. Inspection and test reports are included in Section "Quality Requirements".

5. Unless otherwise instructed by the Owner all submittals shall be directed to Architect/Engineer Consultant of Record. The Contractor's construction schedule, submittal schedule and daily construction reports shall be directed to the Consultant's representative, the State of Montana's representative and MSU's representative. Shop drawings, product data and samples shall be directed to the Consultant's representative.

C. Submittal Procedures

1. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - a. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.

- b. Coordinate transmittal of different types of submittals for related elements of the work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - 1) The Consultant reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 - c. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.
 - 1) Allow two (2) weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Consultant will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
 - 2) If an intermediate submittal is necessary, process the same as the initial submittal.
 - 3) Allow two (2) weeks for reprocessing each submittal.
 - 4) No extension of contract time will be authorized because of failure to transmit submittals to the Consultant sufficiently in advance of the work to permit processing.
2. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
- a. Provide a space approximately 4" x 5" on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
 - b. Include the following information on the label for processing and recording action taken.
 - 1) Project name and PPA Number
 - 2) Date
 - 3) Name and address of Consultant
 - 4) Name and address of Contractor
 - 5) Name and address of Subcontractor
 - 6) Name and address of supplier
 - 7) Name of manufacturer
 - a) Number and title of appropriate Specification Section
 - b) Drawing number and detail references, as appropriate
3. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Consultant using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.
- a. On the transmittal record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include

Contractor's certification that information complies with Contract Documents requirements.

- b. Transmittal Form: Contractor's standard form.

D. Contractor's Construction Schedule

1. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart type Contractor's construction schedule. Submit both in print and electronically within thirty (30) days of the date established for "Commencement of the Work".
 - a. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the work as indicated in the "Schedule of Values".
 - b. Within each time bar indicate estimated completion percentage in 10 percent increments. As work progresses, place a contrasting mark in each bar to indicate actual completion.
 - c. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
 - d. Secure time commitments for performing critical elements of the work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the work.
 - e. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other schedules.
 - f. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Consultant's procedures necessary for certification of Substantial Completion.
2. Work Stages: Indicate important stages of construction for each major portion of the Work, including testing and installation.
3. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the work. Indicate where each element in an area must be sequenced or integrated with other activities.
4. Cost Correlation: At the head of the schedule, provide a two (2) item cost correlation line, indicating "pre-calculated" and "actual" costs. On the line show dollar-volume of work performed as of the dates used for preparation of payment requests.
 - a. Refer to Section "Price and Payment Procedures" for cost reporting and payment procedures.
5. Distribution: Following response to the initial submittal, print and distribute copies to the Consultant, Owner, subcontractors, and other parties required to comply with scheduled dates. Transmit electronically and post copies in the project meeting room and temporary field office.
 - a. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have

completed their assigned portion of the work and are no longer involved in construction activities.

6. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule electronically and in print concurrently with report of each meeting.

E. Submittal Schedule

1. After development and acceptance of the Contractor's construction schedule, prepare a complete schedule of submittals. Submit the schedule within ten (10) days of the date required for establishment of the Contractor's construction schedule.

- a. Coordinate submittal schedule with the list of subcontracts, schedule of values and the list of products, as well as the Contractor's construction schedule.
- b. Prepare the schedule in chronological order; include submittals required during the first thirty (30) or sixty (60) days of construction. Provide the following information:

- 1) Scheduled date for the first submittal
- 2) Related section number
- 3) Submittal category
- 4) Name of subcontractor
- 5) Description of the part of the work covered
- 6) Scheduled date for resubmittal
 - a) Scheduled date the Consultant's final release or approval

2. Distribution: Following response to initial submittal, print and distribute copies to the Consultant, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the project meeting room and field office.

- a. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the work and are no longer involved in construction activities.

3. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

F. Daily Construction Reports

1. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Consultant at weekly intervals:

- a. List of subcontractors at the site
- b. Approximate count of personnel at the site
- c. High and low temperatures, general weather conditions
- d. Accidents and unusual events
- e. Meetings and significant decisions

- f. Stoppages, delays, shortages, losses
 - g. Meter readings and similar recordings
 - h. Emergency procedures
 - i. Orders and requests of governing authorities
 - j. Change Orders received, implemented
 - k. Services connected, disconnected
 - l. Equipment or system tests and start-ups
 - m. Partial completions, occupancies
 - n. Substantial Completions authorized
- G. Shop Drawings
1. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the project is not considered Shop Drawings.
 2. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:
 - a. Dimensions
 - b. Identification of products and materials included
 - c. Compliance with specified standards
 - d. Notation of coordination requirements
 - e. Notation of dimensions established by field measurement
 - f. Sheet Size: Except for templates, patterns and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2" x 11", but no larger than 36" x 48".
 - g. Submittal: Submit electronically and in print for the Consultant's review; Consultant's comments will be returned electronically.
 - 1) One (1) of the prints returned shall be marked-up and maintained as a "Record Document".
 - h. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.
 3. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.
 - a. Preparation of coordination drawings is specified in section "Project Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.
 - b. Submit coordination drawings for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space.
- H. Product Data
1. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's

installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings".

- a. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
 - 1) Manufacturer's printed recommendations
 - a) Compliance with recognized trade association standards
 - b) Compliance with recognized testing agency standards
 - 2) Application of testing agency labels and seals
 - a) Notation of dimensions verified by field measurement
 - 3) Notation of coordination requirements
- b. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
- c. Preliminary Submittal: Submit a preliminary single-copy of Product Data where selection of options is required.
- d. Submittals: Submit two (2) copies of each required submittal; submit four (4) copies where required for maintenance manuals. The Consultant will retain one (1), and will return the other marked with action taken and corrections or modifications required.
 - 1) Unless non-compliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
- e. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
 - 1) Do not proceed with installation until an applicable copy of Product Data applicable is in the installer's possession.
 - 2) Do not permit use of unmarked copies of Product Data in connection with construction.

I. Samples

1. Submit full-size, fully fabricated samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.
 - a. Mount, display, or package samples in the manner specified to facilitate review of qualities indicated. Prepare samples to match the Consultant's sample. Include the following:
 - 1) Generic description of the sample
 - 2) Sample source
 - 3) Product name or name of manufacturer

- 4) Compliance with recognized standards
 - 5) Availability and delivery time
2. Submit samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 - a. Where variation in color, pattern, texture, or other characteristics are inherent in the material or product represented, submit multiple units (not less than three (3)), that show approximate limits of the variations.
 - b. Refer to other specification sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
 - c. Refer to other sections for samples to be returned to the Contractor for incorporation in the work. Such samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of sample submittals.
 3. Preliminary Submittals: Where samples are for selection of color, pattern, texture, or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.
 - a. Preliminary submittals will be reviewed and returned with the Consultant's mark indicating selection and other action.
 4. Submittals: Except for samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit three (3) sets; one (1) will be returned marked with the action taken.
 - a. Maintain sets of samples, as returned, at the project site, for quality comparisons throughout the course of construction.
 - 1) Unless non-compliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
 - 2) Sample sets may be used to obtain final acceptance of the construction associated with each set.
 5. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the work. Show distribution on transmittal forms.
 - a. Field samples specified in individual sections are special types of samples. Field samples are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the work will be judged.
 - 1) Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

J. Consultant's Action

1. Except for submittals for record, information, or similar purposes, where action and return is required or requested, the Consultant will review each submittal, mark to indicate action taken, and return promptly. Compliance with specified characteristics is the Contractor's responsibility.
2. Action Stamp: The Consultant will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:
 - a. Final-But-Restricted Release: When submittals are marked "Make Corrections Noted", that part of the work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
 - b. Returned for Resubmittal: When submittal is marked "Revise and Resubmit", do not proceed with that part of the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
 - 1) Do not permit submittals marked "Revise and Resubmit" to be used at the project site, or elsewhere where work is in progress.
 - c. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Action not Required".

END OF SECTION 013000

**SECTION 013100
PROJECT COORDINATION**

1.1 GENERAL

- A. Related Documents
 - 1. Drawings and general provisions of Contract, including General Conditions and Supplemental Conditions and other Division 1 Specification Sections, apply to this Section.

- B. Summary
 - 1. This section specifies administrative and supervisor requirements necessary for project coordination including, but not necessarily limited to:
 - a. Coordination
 - b. Administrative and supervisory personnel
 - c. General installation provisions
 - d. Cleaning and protection
 - 2. Field Engineering is included in Section "Field Engineering".
 - 3. Progress meetings, coordination meetings and pre-installation conferences are included in Section "Project Meetings".
 - 4. Requirements for Contractor's Construction Schedule are included in Section "Submittals".

- C. Coordination
 - 1. Coordination: Coordinate construction activities included under various sections of these specifications to assure efficient and orderly installation of each part of the work. Coordinate construction operations included under different sections of the specifications that are dependent upon each other for proper installation, connection, and operation.
 - a. Provide access to work at all times for inspections by Owner and authorized representatives.
 - b. Provide safe working conditions and protection of completed work.
 - c. Provide barricades and signs.
 - d. Where installation of one part of the work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
 - e. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
 - f. Make adequate provisions to accommodate items scheduled for later installation.
 - g. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
 - 1) Prepare similar memoranda for the Owner and separate Contractors where coordination of their work is required.
 - 2. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the work. Such administrative activities include, but are not limited to, the following:

- a. Notify Facilities Services or Campus Planning, Design and Construction of any expected disruptions in service or changes in construction schedule at least 72 hours (3 working days) in advance.
 - b. Preparation of schedules.
 - c. Installation and removal of temporary facilities.
 - d. Delivery and processing of submittals.
 - e. Progress meetings.
 - f. Project close-out activities.
3. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
- a. Salvage materials and equipment involved in performance of, but not actually incorporated in, the work. Refer to other sections for disposition of salvaged materials that are designated as Owner's property.
- D. Submittals
- 1. Coordinated Drawings: Prepare and submit coordination drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.
 - a. Show the interrelationship of components shown on separate shop drawings.
 - b. Indicate required installation sequences.
 - c. Comply with requirements contained in Section "Submittals".
 - d. Section "Basic Electrical Requirements" for specific coordination drawing requirements for mechanical and electrical installations.
 - 2. Staff Names: Within 15 days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers. Post copies of the list in the project meeting room, the temporary field office, and each temporary telephone.

1.2 PROJECT MEETINGS

- A. Related Documents
- 1. Drawings and general provisions of the Contract, including General and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Summary
- 1. This section specifies administrative and procedural requirements for project meetings including but not limited to:
 - a. Pre-construction conference
 - b. Pre-installment conferences
 - c. Coordination meetings
 - d. Progress meetings
- C. Pre-construction Conference
- 1. Schedule a pre-construction conference and organizational meeting.
 - a. Hold meeting at the project site or other convenient location and prior to commencement of construction activities, including the moving of

equipment on to the site. Conduct the meeting to review responsibilities and personnel assignments.

2. Attendees: The Owner, Consultant and their consultants, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work. Both the Contractor and the Contractor's job foremen shall attend the meeting, along with all subcontractors.
3. Agenda: Discuss items of significance that could affect progress including such topics as:
 - a. Tentative construction schedule
 - b. Critical work sequencing
 - c. Designation of responsible personnel
 - d. Procedures for processing field decisions and Change Orders
 - e. Procedures for processing Applications for Payment
 - f. Distribution of Contract Documents
 - g. Submittal of Shop Drawings, Product Data and Samples
 - h. Preparation of record documents
 - i. Use of the premises
 - j. Office, work and storage areas
 - k. Equipment deliveries and priorities
 - l. Safety procedures
 - m. First aid
 - n. Security
 - o. Housekeeping
 - p. Working hours

D. Pre-Installation Conferences

1. Conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction. The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Consultant of scheduled meeting dates.
2. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:
 - a. Contract Documents
 - b. Options
 - c. Related Change Orders
 - d. Purchases
 - e. Deliveries
 - f. Shop Drawings, Product Data and quality control samples
 - g. Possible conflicts
 - h. Compatibility problems
 - i. Time schedules
 - j. Weather limitations
 - k. Manufacturer's recommendations
 - l. Compatibility of materials
 - m. Acceptability of substrates
 - n. Temporary facilities
 - o. Space and access limitations
 - p. Governing regulations

- q. Safety
 - r. Inspection and testing requirements
 - s. Required performance results
 - t. Recording requirements
 - u. Protection
3. The Consultant will record significant discussions and agreements and disagreements of each conference, along with the approved schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner and Consultant.
 4. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of work and reconvene the conference at the earliest feasible date.
- E. Coordination Meeting
1. Conduct project coordination meetings at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.
 2. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.
 3. The Consultant will record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.
- F. Progress Meetings
1. Conduct progress meetings at the project site at regularly scheduled intervals. Coordinate with the Owner and Consultant of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.
 2. Attendees: In addition to representatives of the Owner and Consultant, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the project and authorized to conclude matters relating to progress.
 3. Agenda: Visit job site to raise specific pending issues prior to meeting. Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the contract time.
 - b. Review the present and future needs of each entity present, including such items as:
 - 1) Interface requirements
 - 2) Time
 - 3) Sequences
 - 4) Deliveries
 - 5) Off-site fabrication problems
 - 6) Access
 - 7) Site utilization

- 8) Temporary facilities and services
 - 9) Hours of work
 - 10) Hazards and risks
 - 11) Housekeeping
 - 12) Quality and work standards
 - 13) Change Orders
 - 14) Documentation of information for payment requests
4. Reporting: The Consultant shall distribute printed and electronic copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
- a. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

1.3 PRODUCTS (NOT APPLICABLE)

1.4 EXECUTION

A. General Installation Provisions

1. Inspection of Conditions: Require the installer of each major component to inspect both the substrate and conditions under which work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
2. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
3. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.
4. Provide attachment and connection devices and methods necessary for securing work. Secure work true to line and level. Allow for expansion and building movement.
5. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable choices to the Consultant for final decision.
6. Recheck measurements, quantities and dimensions, before starting each installation.
7. Install each component during weather conditions and project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.
8. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.
9. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated and in compliance with accessibility requirements. Refer questionable mounting height decisions to the Consultant for final decision.

B. Cleaning and Protection

1. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

2. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
3. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:
 - a. Excessive static or dynamic loading
 - b. Excessive internal or external pressures
 - c. Excessively high or low temperatures
 - d. Thermal shock
 - e. Excessively high or low humidity
 - f. Air contamination or pollution
 - g. Water or ice
 - h. Solvents
 - i. Chemicals
 - j. Light
 - k. Radiation
 - l. Puncture
 - m. Abrasion
 - n. Heavy traffic
 - o. Soiling, staining and corrosion
 - p. Bacteria
 - q. Rodent and insect infestation
 - r. Combustion
 - s. Electrical current
 - t. High speed operation
 - u. Improper lubrication
 - v. Unusual wear or other misuse
 - w. Contact between incompatible materials
 - x. Destructive testing
 - y. Misalignment
 - z. Excessive weathering
 - aa. Unprotected storage
 - ab. Improper shipping or handling
 - ac. Theft
 - ad. Vandalism

END OF SECTION 013100

SECTION 014000 QUALITY REQUIREMENTS

1.1 GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General Conditions, Supplemental Conditions and other Division-1 Specification Sections, apply to this Section.

B. SUMMARY

1. This Section specifies administrative and procedural requirements for quality control services.
2. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Architect.
3. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.
4. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.
 - a. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.
 - b. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.
 - c. Requirements for the Contractor to provide quality control services required by the Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. RESPONSIBILITIES

1. Contractor Responsibilities: The Contractor shall provide inspections, tests and similar quality control services, specified in individual Specification Sections and required by governing authorities, except where they are specifically indicated to be the Owner's responsibility, or are provided by another identified entity; these services include those
 - a. Services specified to be performed by an independent agency and not by the Contractor. Costs for these services shall be included in the Contract Sum.
 - b. The Contractor shall employ and pay an independent agency, to perform specified quality control services.
 - c. The Owner will engage and pay for the services of an independent agency

- to perform inspections and tests specified as the Owner's responsibility. Payment for these services will be made by the Owner.
- d. Where the Owner has engaged a testing agency or other entity for testing and inspection of a part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the Owner, unless otherwise agreed in writing with the Owner.
2. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services provide unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.
 - a. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.
 3. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Associated services required include but are not limited to:
 - a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
 - b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
 - c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
 - d. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
 - e. Security and protection of samples and test equipment at the Project site.
 4. Owner Responsibilities: The Owner will provide inspections, tests and similar quality control services specified to be performed by independent agencies and not by the Contractor, except where they are specifically indicated as the Contractor's responsibility or are provided by another identified entity. Costs for these services are not included in the Contract Sum.
 - a. The Owner will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform services which are the Owner's responsibility.
 5. Duties of the Testing Agency: The independent testing agency engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with the Architect and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.
 - a. The agency shall notify the Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

- b. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.
 - c. The agency shall not perform any duties of the Contractor.
6. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

D. SUBMITTALS

- 1. The independent testing agency shall submit a certified written report and electronic copy of each inspection, test or similar service, to the Architect, in duplicate, unless the Contractor is responsible for the service. If the Contractor is responsible for the service, submit a certified written report of each inspection, test or similar service through the Contractor, in duplicate.
 - a. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
 - b. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:
 - 1) Date of issue
 - 2) Project title and number
 - 3) Name, address and telephone number of testing agency
 - 4) Dates and locations of samples and tests or inspections
 - 5) Names of individuals making the inspection or test
 - 6) Designation of the Work and test method
 - 7) Identification of product and Specification Section
 - 8) Complete inspection or test data
 - 9) Test results and in interpretations of test results
 - 10) Ambient conditions at the time of sample-taking and testing
 - 11) Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements
 - 12) Name and signature of laboratory inspector
 - 13) Recommendations on retesting

DI. QUALITY ASSURANCE

- 1. Qualification for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.
- 2. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State of Montana.

1.2 PRODUCTS (NOT APPLICABLE)

1.3 EXECUTION

A. GENERAL

1. Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.
2. Protect construction exposed by or for quality control service activities, and protect repaired construction.
3. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 014000

**SECTION 015000
TEMPORARY FACILITIES AND UTILITIES**

1.1 GENERAL

A. RELATED DOCUMENTS

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

B. SUMMARY

1. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.
2. Temporary utilities required may include but are not limited to:
 - a. Telephone service
 - b. Electric Service
 - c. Water
 - d. Natural gas
 - e. Sewer
3. Temporary construction and support facilities required may include but are not limited to:
 - a. Field offices and storage sheds.
 - b. Sanitary facilities, including drinking water
 - c. Temporary Project identification signs and bulletin boards
 - d. Waste Disposal services
 - e. Construction aids and miscellaneous services and facilities
4. Security and protection facilities required include but are not limited to:
 - a. Temporary Security Fencing
 - b. Temporary fire protection
 - b. Barricades, warning signs, lights
 - c. Environmental protection

C. QUALITY ASSURANCE

1. Regulations: Comply with industry standards and applicable laws and regulations if authorities having jurisdiction, including but not limited to:
 - a. Building Code requirements
 - b. Health and safety regulations
 - c. Utility company regulations
 - d. Police, Fire Department and Rescue Squad rules
 - e. Environmental protection regulations
2. Standards: Comply with NFPA Code 241, "Building Construction and

Demolition Operations" and ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition".

D. PROJECT CONDITIONS

1. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

1.2 PRODUCTS

A. MATERIALS

1. General: Provide new materials; if acceptable to the Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.
2. Water: Provide potable water approved by local health authorities.
3. Open-Mesh Fencing: Provide 11-gage, galvanized 2-inch, chain link fabric fencing 6-feet high with galvanized barbed wire top strand and galvanized steel pipe posts, 1 1/2" I.D. for line posts and 2-1/2" I.D. for corner posts.

B. EQUIPMENT

1. General: Provide new equipment; if acceptable to the Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.
2. Water Hoses: Provide 3/4" heavy-duty, abrasion-resistant, flexible rubber hoses 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.
3. Electrical Outlets: Provide properly configured NEA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.
4. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.
5. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.
6. Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.
7. Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.

9. First Aid Supplies: Comply with governing regulations.
10. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.
 - a. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

1.3 EXECUTION

A. INSTALLATION

1. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work and Owner's operations. Relocate and modify facilities as required.
2. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

B. TEMPORARY UTILITIES

1. Temporary Telephones: Provide temporary telephone service for all personnel engaged in construction activities, throughout the construction period. Provide cellular telephone, operational and on site at all times.

C. TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

1. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access and minimal interruption to Owner's operations.
 - a. Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.
2. Field Offices: The Contractor, at his option, shall provide insulated, weather tight temporary offices of sufficient size to accommodate required office personnel at the Project site. Keep the office clean and orderly for use for small progress meetings. Furnish and equip offices as follows:
 - a. Furnish with a desk and chairs, a 4-drawer file cabinet, plan table and plan rack and a 6-shelf bookcase.
 - b. Equip with a water cooler and private toilet complete with water closet, lavatory and mirror-medicine cabinet unit.
3. Storage and Fabrication Sheds: Install storage and fabrication sheds, sized, furnished and equipped to accommodate materials and equipment involved,

including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on the site.

4. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.
 - a. Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used material.
5. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.
6. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.
 - a. Provide safety showers, eye-wash fountains and similar facilities for convenience, safety and sanitation of personnel.
7. Drinking Water Facilities: Provide containerized tap-dispenser bottled-water type drinking water units, including paper supply.
 - a. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F (7 to 13 deg C).
8. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg. F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner. Do not use University trash containers for any reason.

D. SECURITY AND PROTECTION FACILITIES INSTALLATION

1. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - (a) Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
3. Open-Mesh Fencing: Provide 11-gage, galvanized 2-inch, chain link fabric fencing 6-feet high with galvanized barbed wire top strand and galvanized steel

pipe posts, 1 1/2" I.D. for line posts and 2-1/2" I.D. for corner posts.

4. Barricades, Warning Signs and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
5. Do not remove temporary security and protection facilities until Substantial Completion, or longer as requested by the Architect.
6. Temporary Fire Protection: Install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations."
 - a. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
 - b. Store combustible materials in containers in fire-safe locations.
 - c. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
 - d. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.
7. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

E. OPERATION, TERMINATION AND REMOVAL

1. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
2. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
3. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.
 - a. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project identification signs.

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplemental Conditions and Division 1 Specification Sections, apply to this section.

1.2 SECTION REQUIREMENTS

- A. Provide products of same kind from a single source. The term "product" includes the terms "material," "equipment," "system," and similar terms.
- B. Deliver, store, and handle products according to manufacturer's written instructions, using means and methods that will prevent damage, deterioration, and loss, including theft.
 - 1. Inspect products at time of delivery for compliance with the Contract Documents and to ensure items are undamaged and properly protected.
- C. Product Substitutions: Reasonable and timely requests for substitutions will be considered. Substitutions include products and methods of construction differing from that required by the Contract Documents and proposed by Contractor after award of Contract. Substitutions only allowed for products when more than one manufacturer is indicated.
 - 1. Submit two (2) copies of each request for product substitution. Identify product to be replaced and provide complete documentation showing compliance of proposed substitution with applicable requirements. Include a full comparison with the specified product, a list of changes to other Work required to accommodate the substitution, and any proposed changes in Contract Sum or Contract Time should the substitution be accepted.
 - 2. Submit requests for product substitution in time to permit processing of request and subsequent Submittals, if any, sufficiently in advance of when materials are required in the Work. Do not submit unapproved substitutions on Shop Drawings or other submittals.
 - 3. Owner will review the proposed substitution and notify Contractor of its acceptance or rejection.

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

- A. Provide products that comply with the Contract Documents, are undamaged, and are new at the time of installation.
 - 1. Provide products complete with accessories, trim, finish, and other devices and components needed for a complete installation and the intended use and effect.

B. Select products as follows:

1. Where only a single product or manufacturer is named, provide the item indicated. No substitutions will be permitted.
2. Where two or more products or manufacturers are named, provide one of the items indicated. No substitutions will be permitted.
3. Where products or manufacturers are specified by name, accompanied by the term "or equal," provide the named item or comply with provisions concerning "product substitutions" to obtain approval for use of an unnamed product or manufacturer.
4. Where a product is described with required characteristics, with or without naming a brand or trademark, provide a product that complies with those characteristics and other Contract requirements.
5. Where compliance with performance requirements is specified, provide products that comply and are recommended in writing by the manufacturer for the application.
6. Where compliance with codes, regulations, or standards, is specified, select a product that complies with the codes, regulations, or standards referenced.

C. Unless otherwise indicated, Owner will select color, pattern, and texture of each product from manufacturer's full range of options.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 016000

**SECTION
173000
EXECUTION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General Conditions, Supplemental Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Installation of the Work.
3. Cutting and patching.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

- B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.

1.3 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Consultant of locations and details of cutting and await directions from Consultant before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or those results in increased maintenance or decreased operational life or safety.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Consultant's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
 - 1. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Consultant for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a written and email request for information to Consultant.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings. If discrepancies are discovered, promptly notify Consultant by email and in writing.
 - 1. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 2. Inform installers of lines and levels to which they must comply.
 - 3. Check the location, level and plumb, of every major element as the Work progresses.
 - 4. Notify Consultant when deviations from required lines and levels exceed allowable tolerances.
- B. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Consultant.

3.4 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Consultant, and in compliance with accessibility requirements.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
 - J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.
- 3.5 CUTTING AND PATCHING
- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
 - B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
 - C. Temporary Support: Provide temporary support of work to be cut.
 - D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
 - E. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond- core drill.
 4. Proceed with patching after construction operations requiring cutting are complete.
 - F. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- G. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste.
 4. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.
1. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- H. Clean and provide maintenance on completed construction as frequently as necessary through

the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

- I. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

**SECTION 017400
WARRANTIES AND
BONDS**

1.1 GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General and Supplemental Conditions and other Division-1 Specification Sections, apply to this Section.

B. SUMMARY

1. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties.
 - a. Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.
 - b. General closeout requirements are included in Section "Project Closeout."
 - c. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Sections of Divisions-2 through -16.
 - d. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
2. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

C. DEFINITIONS

1. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
2. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

D. WARRANTY REQUIREMENTS

1. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
2. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
3. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with

requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefitted from use of the Work through a portion of its anticipated useful service life.

4. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 - a. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
5. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

E. SUBMITTALS

1. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.
 - a. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within fifteen days of completion of that designated portion of the Work.
2. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate items and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect for approval prior to final execution.
 - a. Refer to individual Sections of Divisions-2 through -16 for specific content requirements, and particular requirements for submittal of special warranties.
3. Forms of Submittal: At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 1. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.
 - a. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a

typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.

b. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS, the Project title or name, and the name of the Contractor.

2. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.2 PRODUCTS (NOT APPLICABLE)

1.3 EXECUTION

A. SCHEDULE OF WARRANTIES

1. Schedule: Provide warranties and bonds on products and installations as specified in the appropriate Sections.

END OF SECTION 017400

SECTION 017419 WASTE MANAGEMENT

PART 1 - GENERAL

1.1 WASTE MANAGEMENT REQUIREMENTS

Owner requires that this project generate the least amount of trash and waste possible. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration and shall be recycled:

- Aluminum and plastic beverage containers.
- Corrugated cardboard.
- Wood pallets.
- Clean dimensional wood: May be used as blocking or furring.
- Land clearing debris, including brush, branches, logs, and stumps.
- Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.

Methods of trash/waste disposal that are **not** acceptable are:

- Burning on the project site.
- Burying on the project site.
- Dumping or burying on other property, public or private. Other illegal dumping or burying.

Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, State and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.2 DEFINITIONS

Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

Non-hazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form.

Recycling does not include burning, incinerating, or thermally destroying waste.

Return: To give back reusable items or unused products to vendors for credit.

**SECTION 017320
WASTE MANAGEMENT**

Reuse: To reuse a construction waste material in some manner on the project site.
Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
Toxic: Poisonous to humans either immediately or after a long period of exposure.
Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

1.3 WASTE MANAGEMENT PLAN IMPLEMENTATION

Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and the Architect.

Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

Meetings: Discuss trash/waste management goals and issues at project meetings, including the Pre-bid meeting, Pre-construction meeting and regular job-site meetings.

Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.

As a minimum, provide:

Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.

Separate dumpsters for each category of recyclable.

Recycling bins at worker lunch area.

Provide containers as required.

Provide adequate space for pick-up and delivery and convenience to subcontractors. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION 017419

**SECTION 017700
PROJECT
CLOSEOUT**

1.1 GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General and Supplemental Conditions and other Division-1 Specification Sections, apply to this Section.

B. SUMMARY

1. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
 - a. Inspection procedures
 - b. Project record document submittal
 - c. Operating and maintenance manual submittal
 - d. Submittal of warranties
 - e. Final cleaning
 - f. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions - 2 through - 33.

C. SUBSTANTIAL COMPLETION

1. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.
 - a. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
 - 1) If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
 - b. Advise Owner of pending insurance change-over requirements.
 - c. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
 - d. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.
 - e. See the *Supplemental Conditions of the Contract for Construction* 3.11 for Documentation and As-Built Conditions, and the *Project Closeout Checklist: Contractor Requirements*. Submit maintenance manuals, final project photographs, damage or settlement survey, property survey, and similar final record information.
 - f. Deliver tools, spare parts, extra stock, and similar items.
 - h. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
 - i. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

2. Inspection Procedures: On receipt of a request for inspection, the Consultant will either proceed with inspection or advise the Contractor of unfilled requirements. The Consultant will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
 - a. The Consultant will repeat inspection when requested and assured that the Work has been substantially completed.
 - b. Results of the completed inspection will form the basis of requirements for final inspection.
- D. FINAL ACCEPTANCE
1. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
 - a. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 - b. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
 - c. Submit a certified copy of the Consultant's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Consultant.
 - e. Submit consent of surety to final payment.
 - f. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 2. Re-inspection Procedure: The Consultant will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Consultant.
 - a. Upon completion of re-inspection, the Consultant will prepare a certificate of final acceptance, or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
 - b. If necessary, re-inspection will be repeated.
- E. RECORD DOCUMENT SUBMITTALS
1. **See also the *Supplemental Conditions of the Contract for Construction 3.11 for Documentation and As-Built Conditions, and the Project Closeout Checklist: Contractor Requirements.***
 2. General: Do not use record documents (red-line markups) for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Consultant's reference during normal working hours.
 3. Record Drawings (Red-lined): Maintain two clean, undamaged sets of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the sets to show the red-line changes during the course of construction with actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the

corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

- a. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
 - b. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
 - c. Note related Change Order numbers where applicable.
 - d. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
4. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.
- a. Upon completion of the Work, submit record Specifications to the Consultant for the Owner's records.
5. Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark up of record drawings and Specifications.
- a. Upon completion of mark-up, submit (3) complete sets of record Product Data to the Consultant for the Owner's records.
6. Record Sample Submitted: Immediately prior to the date or dates of Substantial Completion, the Contractor will meet at the site with the Consultant and the Owner's personnel to determine which of the submitted Samples that have been maintained during progress of the Work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's Sample storage area
7. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Consultant for the Owner's records.
8. Maintenance Manuals: Provide one (1) draft copy for review. Provide **one (1)** final paper copy and one electronic pdf file prior to final completion. Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 3-inch, 3 ring vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include the following types of information; and others as specified in other Divisions:
- a. Emergency instructions
 - b. Spare parts list
 - c. Copies of warranties
 - d. Wiring diagrams

- e. Recommended "turn around" cycles
- f. Inspection procedures
- g. Shop Drawings and Product Data
- h. Fixture lamping schedule
- i. List of final color and material selections

F. WARRANTIES AND BONDS

1. SUMMARY

- a. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.
 - 1) Refer to the General Conditions and Supplemental Conditions for terms of the Contractor's special warranty of workmanship and materials.
 - 2) General closeout requirements are included in Section "Project Closeout."
 - 3) Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Sections of Divisions-2 through -16.
 - 4) Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- b. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.
- c. Separate Prime Contracts: Each prime Contractor is responsible for warranties related to its own Contract.

2. DEFINITIONS

- a. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- b. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

G. WARRANTY REQUIREMENTS

- a. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- b. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- c. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is

responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefitted from use of the Work through a portion of its anticipated useful service life.

- d. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 - 1) Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- di. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

4. SUBMITTALS

- a. Submit written warranties to the Consultant prior to the date certified for Substantial Completion. If the Consultant's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Consultant.
 - 1) When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Consultant within fifteen days of completion of that designated portion of the Work.
- b. Forms of Submittal: At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- c. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.
 - 1) Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name or the product, and the name, address and telephone number of the installer.
 - 2) Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS, the Project title or name, and the name of the Contractor.
- d. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.2 EXECUTION

A. CLOSEOUT PROCEDURES

1. Functional Demonstration: Demonstrate proper operation of all systems to Consultants and Owners representative prior to request for substantial completion. Coordinate schedule with Consultant.
2. Operating and Maintenance Instructions: Provide two (2) duplicate training sessions for each MSU trade group responsible for systems installed under this project. Coordinate schedule with Owner. Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:
 - a. Maintenance manuals
 - b. Record documents
 - c. Spare parts and materials
 - d. Tools
 - e. Lubricants
 - f. Fuels
 - g. Identification systems
 - h. Control sequences
 - i. Hazards
 - j. Cleaning
 - k. Warranties and bonds
 - 1) Maintenance agreements and similar continuing commitments

END OF SECTION 017700

**SECTION 017823
OPERATION AND MAINTENANCE DATA**

PART 1 - GENERAL

1.1 A.RELATED DOCUMENTS

- A. General provisions of Contract, including General and Supplemental Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Operation manuals for systems, subsystems, and equipment.
 - 3. Product maintenance manuals.
 - 4. Systems and equipment maintenance manuals.

1.3 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
 - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
 - 2. One paper copy and one electronic pdf. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will deliver copies to the Owner.
- C. Manual Submittal: Submit each manual in DRAFT in PDF format form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments. PROVIDE PAPER AND PDF OF FINAL APPROVED MANUALS

1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR OPERATION, AND MAINTENANCE MANUALS

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.
- B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 1. Title page.
 2. Table of contents.
 3. Manual contents.
- C. Title Page: Include the following information:
 1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Construction Manager.
 7. Name and contact information for Architect.
 8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 9. Cross-reference to related systems in other operation and maintenance manuals.
- D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily

navigated file tree. Configure electronic manual to display bookmark panel on opening file.

- G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: These binders are sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and oversize sheets will need to be folded to 8x11.5.
 - a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
 4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor is delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Precautions against improper use.
 9. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.

7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- CI. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- CII. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.3 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.4 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

- B. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- C. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
- D. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
- E. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

PART 4 - MATERIAL AND FINISHES MAINTENANCE MANUAL

- A. General: Incorporate as part of the O& M Manuals. Material and finishes to the Architect/Engineer for approval and distribution. Provide one section for architectural products, including applied materials and finishes, and a second section for products designed for moisture protection and products exposed to the water.
 - 1. Refer to individual specification sections for additional requirements on the care and maintenance of materials and finishes
- B. Architectural Products, Applied Materials and Finishes: Provide complete manufacturers data and instructions on the care and maintenance of architectural products, including applied materials and finishes.
- C. Manufacturers Data: Provide complete information on architectural products, including but not limited to the following items, as applicable:
 - 1. Manufacturer's catalog number
 - 2. Size
 - 3. Material composition
 - 4. Color texture reordering information for specially manufactured products
 - 5. Manufacturer and supplier/installers contact information
 - 6. Warranty terms
- D. Care and Maintenance Instruction: Provide complete information on the care and maintenance of architectural products, including the manufacturer's recommendations for the types of cleaning agents to be used and the methods of cleaning. In addition, provide information regarding cleaning agents and methods which could prove detrimental to the product. Include the manufacturer's recommended schedule for cleaning and maintenance.

- E. Manufacturer's Data: Provide complete manufacturer's data giving detailed information including, but not limited to the following, as applicable:
 - 1. Applicable standards
 - 2. Chemical composition
 - 3. Installation details
 - 4. Inspection procedures
 - 5. Maintenance information
 - 6. Repair procedures

- F. Schedule: Provide complete information in the materials and finishes manual on products specified in the following sections: (To be determined with Owner)

- G. Color Schedule: Provide complete information on MSU CPDC provided electronic spreadsheet form, to include manufacturer's name and number, location, item and surface of all painted, stained or treated material, surface or piece of equipment.

END OF SECTION 017823

**SECTION 017839
PROJECT RECORD DOCUMENTS**

PART 1 - GENERAL

1.1 SUMMARY

- A. See also General Conditions and Supplemental Conditions of the Contract for Construction.
- B. **See the *Supplemental Conditions of the Contract for Construction 3.11 for Documentation and As-Built Conditions, and the Project Closeout Checklist: Contractor Requirements***
- C. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
- D. Related Requirements:
 - 1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 2. Divisions 02 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings (Redline Markups): Comply with the following:
 - 1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Draft Submittal:
 - 1) Submit PDF electronic files of scanned record prints.
 - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit one paper-copy set(s) of marked-up record prints.
 - 2) Submit PDF electronic files of scanned record prints and one set(s) of prints.
 - 3) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit one annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one annotated PDF electronic files and directories of each submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.
1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Record data as soon as possible after obtaining it.
 - c. Record and check the markup before enclosing concealed installations.
 2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name and PPA Number.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as annotated PDF electronic file

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as annotated PDF electronic file.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

**SECTION 017900
DEMONSTRATION AND TRAINING**

PART 1 - GENERAL

1.1 SUMMARY

1. System Demonstration:

- a. **General:**
 - i. The system demonstration is a functional test of systems to determine whether they are substantially complete and operating as specified. Systems are to be tested and confirmed to be operating properly by the contractor prior to the Demonstration.
 - ii. Where initial Demonstration Session uncovers substantial deficiencies that require more than one Demonstration Session, Contractor shall reimburse Owner for personnel costs associated with performing subsequent Sessions.
- b. **Systems to be Tested:**
 - i. All systems installed and/or provided under the project to have functional testing.
- c. **Attendance:**
 - i. The system demonstration is to be provided by trained representatives that are familiar with the systems, and can operate systems as required to test and verify proper function. The Engineer and Owner's representatives will be present to document performance and/or deficiencies. The General Contractor or others may attend if desired.
 - ii. Individual testing sessions (modules) shall be provided for each type or group of systems, separated roughly by trade group that will be performing maintenance on the system. MSU trades groups and systems typically involved in testing are:
 - (1) Electricians
 - (2) Heating Plant (Hydronic and steam heating systems, controls)
 - (3) Plumbers (Plumbing, gas-fired heating, process piping systems)
 - (4) Refrigeration (Refrigeration, chilled water, packaged cooling systems)
- d. **Schedule:**
 - i. Contractor to coordinate time requirements and dates with Owner and Engineer. Begin scheduling with sufficient time prior to desired Substantial Completion date to allow all parties to work into schedule, and for deficiencies to be completed prior to desired Substantial Completion date. Demonstration is to be provided prior to, and separate from, training.

2. Training:

- a. **General:**
 - i. The system training is intended to familiarize the Owner's operating and maintenance staff with all systems requiring maintenance. Training is to be provided after the systems are in place and operational, after issues noted during the Demonstration have been resolved, and before final acceptance.
- b. **Systems Requiring Training:**
 - i. All systems installed and/or provided under the project are to have training.
- c. **Attendance:**
 - i. Training is to be provided by trained representatives that are familiar with the system's operation and maintenance requirements. Individual training sessions (modules) shall be provided for each type or group of systems, separated roughly by trade group that will be performing maintenance on the system. MSU trades groups and systems typically requiring training are:
 - (1) Electricians

- (2) Heating Plant (Hydronic and steam heating systems, controls)
- (3) Plumbers (Plumbing, gas-fired heating, process piping systems)
- (4) Refrigeration (Refrigeration, chilled water, packaged cooling systems)
- d. Schedule:
 - i. Duplicate training sessions are to be provided for each training module, so that Owner's operating personnel can be split into two groups during training. Duplicate training sessions to be scheduled during different weeks. Length of training sessions will be determined by scope of training, and as coordinated with Owner after draft copy of training documents have been reviewed.

2.1 PRODUCTS

- 1. Not applicable

3.1 EXECUTION

- 1. Demonstration:

- a. Demonstration Program:

- i. Engineer to develop a demonstration program to verify the proper operation of all required systems. Submit program to Owner and Contractor at least two weeks prior to Demonstration.
- ii. Engineer to work with Contractor to generate methods to be used to verify sequences and modes of operation that cannot be verified directly.
- iii. Engineer to provide at least one copy of all submittals, contract drawings, specifications, and changes related to systems to be demonstrated. Documents to be made available during Demonstration.
- iv. Contractor to provide at least one copy of Operating and Maintenance Manuals to be used during demonstration, including specified sequences of operation for field-constructed systems, and operating sequences for all manufactured equipment.

- b. Demonstration Session:

- i. Verify that all systems are functional and ready to operate in all modes prior to demonstration.
- ii. Assemble all program materials required for demonstration.
- iii. Contractor to provide all equipment necessary for access to, and operation of, systems including tools, ladder, lighting, and diagnostic equipment.
- iv. Verify operation of individual components within systems.
- v. Verify controls of related components are coordinated.
- vi. Verify all operating sequences, operating modes, and safety controls.
- vii. Record all pressures, temperatures, and other relevant data available from installed devices.
- viii. Where digital control systems are available, set-up trend reports of relevant parameters which will confirm proper operation of systems installed, modified, or affected by changes made during this project. Provide copies of reports to Engineer and Owner for review. Review, analyze, and discuss results, and provide follow-up reports as required to confirm proper operation.

- 2. Training:

- a. Training Documentation:

- i. Contractor to submit draft copy of agenda and training documents to Owner for review at least two weeks prior to training date.
- ii. Provide a copy of the following items for each person that will be attending the

training sessions. Coordinate required number with the Owner.

- (1) Training agenda.
- (2) Summary of new systems and existing systems affected by this project.
- (3) Summary of work performed under this project.
- (4) Control system drawings and sequences of operation.
- (5) List of important maintenance and trouble-shooting operations for all systems.

iii. Provide minimum of 2 copies of following items:

- (1) Contract documents including all drawings, specifications, addendums, and change orders.

b. Training Sessions:

- i. Assemble at location to be determined by the Owner.
- ii. Distribute training documentation as indicated above.
- iii. Provide classroom style training if required for orientation, discussion of new systems and existing systems affected by this project, and other issues appropriate for a classroom format.
- iv. Visit site and review locations, and perform detailed review of operation and maintenance requirements for current systems.

END OF SECTION 179000

**SECTION 024119
SELECTIVE DEMOLITION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Demolition and removal of selected portions of building or structure.
- 2. Salvage of existing items to be reused or recycled.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 QUALITY ASSURANCE

- 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 ANSI A10.6 and NFPA 241.

1.5 PRE-INSTALLATION MEETINGS

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

1.6 CLOSEOUT SUBMITTALS

- A. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.7 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - 1. Before selective demolition, Owner will remove the following items:
 - a. Text books and other loose classroom resources.
 - b. Loose shelving units and storage cabinets.
 - c. Loose furniture (tables and chairs).
 - d. Loose equipment.

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

D. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is included in the Contract Documents. Examine report to become aware of locations where hazardous materials are present. Do not proceed with selective demolition until all hazardous materials have been removed. Do not proceed with selective demo until all hazardous materials have been removed.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials
 - i. except under procedures specified elsewhere in the Contract Documents.

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

DII. Utility Service: Maintain existing utilities and the protection facilities indicated to remain in and protect them against damage during selective demolition 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 ANSI/ 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. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit and email a written report to Architect and MSU Project Manager.

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. Comply with requirements for existing services/ systems interruptions specified in Section 011000 "Summary."
- C. Existing Services/ Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/ electrical systems serving areas to be selectively demolished.

1. 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.

2. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
3. Piping to be removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
4. Piping to be abandoned in place: Drain piping and cap or plug piping with same or compatible piping material.
5. Equipment to be removed: Disconnect and cap services and remove equipment.
6. Equipment to be removed and reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
7. Equipment to be removed and salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
8. Ducts to be removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
9. Ducts to be abandoned in place: Cap or plug ducts with same or compatible ductwork material.

3.3 PREPARATION

A. 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.

1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls".

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

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:

B. . 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, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

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

D. Do not use cutting torches for selective demolition operations.

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

F. Dispose of demolished items and materials promptly.

G. 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 on campus as directed by Owner.
5. Protect items from damage during transport and storage.

H. 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.
- I. 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 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them.

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 017419 Waste "Construction Management and Disposal".

B. Burning: Do not burn demolished materials.

3.6 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 024119

**SECTION 02110
GEOTEXTILES**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This work consists of furnishing and placing a geotextile as a subsurface drainage fabric permeable separator between dissimilar materials (such as between subgrade and subbase/base), stabilization fabric, temporary and/or permanent erosion control measures or as waterproofing/stress releasing membrane within pavement structures.

1.2 REFERENCES

- A. The current publications listed below form part of this specification.
- B. ASTM Standards

D123	Standard Terminology Relating to Textiles
D276	Standard Test Methods for Identification of Fibers in Textiles
D4354	Standard Practice for Sampling of Geosynthetics and Rolled Erosion Control Products for Testing
D4632	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles (Gra Method)
D4533	Standard Test Method for Trapezoid Tearing Strength of Geotextiles
D3786	Standard Test Method for Bursting of Textile Fabrics - Diaphragm Bursting Strength Tester Method
D4833	Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
D4491	Standard Test Method for Water Permeability of Geo- textiles by Permeability
D4751	Standard Test Method for Determining the Number of Constrictions "m" of Non-Woven Geotextiles as a Complementary Filtration Property
D4354	Standard Practice for Sampling of Geosynthetics and Rolled Erosion Control Products for Testing

D4759	Standard Practice for Determining the Specification Conformance of Geosynthetics
D276	Standard Test Methods for Identification of Fibers in Textiles
D4355	Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc-Type Apparatus
D4873	Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples
D5141	Standard Test Method for Determining Filtering Efficiency and Flow Rate of the Filtration for Component of a Sediment Retention Device
D5261	Standard Test Method for Measuring Mass per Unit Area of Geotextiles
D1140	Standard Test Methods for Determining the Amount of Material Finer than 75- μm (No. 200) Sieve in Soils by Washing
D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft- lbf/ft ³ (600 kN-m/m ³))

C. AASHTO Specifications – Standard Specifications for Transportation Materials and Methods of Sampling and Testing

1. Augmenting and prevailing over this specification section.

PART 2 - PRODUCTS

2.1 PHYSICAL AND CHEMICAL REQUIREMENTS

- A. Assure that fibers used in the manufacture of geotextiles, and the threads used in joining geotextiles by sewing, consist of long-chain synthetic polymers, composed of at least 95 percent by weight polyolefins or polyesters. They must be formed into a network so the filaments on yarns retain dimensional stability relative to each other, including selvages. Furnish materials meeting the physical requirements listed in Section 2.4 or as shown on the plans.
- B. Provide moderate or high survivability non-woven polypropylene fabric that is inert to commonly encountered chemicals and soils and that remains stable over a temperature range of -50 degrees Fahrenheit (-46° C) to 150 degrees Fahrenheit (66° C) and at a pH

range of 2 to 13.

2.2 CERTIFICATION

- A. Assure the manufacturer furnishes the purchaser a certificate stating: the name of the manufacturer, the chemical composition of the filaments or yarns, and other information fully describing the geotextile. The manufacturer must include in the certificate a guarantee stating that the geotextile furnished meets specifications. The certificate must be attested to by a person having legal authority to bind the company. Mismatching, or misrepresentation by the manufacturer is reason to reject the geotextile under these specifications. Notice sent to the manufacturer by the purchaser regarding rejection of, will be considered to be notice to all wholesalers, jobbers, distributors, agents and other intermediaries handling the manufacturer's product.
- B. Label the fabric and its container with the manufacturer's name and fabric type or trade name, lot number and quantity.

2.3 SHIPMENT AND STORAGE

- A. During shipment and storage, protect the fabric from direct sunlight, ultra-violet rays, temperatures exceeding 160 degrees Fahrenheit (71°C), mud, dust and debris. Keep the fabrics in the manufacturer's wrapping until just before use. Include with each shipping, a document, a certification showing that the geotextile meets the manufacturer's certificate and a guarantee that has been previously filed with the purchaser.
- B. At the time of installation, the fabric will be rejected if it has defects, seams or weakness, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, or storage.

2.4 MATERIALS

- A. Drainage Fabric
 - 1. Furnish Class 2 fabric as specified in AASHTO M 288 – Geotextile Specifications for Highway Applications.
- B. Separation Fabric
 - 1. Furnish Class 1 fabric as specified in AASHTO M 288 – Geotextile Specifications for Highway Applications.
- C. Stabilization Fabric
 - 1. Furnish Class 1 fabric as specified in AASHTO M 288 – Geotextile Specifications for Highway Applications
- D. Permanent Erosion Control
 - 1. Furnish Class 1 fabric, as specified in AASHTO M 288 – Geotextile Specifications

for Highway Applications, with an Apparent Opening size of #40, #60, #70, or #100 (US Sieve No.), as shown on the plans.

E. Silt Fence Fabric

1. Support silt fence with either wood or metal fence posts.
2. Assure silt fence geotextile meets the minimum requirements in the following table:

Required Properties for Silt Fence		
<i>Property</i>	<i>Test Method</i>	<i>Value</i>
<i>Minimum Grab Tensile Strength (lbs)</i>	<i>ASTM D4632</i>	<i>>125</i>
<i>Minimum Grab Tensile Strength, X Direction (lbs)</i>	<i>ASTM D4632</i>	<i>>100</i>
<i>Minimum Permittivity (sec⁻¹)</i>	<i>ASTM D4491</i>	<i>≥0.05</i>
<i>Maximum Apparent Opening (US Sieve No.)</i>	<i>ASTM D4751</i>	<i>#30</i>
<i>Ultraviolet Stability (% Retained After 500 hrs of Exposure)</i>	<i>ASTM D4355</i>	<i>≥70</i>

F. Landfill Cell Filter Fabric

1. Assure landfill cell filter fabric minimum requirements in the following table:

Required Properties for Landfill Cell Filter Fabric		
<i>Property</i>	<i>Test Method</i>	<i>Value</i>
<i>Minimum Grab Tensile Strength (lbs)</i>	<i>ASTM D4632</i>	<i>390</i>
<i>Grab Tensile Elongation (%)</i>	<i>ASTM D4632</i>	<i>50</i>
<i>Puncture (lb)</i>	<i>ASTM D4833</i>	<i>240</i>
<i>Maximum Apparent Opening Size (US sieve number)</i>	<i>ASTM D4751</i>	<i>100</i>

PART 3 - EXECUTION

3.1 GENERAL

- A. Where placing geotextiles on native ground, cut the trees and shrubs flush with the ground surface. Do not remove the topsoil and vegetation mat. Remove all sharp objects and large rocks. Fill depressions or holes with a suitable material to provide a firm foundation.
- B. Replace or repair all geotextile that is torn, punctured, or muddy. Remove the damaged area and place a patch of the same type of geotextile overlapping 3 feet, in all directions, (0.9m) beyond the damaged area.

3.2 DRAINAGE, SEPARATION AND STABILIZATION APPLICATIONS

- A. Shape the subgrade to a smooth surface and to the cross section required. Shape slopes to gradually transition into slope adjustments without noticeable breaks. At the ends of cuts, the intersection of cuts, and embankments, adjust slopes in the horizontal and vertical planes to blend into each other or into the natural ground.
- B. Remove all material larger than 6 inches (15 cm) within the top 6 inches (15 cm) of the roadbed. Remove unsuitable material from the roadbed and replace with suitable material. Finish the roadbed and ditches to the required elevation and cross-section.
- C. Place the geotextile smooth and free of tension, stress, or wrinkles. Fold and cut the geotextile to conform to curves. Overlap in the direction of construction. Overlap the geotextile a minimum of 2 feet (0.6m) at the ends and sides of adjoining sheets or sew the geotextile joints according to the manufacturer's recommendations. Do not place longitudinal overlaps below anticipated wheel loads. Hold the geotextile in place with pins, staples, or piles of cover material.
- D. End dump the cover material onto the geotextile from the edge of the geotextile or from previously placed cover material. Do not operate equipment directly on the geotextile. Spread the end-dumped pile of cover material maintaining a minimum lift thickness of 10 inches (250mm). Compact the cover material with rubber-tired or nonvibratory smooth drum rollers. Avoid sudden stops, starts, or turns of the construction equipment. Fill all ruts from construction equipment with additional cover material. Do not regrade ruts with placement equipment.
- E. Place subsequent lifts of cover material in the same manner as the initial lift. Vibratory compactors may be used for compacting subsequent lifts. If foundation failures occur, repair the damaged areas and revert to the use of nonvibratory compaction equipment.

3.3 TEMPORARY AND PERMANENT EROSION CONTROL APPLICATIONS

- A. Place and anchor the geotextile on the approved smooth-graded surface. For slope protection, place the long dimension of the geotextile down the slope. For stream bank protection, place the long dimension of the geotextile parallel to the centerline of the channel.
- B. Overlap geotextile a minimum of 24 inches (60 cm) at the ends and sides of adjoining sheets or sew the geotextile joints according to the manufacturer's recommendations. Overlap the uphill or upstream sheet over the downhill or downstream sheet. Offset end joints of adjacent sheets a minimum of 5 feet (1.5 m). Pins may be used to hold the geotextile sheets in place other than on interior slopes of lagoons or ponds. Space pins along the overlaps at approximately 3-foot (1 m) centers.

- C. Place aggregate, slope protection, or riprap on the geotextile starting at the toe of the slope and proceed upward. Place materials by overhead construction methods or in such a manner that no vehicles or equipment operate directly on the fabric. Place riprap onto the geotextile from a height of less than 12 inches (30 cm). Place slope protection rock or aggregate backfill onto the geotextile from a height less than 3 feet (1 m). In underwater applications, place the geotextile and cover material in the same day.

3.4 PAVEMENT APPLICATIONS

- A. Use SS-1 crack filler meeting the applicable section for crack filler for surface preparation of cracks between 1/8-and 1/4-inch wide. Fill cracks exceeding 1/4- inch (6 mm) width with an asphalt emulsion slurry consisting of 20% by volume of SS-1, 2 percent by volume Portland Cement and the remaining portion fine sand.
- B. Use distributors for spraying a Performance Graded (PG) Asphaltic Binder meeting the specifications for the asphalt cement being used in the asphalt concrete overlay.
- C. Place fabric using manufacturer recommended equipment.
- D. Handle and place all fabric following the manufacturer's recommendations.
- E. Clean pavement to receive fabric, free of dirt, water, and vegetation. Clean all cracks between 1/8-inch (3 mm) and 1/4-inch (6 mm) wide and fill flush to the surface with SS-1 bituminous material. Top with sand. Repair larger cracks or holes using the asphalt emulsion slurry. Pour the mixture into the cracks until full. Re-fill with slurry the following day, any cracks which are not filled initially. When a leveling course is required, place it before installing the fabric. Areas to be covered with a leveling course do not require surface preparations for cracks unless the leveling courses will be less than 0.3 foot (10cm).
- F. Uniformly apply the asphaltic binder at the rate determined by the Engineer. The quantity will vary with pavement porosity. Take care to place sufficient binder to satisfy the fabric and make the membrane impervious to water without causing a slippage plane. The applications rates are typically 0.25 to 0.30 gallon per square yard. Apply binder using a distributor.
- G. Heat the asphalt binder high enough to permit a uniform spray pattern. Ensure air temperature is at least 50 degrees Fahrenheit (10° C) and rising before applying binder and fabric.
- H. Place the paving geotextile onto the asphalt sealant with minimal wrinkling. Slit, lay flat and tack all wrinkles or folds higher than 1 inch (25 mm). Broom and/or roll the paving geotextile to maximize fabric contact with the pavement surface.

- I. At geotextile joints, overlap the geotextile 1 to 3 inches (25 to 75 mm) to ensure full closure. Overlap transverse joints in the direction of paving to prevent edge pickup by the paver. Apply additional asphalt sealant to paving geotextile overlaps to ensure proper bonding of the double fabric layer.
- J. If asphalt sealant bleeds through the fabric, treat the affected areas with blotter. Minimize traffic on the geotextile. If circumstances require traffic on the fabric, apply blotter and place "slippery when wet" signs.
- K. Broom the excess blotter from the geotextile surfaces before placing the overlay. Repair all damaged fabric before placing overlay. Apply a light tack coat before placing the overlay. To avoid damaging the geotextile, do not turn equipment on the geotextile.
- L. Place a hot asphalt concrete overlay within 48 hours after placing the paving geotextile. Limit the lay-down temperature of the mix to a maximum of 325°F (163°C) except when the paving geotextile is composed of polypropylene fibers, limit the lay-down temperature of the mix to a maximum of 300°F (149°C).

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. All geotextiles will be measured by the square yard on a plane parallel to the ground surface, excluding overlaps. The accepted quantities, measured as provided above, will be paid at the contract price per unit of measurement for the pay item that is shown in the bid schedule.
- B. Payment indicated to include complete compensation for all labor, equipment, materials and incidentals required for the completion of the work.

4.2 PAVING FABRICS

- A. Fabric is measured and paid per square yard of roadway surface covered, complete and in place. No allowance is made for additional fabric required for overlap joints. No allowance is made for blotter sand (if occasionally required).
- B. Crack filling is measured per job and payment is at contract lump sum price, complete in place.
- C. Asphalt cement binder is measured and paid by the ton, corrected to standard temperature, complete in place.
- D. Fabric to follow Geotechnical recommendation and design document requirements.

END OF SECTION

SECTION 02111

CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work consists of removing and disposing of existing features, trees, stumps, brush, roots, shrubs, logs, windfalls, and all miscellaneous debris and other objectionable matter.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 PROTECTION

- A. Locate and protect all above ground and below ground utilities or relocate as directed by the Contract.
- B. Protect benchmarks and survey monuments from damage and displacement.
- C. Protect land outside of construction/disturbance limits as indicated in the construction documents.
- D. Protect existing roads from damage.
- E. Retain and protect any trees and vegetation not designated for removal.
 - 1. No equipment, vehicles, building materials, chemicals, stockpiles or debris shall be placed within the tree protection area.
 - 2. No changes in grade should be made within the tree protection area.
 - 3. Should excavation damage or break roots greater than 1 inch in diameter, make a clean saw cut through the undamaged portion of the root behind the break perpendicular to the root.
 - 4. Should excavation result in damage to roots greater than 2 inches in diameter, branches, or bark, notify the CLIENT immediately.
 - 5. If required by the CLIEN, hire an approved tree service to trim trees, prior to beginning excavation.
- F. The Contractor is responsible for damage resulting from construction operations.
- G. Preserve and protect all vegetation and ground cover not within the construction area, including areas not requiring grading, as directed.

3.2 REMOVAL AND DISPOSAL

- A. Complete clearing and grubbing as required within the disturbance limits defined by a line drawn as shown on the Contract Documents or as directed.
- B. Unless otherwise provided, all merchantable timber in the clearing area not removed from the project area prior to the beginning of construction becomes the property of the Contractor.
- C. Remove all brush and shrubs from the site including the roots. Dispose of the shrubs and brush off-site at a location provided by the Contractor.
- D. Strip all soils, heavy growths of grass, and sod that comprise the organic root-zone.
- E. Unless otherwise directed remove all stumps within the clearing disturbance limits.
- F. Dispose of all removed materials at offsite locations that comply with all Federal, State, and Local Regulations.

3.3 CLEANUP

- A. Upon completion of the site work and project, clean the entire work area. Remove all excess excavated material, rocks, boulders, brush, trees, pipe, or debris of any type from the site and dispose at a site acceptable to Federal, State, and Local Regulations.

PART 4 - MEASUREMENT AND PAYMENT^[SE1]^[MR2]^[MR3]

4.1 GENERAL

- A. Payment indicated to include complete compensation for all labor, equipment, materials and incidentals required for the completion of the work.
- B. Payment will be made under Clearing and Grubbing – per square foot.

END OF SECTION

SECTION 02112

REMOVAL OF EXISTING PAVEMENT, CONCRETE CURB, SIDEWALK, DRIVEWAY AND/OR STRUCTURES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work consists of removing and disposing of existing pavement, concrete curb, combined curb and gutter, sidewalk, private driveways, and crosswalks, along with any structures designated for removal in the contract documents. Additional details of removals are specified in the contract documents.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 GENERAL

- A. Dispose of all existing pavement, concrete curb, crosswalk and/or combined curb and gutter specified for removal in the contract documents or directed by the Engineer. Exercise care in such removal to assure that remaining nearby facilities and/or structures are not disturbed. Restore to original condition any such existing facilities or structures damaged by construction activities.
- B. Remove and dispose of designated existing pavement to the lines indicated on the contract documents or directed by the Engineer. Make straight and approximately vertical cuts of edges along which new pavement is to be placed.
- C. Remove and dispose of existing private concrete driveways and/or sidewalks which interfere with construction of street improvements, or which do not match the new grade as shown on the contract documents or as directed by the Engineer. Remove such driveways and/or sidewalks to a distance of 8 inches behind curbs, or to greater distance if required to properly match the new curb and gutter grade. Remove along the neat line produced by a concrete saw cut. Make cuts to a depth of the thickness of the driveway and/or sidewalk or to a maximum depth of 6 inches, whichever is lesser, and take care in removing the concrete assuring the slab breaks on the sawed neat line.

PART 4 - MEASUREMENT AND PAYMENT

4.1 ASPHALTIC CONCRETE PAVEMENT REMOVAL

- A. Removal and disposal of asphalt concrete pavement is part of Section 2230, Street Excavation, Backfill and Compaction. No separate payment will be made for this item.

4.2 CONCRETE REMOVAL

- A. All concrete required to be removed shall be measured by the lineal foot, square yard, or cubic yard as described by the contract documents.
- B. Concrete removal and disposal shall be paid for at the contract unit price bid, constituting full compensation for all equipment, tools and labor, including the performance of all work to provide incidentals necessary to complete this item.
- C. Measurement and payment for concrete removal and disposal will be made only if listed as a separate pay item in the contract documents. If not listed separately in the contract as a bid item, concrete removal and disposal will be included as part of Section 2230, Street Excavation, Backfilling and Compaction.
- D. Payment will be made under one of the following if identified in the contract documents:
 - 1. Concrete Removal – Per Lineal Foot
 - 2. Concrete Removal – Per Square Yard
 - 3. Concrete Removal – Per Cubic Yard

4.3 CONCRETE SAW CUT

- A. For those projects where concrete saw cutting is a substantial item of work, this item may be measured and paid for at the contract unit price bid per lineal foot, constituting full compensation for all equipment, tools and labor, including the performance of all work to provide incidentals necessary to complete this item.
- B. Payment will be made under the following:
 - 1. Saw Cut for Concrete Pavement, Sidewalk, Driveway, and Curb and Gutter – Per Lineal Foot.
- C. Measurement and payment for concrete saw cuttings will be made only if listed as a separate item in the bid documents. If not listed in the contract as a bid item, saw cutting shall be part of the Concrete Removal in Section 4.2 above, or part of the Excavation Above Subgrade item in Section 2230, Street Excavation, Backfill and Compaction, Excavation. Concrete saw cut work will not be paid in the event that there is an existing joint within the concrete that provide a means of tying to concrete or asphalt resulting in the same or comparable end product.

4.4 GENERAL

- A. Payment indicated to include complete compensation for all labor, equipment, materials and incidentals required for the completion of the work.

END OF SECTION

SECTION 02113

ADJUSTING EXISTING MANHOLES, INLETS, WATER VALVE BOXES, WATER SERVICES, UTILITY VAULTS, AND FIRE HYDRANTS TO GRADE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section consists of locating and adjusting to grade existing manholes, inlets, water valve boxes or services, utility vaults or accesses, and fire hydrants as shown in the contract documents, staked in the field or as required in the Special Provisions.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide all materials including concrete, brick and mortar, complying with the specification section for the particular material involved, or if the material is not covered in these specifications, the material used for adjusting shall be equal, and comparable to that in the existing structure. If extensions for water valve boxes or services and fire hydrants are required beyond the length found to exist, provide items comparable to those in the existing structure.

PART 3 - EXECUTION

3.1 GENERAL

- A. Bring to required grade all existing manholes, inlets and water valve boxes by either lowering or raising in accordance with the details shown in the contract documents. Do not lower manholes or inlets by removal of portions of the cones or barrel sections. Accomplish downward adjustments by replacement of existing sections with shorter sections. Assure that all structures have a minimum of one 2-inch concrete adjusting ring and a maximum of 12 inches of rings under the casting. Do not use brick and/or mortar for adjustment of castings.
- B. On manholes requiring steps, assure that maximum spacing between steps is 16 inches and that 10 inches is the maximum distance from the top of the manhole cone section to the first step.
- C. Excavate water valve boxes and services to readily determine whether height adjustment can be made without substituting a longer section. Adjust water valve boxes and services laterally so the valve stems can be operated by the extension. Adjust water services by raising or lowering the curb key stop and extension box.
- D. Adjust manholes and water valve boxes to final grade before placing the final pavement surface. If required, make preliminary adjustment to allow placement of base courses and paving adjacent to the manhole or water valve.

- E. Provide backfill material conforming to the requirements of Section 02235, 1 inch Minus Crushed Base Course, and compacted to at least 97% percent of the maximum dry density as determined by AASHTO T99 or ASTM D698.
- F. If required, make minor adjustments 5 feet to 10 feet in the horizontal location of existing fire hydrants to ensure that they are the required minimum distance behind the back of curb. At the time of construction staking, any hydrants which require horizontal adjustment will be located by the Engineer and the adjusted location will be staked by the Engineer.
- G. Make any minor adjustments required as dimensioned in the contract documents to the height of existing fire hydrants to ensure that they are at a reasonable height above the back of curb. At the time of construction staking, any hydrants which require vertical adjustment will be located by the Engineer and the adjusted height will be staked by the Engineer. Accomplish extension of fire hydrant height only by the use of standard extension spools provided by the hydrant manufacturer.
- H. Before final acceptance, clean all manholes, inlets and water valve boxes/services. Assure that all water valve boxes, services and fire hydrants are operational.
- I. All requirements of this section shall apply to new, as well as to existing, manholes, valve boxes, water services and fire hydrants.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Payment indicated to include complete compensation for all labor, equipment, materials and incidentals required for the completion of the work.

4.2 ADJUSTING EXISTING MANHOLES, LAMPHOLES, INLETS, WATER VALVE BOXES AND WATER SERVICES

- A. These items are measured and paid for by the number of existing facilities adjusted, complete in place, at contract unit price bid for the item, constituting full compensation for all necessary materials, excavation, backfill, compaction, cleaning, labor, tools and incidentals.
- B. Payment will be made under:
 - 1. Existing Sewer Manholes to Adjust - Per Each
 - 2. Existing Sewer Lampholes to Adjust - Per Each
 - 3. Existing Storm Drain Inlets to Adjust - Per Each
 - 4. Existing Water Valve Boxes to Adjust - Per Each
 - 5. Existing Water Services to Adjust - Per Each

6. Existing Utility Service/Access/Vault/Box to Adjust – Per Each

4.3 LOCATION ADJUSTMENT FOR EXISTING FIRE HYDRANTS

- A. This item is measured and paid for by the number of existing fire hydrants adjusted horizontally, complete in place, at the contract unit price bid for “Horizontal Adjustment for Existing Fire Hydrants”, constituting full compensation for all material, excavation, backfill, compaction, labor, tools and incidentals.
- B. Payment will be made under:
 - 1. Horizontal Adjustment for Existing Fire Hydrant - Per Each

4.4 VERTICAL ADJUSTMENTS FOR EXISTING FIRE HYDRANTS

- A. This item shall be measured and paid for by the vertical adjustment of existing fire hydrants, complete in place, as measured in the field to the nearest one-half foot, at the contract unit price bid for “Vertical Adjustment for Existing Fire Hydrants”, materials, including any additional stem length, excavation, backfill, compaction, concrete, labor, tools and incidentals.
- B. Payment will be made under:
 - 1. Vertical Adjustment of Existing Fire Hydrant - Per Vertical Foot

END OF SECTION

**SECTION 02114
RELOCATING OR REMOVING UTILITY POLES, SIGNS AND
MAILBOXES**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This item consists of relocating or removing existing streetlights, signs, power poles, telephone poles, and mailboxes, as shown in the contract documents.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 POWER, STREET LIGHT, AND TELEPHONE POLES

- A. Affected utility companies are to move power, streetlight, and telephone poles unless they are designated in the contract documents to be removed or relocated by the CONTRACTOR. If a utility company is non-responsive, notify ENGINEER. Coordinate all utility relocation activity with the construction activity.
- B. When relocating or removing power poles, street light poles, and telephone poles, comply with the contract documents' applicable requirements.

3.2 STREET, TRAFFIC CONTROL, AND ADA SIGNS

- A. Remove and reinstall all street, stop, and other traffic control/direction signs designated to be relocated by the CONTRACTOR as shown in the contract documents or as designated by the ENGINEER. Include removing, temporarily installing, storing, and permanently installing the signs.
- B. The locations shown in the contract documents for streetlights, street signs, power poles, telephone poles, and private mailboxes to be relocated are approximate. The specific locations are to be designated by the ENGINEER in the field.
- C. Relocate all signs within the staked grading limits whose existing locations do not conform to final plan locations. Also, relocate signs outside the staked grading limits to conform to final plan locations.
- D. Preserve all street, stop, ADA, and other traffic control and direction signs that are to remain in place. Should any such signs be moved for the CONTRACTOR's convenience, permanently reinstall the signs after curb and gutter construction is complete. Assume responsibility for any damage to such signs. No extra compensation will be allowed for preserving, removing, or replacing stop and traffic control and direction signs designated to remain in place since this work is considered incidental to the contract unit prices for the various items of the contract.
- E. Where stop signs and traffic direction or control signs are temporarily removed but are

needed for traffic reasons during construction, temporarily install a similar stop sign or traffic direction sign in locations acceptable to the ENGINEER. Assure that the temporary signs remain in place until the permanent stop or traffic control signs are in place.

- F. Do not install street signs temporarily.
- G. Store signs which are not used for temporary installation.
- H. Set all permanent signs in fresh concrete, the pole supporting the sign being vertical, and the bottom of the sign being 7'-0" above the top of the curb or sidewalk. Replace all signs which are damaged during removal with new signs.
- I. Assure that all sign locations conform to the latest issue of the Manual on Uniform Traffic Control Devices and MSU Standards.

3.3 MAILBOXES

- A. Mailboxes within the staked grading limits generally are not shown in the contract documents. Mailboxes are not to be removed in this project. Any Mailbox damaged or reset will be replaced and installed at CONTRACTOR expense. Within 48 hours following the damage or removal, reinstall the mailboxes behind the curb in accordance with current U.S. Post Office regulations and applicable City standards.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Measurement and payment for the following items are made only if listed as separate pay items in the contract documents. If not so listed separately, these items will not be paid separately but are to be included as incidental to the other pay items of the contract documents.

4.2 POWER, STREET LIGHT, AND TELEPHONE POLES

- A. Reinstall all power, street light, and telephone poles removed for the Contractor's convenience at no cost.
- B. Power, street light, and telephone poles designated for relocation or removal shall be measured and paid for by the number of poles relocated or removed at the unit price bid for "Existing Power, Light, and Telephone Poles to be Relocated" or "Existing Power, Light and Telephone Poles to be Removed," which price and payment constitute full compensation for all materials, excavation, temporary and/or permanent installation, forming and curing of concrete, equipment, tools, labor, and incidentals necessary to complete this item.
- C. Payment will be made under:
 - 1. Existing Power, Light, and Telephone Poles to be Relocated - Per Each.

2. Existing Power, Light, and Telephone Poles to be Removed - Per Each.

4.3 STREET, TRAFFIC CONTROL, AND ADA SIGNS

- A. Reinstall all street, stop, ADA, and traffic control or direction signs removed for the Contractor's convenience at no cost.
- B. Street, stop, ADA, and traffic control or direction signs designated for relocation or removal shall be measured and paid for by the number of street, stop, and traffic control or direction signs relocated or removed at the unit price bid for "Existing Signs to be Relocated" or "Existing Signs to be Removed," which price and payment constitute full compensation for all materials, excavation, temporary and/or permanent installation, forming and curing of concrete, equipment, tools, labor, and incidentals necessary to complete the item. If two or more signs exist on one post, they are defined as one sign for payment purposes.
- C. Payment will be made under:
 1. Existing Signs to be Relocated - Per Each.
 2. Existing Signs to be Removed - Per Each.

4.4 MAILBOXES

- A. Reinstall existing mailboxes removed for the Contractor's convenience at no cost.
- B. Mailboxes designated for relocation shall be measured and paid for by the number of mailboxes relocated at the unit price bid for "Existing Mailboxes to be Relocated," which price and payment constitute full compensation for all materials, excavation, temporary and/or permanent installation, forming and curing of concrete, equipment, tools, labor, and incidentals necessary to complete the item.
- C. Payment will be made under:
 1. Existing Mailboxes to be Relocated - Per Each.

4.5 GENERAL

- A. Payment indicated to include complete compensation for all labor, equipment, materials, and incidentals required for the completion of the work.

END OF SECTION

SECTION 02221
TRENCH EXCAVATION AND BACKFILL FOR PIPELINES & APPURTENANT STRUCTURES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This work is the excavation, trenching, and backfilling for pipelines and appurtenances. It includes all clearing, grubbing, site preparation, removal, and disposal of debris from the excavation, handling and storing materials for fill and backfill, all bracing, shoring and trench protection, construction dewatering, all backfill, subgrade preparation, final grading, site dressing, and cleanup.

1.2 REFERENCES

- A. The current publications listed below form a part of this specification.

AASHTO T99	Moisture-Density Relations of Soils Using 5-lb (2.5kg) Rammer and 12- inch (305mm) Drop
ASTM D698	Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³)(600 kn-m/m ³)
AASHTO T191 (ASTM D1556)	Density of Soil In-Place by the Sand-Cone Method
AASHTO T310 aggregate (ASTM D6938)	In-Place density and water content of the soil and soil by Nuclear Method (Shallow Depth)
AASHTO T11 (ASTM C117)	Materials Finer Than 0.075mm (No. 200) Sieve in Mineral Aggregates by Washing
AASHTO T27 (ASTM C136)	Sieve Analysis of Fine and Coarse Aggregate
AASHTO T89	Determining the Liquid Limit of Soils
AASHTO T90	Determining the Plastic Limit and Plasticity Index of Soils
ASTM D4318	Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4253 Vibratory Tube	Maximum Index Density and Unit Weight of Soils Using a
ASTM D4254 of	Minimum Index Density and Unit Weight of Soils and Calculation Relative Density

1.3 TESTING

A. Field Density Testing

1. Meet the quality control and quality assurance testing requirements in Section 014000, QUALITY REQUIREMENTS.
2. In-place field density tests for quality assurance are at Owner expense meeting AASHTO T191 (ASTM D1556), Sand Cone Method; or by AASHTO T310 (ASTM D6938) Nuclear Densometer Methods. Quality assurance field density testing frequency is at the ENGINEER's discretion.
3. Retesting failing areas is at the expense of the CONTRACTOR. Where ENGINEER provides testing on behalf of the Owner, the CONTRACTOR will be assessed the cost of all retests conducted by the ENGINEER, with that cost deducted from the progress payments.
4. At the direction of the ENGINEER, provide the necessary equipment and labor to excavate and replace materials for test holes up to 5 feet deep into the compacted backfill to allow testing below the surface of any layers covered without inspection and approval by the ENGINEER.

B. Laboratory Maximum Density and Optimum Moisture

1. Quality assurance tests will be made by the ENGINEER for each on-site natural soil or each source of off-site material, including borrow material, to determine the laboratory maximum density values and optimum compaction moisture content according to AASHTO T-99 or ASTM D698.

C. Material Submittals

1. Submit to the ENGINEER material quality test results, including Type 1 Bedding gradation and plasticity index, and Type 2 Bedding gradation.
2. Submit to the ENGINEER laboratory moisture-density relationship testing results of on-site and off-site borrow soils.

PART 2 - PRODUCTS

2.1 PIPE BEDDING MATERIALS

A. Type 1 Pipe Bedding

1. Type 1 Pipe Bedding includes the material placed from 4 inches below the bottom of the pipe to 6 inches over the pipe.
2. Provide Type 1 Bedding consisting of crushed stone or gravel, which is free of cementitious substances or thin, flat particles in an amount that would cause the material to cake, pack, or otherwise form and unyielding support for the pipe.

3. Provide imported granular material with a gradation as follows and a maximum plasticity index of 6, determined by AASHTO T89 and T90 or by ASTM D4318.

Percent by Weight Passing	
Sieve Size	% Passing
1" (25 mm)	100
3/4" (19.0 mm)	90 - 100
3/8" (9.5 mm) No.	20 - 55
4 (4.75 mm) No.	5 - 10
8 (2.36 mm)	0 - 5

4. Crush material so that the percentage of fractured particles in the finished product is as constant and uniform as practical. Crush to produce material where at least 50 percent of the material retained on the No. 4 sieve has at least one fractured face.
5. To prevent migration of material from around the pipe, do not use sand, sandy gravel, or material composed mainly of sand for bedding material in the pipe zone where groundwater is or will be present or where existing material contains voids which would allow migration. Where trench excavation encounters wet or unstable material, Type 1 Pipe Bedding must be well graded, free- draining, and non-plastic.
6. Refer to the Special Provisions and details in the Drawings for other requirements.

B. Type 2 Pipe Bedding

1. Type 2 Pipe Bedding is used as directed by the ENGINEER to replace unsuitable material encountered in the trench bottom.
2. Place Type 2 Pipe Bedding from the bottom of the Type 1 Bedding material to the depth required to adequately support the pipe.
3. Type 2 Bedding consists of granular material meeting the following gradation and having a maximum plasticity index of 6 and a maximum liquid limit of 25%.

Percent by Weight Passing	
Sieve Size	Type B-Modified
3" (75 mm)	100
No. 4 (4.75 mm)	0 - 25
No. 8 (2.36 mm)	0 - 10

C. Separation Geotextile

1. The plans may require, or the ENGINEER may direct, the use of non-woven geotextile fabric intended to provide materials separation. The fabric will wrap all or part of the Type 1 Pipe Bedding and Select Type 1 Pipe Bedding to prevent materials migrating into the trench bottom and trench walls as shown on the plans or as directed by the ENGINEER. The fabric shall be AASHTO M288 Class 1, 2, or 3 as specified or determined by the ENGINEER and shall fully comply with MPW Section 2110.

2.2 TRENCH BACKFILL MATERIALS

A. Materials from Trench Excavation

1. Backfill material obtained from trench excavations must be free of cinders, ash, refuse, organic or frozen material, boulders, or other deleterious materials. Backfill materials and placement are further described in the Execution Section of this specification.

B. Imported Backfill Material

1. Imported backfill material is from borrow source(s) outside the project limits and is used when, in the opinion of the ENGINEER, an adequate volume of suitable backfill material is not available within the project limits. Imported Backfill Materials must comply with the requirements of Section 2.2.A, MATERIALS FROM TRENCH EXCAVATION.

2.3 FLOWABLE FILL

- ### **A. Flowable fill will not be used.**

2.4 DETECTABLE BURIED WARNING TAPE

- ### **A. Detectable buried warning tape is to have a minimum 6-inch width and 5-mil thickness and a solid aluminum core running the full length and width of the tape enclosed in a color-coded inert plastic jacket, impervious to alkalis, chemical reagents and solvents in the soil. The tape is to meet APWA/ULCC Color Code requirements and is to have a maximum 36-inch imprint.**

PART 3 - EXECUTION

3.1 PROTECTION OF EXISTING PROPERTIES

A. General

1. Take precautions to protect all adjoining private and public property and facilities, including underground and overhead utilities, curbs, sidewalks, driveways, structures, and fences. Restore or replace all disturbed or damaged facilities to its original condition at the CONTRACTOR's expense.
2. Contact utility owners using the Montana One Call System for utility locates

before starting work. Protect the utilities exposed during the work and prevent damaging underground utilities adjacent to excavations. Immediately notify the utility owner of any construction damage. Repairs of damage to marked utilities are at the expense of the CONTRACTOR.

3. Re-locate existing water mains, sanitary sewers, and storm drains shown on the plans that conflict with new pipelines or structures, as indicated in the contract documents. No separate payment will be made for this work unless shown as a payment item. If the Owner authorizes the relocation of mains or sewers, which are not indicated in the bid documents, and the ENGINEER determines the work was not included in the original contract, payment will be made under the applicable sections of the General Conditions.
4. Cut and replace existing service lines interfering with trenching operations only with the ENGINEER's permission and at the CONTRACTOR's expense.
5. Show all repaired and/or adjusted water and sewer lines on the As-Built Plans.
6. Protect existing water and sewer mains and water and sewer services from freezing at all times during construction.

B. Privately Owned Utilities

1. If any existing private utility interferes with the work in either alignment or grade and has to be moved, the work will be performed by the appropriate Utility Owner unless otherwise specified in the contract documents. Such private utilities may include gas mains, underground electrical and telephone cables, telephone poles, light poles, etc.
2. If, however, such private utility relocation is performed by the CONTRACTOR, and the relocation is not a separate payment item, payment will be made under Section 02221 conditions covering such changes.
3. Such payment will be made only if the work is determined by the ENGINEER to be a change from the original contract work scope.

C. Existing Structures

D. Prevent damage to existing buildings or structures in the work area. Repair all construction related damage to the satisfaction of the Owner Existing Overhead Utilities

1. Use extreme caution to avoid conflict, contact, or damage to overhead utilities during the work.

E. Exploratory Excavation

1. The location of existing buried public utilities may need to be verified by exploratory excavation before construction.

2. Where authorized by the ENGINEER, the CONTRACTOR will be reimbursed for exploratory excavation work at the unit price bid per hour for a backhoe/excavator with an operator and a laborer to assist. Use a backhoe/excavator having at least 60 horsepower, as rated by the manufacturer.
3. The unit price per hour includes the backhoe/excavator, operator, and one laborer based upon the actual time, to the nearest one-half hour, that the equipment and personnel are used in actual excavating and backfilling operations, including standby time between excavation and backfilling, which allows the ENGINEER to make the necessary survey of the underground utilities.
4. Exercise care to prevent damaging all utilities and repair any utility damage caused by exploratory excavation.

F. Pavement Removal and Stripping

1. Where trench excavation or appurtenant structure excavation requires removing curb and gutter, concrete sidewalks, asphalt concrete pavement, or Portland cement concrete pavement, cut the concrete or pavement in a straight line parallel to the excavation's edge using a spade-bitted air hammer, concrete saw or other suitable equipment to produce a straight, square and clean break. Re-cut edges broken during construction, before concrete or paving operations.
2. For trenches passing through the existing pavement, cut the pavement along a neat vertical line at least 12 inches from the trench edge. Where the neat line cut is less than 3 feet from the edge of the existing pavement, remove and replace the entire pavement section between the trench and edge of the pavement.
3. Dispose of the asphalt concrete and/or Portland cement concrete debris off-site according to applicable state and local regulations.

G. When excavating across existing gravel streets or other developed surfaces, remove the surfacing material full depth and stockpile for inclusion in the trench backfill or legally dispose of the surfacing material.

H. When excavating across cultivated or sodded areas, remove full topsoil depth or a maximum 12-inch depth, whichever is less, and stockpile for possible project use.

I. Re-sod or reseed all established lawn areas cut by trenching or damaged during the construction.

3.2 MAINTENANCE OF FLOWS

A. Maintain the flow of sewers, drains, and watercourses encountered during construction. Restore culverts, ditches, fences, crosswalks, and structures disturbed by construction to their original condition upon completion of the work.

3.3 TRENCH EXCAVATION

A. General

1. Meet current OSHA Safety and Health Standards for all excavation, trenching, shoring, and related work.
2. Excavate at the specified locations for pipeline installations and appurtenant structures.
3. Crossings under sidewalks or curbs may be made by tunneling if approved by the ENGINEER. If a portion of a sidewalk or curb is removed, use a concrete saw to make joints, compact the backfill as specified, and replace the removed Section with a new concrete sidewalk or curb.
4. During excavation, stockpile backfill materials away from the trench banks to assure trench wall stability. Stockpile excavated materials on only one side of the trench without obstructing existing fire hydrants, valves, manholes, and other appurtenances. Assure surface drainage of adjoining areas is unobstructed.
5. Remove and dispose of all excess or unsuitable excavated materials.
6. Prevent surface water from flowing into excavations. Promptly remove all water accumulating in trench excavations. Do not permit water to accumulate in any open trench. Remove and re-lay all pipe out of alignment or grade caused by trench flooding.
7. Grade the trench bottoms to the specified lines and grades. Assure bedding material provides uniform bearing and support for each pipe section along its entire length. Excavate for bell and joints after the trench bedding is graded, limiting the excavation to the required length, depth, and width for making the particular type of joint used. Backfill over-excavations with Type 2 Bedding Material.
8. No classification of trench excavated materials will be made. Excavation and trenching work includes the removal and subsequent handling of all earth, loose or cemented gravel, loose or solid rock, and other materials excavated or otherwise removed in the performance of the contract work, regardless of the type, character, composition, or condition thereof. All materials excavated or otherwise removed, including asphalt, curb, gutter, sidewalk, soils, etc., will become the property of the CONTRACTOR, who will be responsible for environmentally sound disposal of said material in accordance with state and federal regulations.
9. The use of trench digging machinery is permitted, except in places where its operation is likely to cause damage to existing structures or features, in which case hand methods are to be employed.

B. Trench Dimensions

1. Excavate to the trench dimensions specified below.
2. Width
 - a. Excavate to provide room to install and join the pipe as specified. The minimum trench width is 3'-6", for outside pipe diameters of 18 inches or less. The minimum trench width is 2'-0" plus the outside pipe diameter, for pipe sizes exceeding 18 inches. Maximum trench width may be specified in the contract documents.
 - b. If the trench is excavated wider than the specified minimum, provide Type 1 Pipe Bedding for the additional width to yield a consistent backfill for the entire width of the trench or take such other measures as the ENGINEER may direct to protect the pipe against the crushing forces of trench backfill at the CONTRACTOR's expense.
3. Depth
 - a. Excavate the trench as required for the invert grade or pipe bury as specified in the contract documents, plus 4 inches for the Type 1 Pipe Bedding. If bedrock, boulders, or large stones are encountered at the bottom of the trench, excavate at least 6 inches below the bottom of the pipe for backfilling with Type 1 Pipe Bedding.

C. Soft or Unsuitable Trench Subgrade

1. When soft or unstable material is encountered at the trench subgrade, which will not uniformly support the pipe, excavate the material to the depth directed by the ENGINEER and backfill to trench subgrade elevation with Type 2 Pipe Bedding.

D. Blasting

1. Not approved for this project.

E. Pavement Damage Cause by Equipment

1. Equip all track-mounted equipment operated on pavement surfacing with pads to prevent pavement damage.
2. Remove and replace all pavement damaged during construction by the CONTRACTOR's equipment, or the use thereof, to at least a depth of 1 inch. Patches will not be allowed less than 1 inch in thickness.
3. Replace all asphalt pavement damaged during construction outside of restoration pay limits in conjunction with asphalt restoration and as otherwise required by the ENGINEER. Provide asphalt meeting the requirements of Section 02510: Asphalt Concrete Pavement, and place asphalt to produce a final surface uniform in texture and consistent with the line and grade of

adjacent pavement or as directed by ENGINEER. No compensation will be allowed for removal and replacement of damaged pavement outside of the pay limits for asphalt restoration.

4. Assure work and materials for pavement restoration is in accordance with Section 02510: Asphalt Concrete Pavement.

F. Shoring, Bracing, and Sheeting

1. Provide all shoring, bracing, and tight sheeting required to prevent caving and protect workers, meeting current Occupational Safety and Health Act Requirements, and to protect adjacent property and structures. The cost of this work is included in the price of trench excavation.

G. Excavation for Appurtenances

1. Make excavations for manholes, hydrants, structures, and other appurtenances of the size and depth to permit compacting of backfill on all sides to the specified density. The requirements for removing water and other applicable portions of these specifications apply to excavation for appurtenances.

3.4 DEWATERING

A. General

1. Furnish all necessary labor, equipment, and incidentals necessary to dewater the project site during construction.
2. Keep all excavation dry and free from water during construction and the placement of materials. Do not place pipe, bedding, or backfill materials below the groundwater elevation established by dewatering operations. Do not allow groundwater or stormwater to enter or flow through the underground piping during installation.
3. The cost of dewatering operations will be incidental to the cost of pipeline and appurtenance installation, and no additional payment will be made for dewatering. Consider shifts in the groundwater level caused by changing seasons or local conditions in estimating the cost of dewatering operations, as no additional payments will be made for fluctuating groundwater levels.
4. Protect all structures that could be potentially impacted by dewatering operations. Repair any damage to structures caused as a result of dewatering at CONTRACTOR's expense.

B. Discharge

1. Do not discharge or dispose of water from dewatering operations in such a manner as to flood existing landscaped areas, graveled areas, or structures

unless approved by ENGINEER. Written permission from the appropriate landowner shall also be required for discharge or disposal on private property.

2. It is the CONTRACTOR's responsibility to comply with requirements and regulations of federal, state, and local agencies that govern areas affected by dewatering of the construction site and application for and maintenance of any required permits.

3.5 EXCAVATION STABILITY AND SAFETY

- A. The stability of construction excavations and associated worker safety, including slope geometry and shoring/bracing considerations, are the CONTRACTOR's responsibility. Meet current OSHA regulations. This may require the design of temporary slopes and/or shoring by a licensed professional ENGINEER.

3.6 TRENCH FILLING AND BACKFILLING

- A. General
 1. Backfill all trenches as specified immediately after grade, alignment, and pipe jointing has been inspected and approved by the ENGINEER. Conduct any pipe testing as specified in the respective water distribution, sewerage/drainage sections. Correct all defects discovered by tests prior to backfilling.
 2. Storage of all imported backfill materials, including protecting said materials from adverse conditions that would disqualify them from use under these specifications, is the responsibility of the CONTRACTOR.
- B. Pipe Bedding Placement
 1. Type 1 Bedding
 - a. Place Type 1 Pipe Bedding material 4 inches under, around the pipe, and to a point 6 inches above the top of the pipe in 6-inch lifts, using hand or other compaction methods without damaging or disturbing the pipe including mains and service lines and all appurtenances.
 - b. Place bedding material in equal lifts on both sides of the pipe for the full trench width. Thoroughly compact each lift of pipe bedding by tamping, vibration, slicing with a shovel, rodding, or by a combination of these methods. Take special care to assure complete compaction under the haunches of the pipe.
 2. Type 2 Pipe Bedding
 - a. Use Type 2 Pipe Bedding described in PRODUCTS SECTION as specified or as directed by the ENGINEER to replace unsuitable material encountered in the trench bottom, placing it from the bottom of the Type 1

Bedding material to the depth required to adequately support the pipe.

3. Separation Geotextile

- a. Place Separation Geotextile where shown on the plans or where directed by the ENGINEER.

C. Trench Backfill

1. After the pipe bedding materials are placed and compacted as specified, backfill the trench.
 - a. Use backfill material free of cinders, ash, refuse, organic or frozen material, boulders, or other deleterious material.
 - b. From the top of the Type 1 Bedding to 6 inches below the ground surface, or the subgrade elevation, material containing stone up to 8 inches in the greatest dimension may be used.
 - c. Cost of screening, drying, or moistening excavated backfill to comply with specifications will be considered incidental to the CONTRACTOR's bid price per linear foot of pipe and service lines and unit prices for appurtenances, and no additional payment will be made for such work.
2. Trench backfill from the top of the pipe bedding to ground surface or to the street subgrade is separated into three classifications.
 - a. Type A Trench Backfill is compacted backfill typically used in streets or paved areas.
 - b. Type B Trench Backfill is typically used for unpaved alleys, cultivated areas, borrow pits, unimproved streets or other un-surfaced areas, and other areas where compaction is less critical.
 - c. Type C Trench Backfill is typically used in open and unimproved areas outside of the public right-of-way.
3. Meet the backfill and compaction requirements for all of the backfill types described in the contract documents.
4. Watering
 - a. Apply uncontaminated water, when required, at the locations and in the amounts required to compact the backfill material to the specified requirements. Maintain an adequate water supply during the work. Assure the equipment used for watering is of the capacity and design to provide uniform water application.

- b. Apply water during the work to control dust and to maintain all embankment and base courses in a damp condition in accordance with these contract documents.
 - c. Water required for compacting trench backfill may be obtained from the municipal system if approved by the Owner or from other sources.
5. Remove, replace, and re-compact backfill in trenches where settlement has occurred as directed by the ENGINEER at the CONTRACTOR's expense.
6. Trench backfill types are designated as follows:
- a. Type A Trench Backfill. Place trench backfill in maximum 8 inch compacted lifts within 3% of optimum moisture content and compact to at least 95% of maximum dry density determined by AASHTO T99 or by ASTM D698. For materials that do not exhibit a typical well-defined moisture-density curve, compact backfill to 70% relative density as determined by ASTM D4253 and D4254.
 - b. Type B Trench Backfill. Place trench backfill in maximum 8 inch compacted lifts within 3% of optimum moisture content, and compact to at least 90% of maximum dry density determined by AASHTO T99 or by ASTM D698. For materials that do not exhibit a typical well-defined moisture-density curve, compact backfill to 50% relative density as determined by ASTM D4253 and D4254.
 - c. Type C Trench Backfill. Place and compact Type C Trench Backfill in maximum 12-inch lifts at densities equal to or greater than the densities of adjoining undisturbed soil. Mound earth over the trench top, if directed by the ENGINEER. In cultivated areas, place stripped topsoil uniformly over the backfilled trench to the original depth. Do not compact the topsoil, but grade to provide a smooth surface conforming to the adjoining ground surfaces.

D. Replacement of Unsuitable Backfill Material

- 1. Remove and dispose of excavated soils that are saturated, contain deleterious materials, or have characteristics that, in the opinion of the ENGINEER, render the soils unsuitable as backfill and/or which cannot be readily conditioned or dried to be made suitable.
- 2. Replace unsuitable soils with material obtained from trench excavations within the project limits at the expense of the CONTRACTOR.
- 3. If suitable replacement material is not available within project limits, notify the ENGINEER. The ENGINEER will quantify the extent of any unsuitable soils to be removed and replaced with material from an approved source, to be paid for as

Imported Backfill Material, and provide written notification of the approved quantities to the CONTRACTOR. Payment for Imported Backfill Material will not be approved if the CONTRACTOR fails to notify the ENGINEER and/or proceeds with removal and disposal of unsuitable material prior to receiving written notice from the ENGINEER.

4. Provide imported backfill material with a gradation as follows and a maximum plasticity index of 10, determined by AASHTO T89 and T90 or by ASTM D4318. Imported backfill may not contain rock measuring greater than 6 inches in the greatest dimension.

Percent by Weight Passing	
Sieve Size	% Passing
1"	70 -100
No. 4	40 - 80
No. 10	25 - 60
No. 200	2 - 35

5. Place and compact all imported material according to the applicable backfill specification requirements.

E. Backfill of Appurtenances

1. Place and compact backfill for appurtenances to finished grade around manholes, inlets, valve boxes, and other underground items without disturbing appurtenance alignments.
2. Meet the backfill material, placement, and compaction requirements specified for the adjoining trench.

F. Detectable Buried Warning Tape

1. Provide warning tape, as described in this Section. Bury tape a minimum of 6 inches and a maximum of 12 inches below finish surface grade.

3.7 SURVEY MARKERS AND MONUMENTS

- A. Protect all survey markers and monuments. Protection includes marking with flagged high lath and supervising work near markers and monuments. Do not disturb monuments without prior approval from the ENGINEER.
- B. Replace all CONTRACTOR-disturbed or destroyed survey markers or monuments not approved during construction using a licensed land surveyor.

3.8 CLEANUP

- A. As work progresses, remove debris and complete to finish grade each portion of the work. Once the work is complete, clear debris and finish the entire site to smooth, uniform slopes presenting a neat and workmanlike appearance. Remove and dispose of all rocks brought to the surface during excavation or backfilling.
- B. Dispose of vegetation; coarse debris resulting from pavement or sidewalk removal; stones, junk, debris, and other materials encountered in excavation work; and other similar waste materials away from the site of the work at the CONTRACTOR's expense.

3.9 TIME AND DISTANCE OF OPEN TRENCHES

- A. Perform the work so that trenches will remain open the minimum time required to accomplish the work.
- B. Do not begin trench excavating until appropriate compaction equipment is at the excavation site.
- C. The maximum permissible distance between backfilling/compaction operations and the end of newly installed pipe is 100 feet in existing streets (and/or alleys) and 200 feet in all other areas.
- D. The maximum distance between the newly installed pipe and the excavator is to be 100 feet in existing streets (and/or alleys) and 200 feet in all other areas.
- E. For each workgroup consisting of a trench excavator, a pipe laying crew, and a backfilling/compaction crew, the maximum allowable open ditch at any time is 200 feet in existing streets (and/or alleys) and 400 feet in all other areas.
- F. The maximum distance behind the end of the new pipe is 1,500 feet for gravel surfacing replacement, base placement, or pavement replacement.
- G. At the completion of each working day, fill all trenches and/or provide safety netting, Jersey barrier, and other barricades required for public safety.

3.10 DRAINAGE CROSSINGS

- A. Where trenches are constructed in or across roadway ditches or other watercourses, protect the backfill from surface erosion by adequate means. Where the grade of the ditch exceeds 1 percent, prevent erosion by a suitable method approved by the ENGINEER. Backfill trenches in such a manner that water will not accumulate in unfilled or partially filled trenches.
- B. Remove all material deposited in roadway ditches or other water courses crossed by the trench immediately after backfilling is completed and restore the section, grades, and contours of such ditches or watercourses to their original conditions, in order that the surface drainage is obstructed no longer than necessary.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. The following items constitute pay items for the work covered under this Section. Payment for these items is full compensation for providing all materials, tools, labor, and equipment necessary to complete the item and all incidental work related thereto, whether specifically mentioned herein or not.

4.2 TRENCH EXCAVATION AND BACKFILL

- A. No separate measurement and payment are made for TRENCH EXCAVATION AND BACKFILL. Include all costs for this item in the unit price bid for pipe, complete in-place.
- B. The upper limit of the TRENCH EXCAVATION AND BACKFILL item is defined as the top of subgrade. Details of the various types of surface restoration are found in the contract documents.

4.3 TYPE 1 AND SELECT TYPE 1 PIPE BEDDING

- A. Include approved material for Type 1 and Select Type 1 Pipe Bedding in the pipe installation price. No measurement or additional payment is made for furnishing or placing Type 1 and Select Type 1 Pipe Bedding materials.

4.4 TYPE 2 BEDDING

- A. Approved material for Type 2 Pipe Bedding to replace soft or unsuitable material is measured in cubic yards of material furnished, in-place, for the depth directed.
- B. Payment for Type 2 Pipe Bedding is made at the contract unit price bid per cubic yard, which includes furnishing, placing, and compacting the Type 2 Bedding material as specified and all other work necessary or incidental for completion of the item.
- C. Payment quantity is based upon an excavation width of 2.0 feet plus the outside pipe diameter with a minimum payment width of 3.5 feet.
- D. If Type 2 Bedding is placed without the Engineer's authorization, the Type 2 Bedding is a construction expedient solely for the Contractor's convenience, and no payment for Type 2 Bedding is made.
- E. Payment will be made under: Type 2 Pipe Bedding - Per Cubic Yard.

4.5 IMPORTED BACKFILL MATERIAL

- A. When satisfactory backfill material is not available within the project limits, backfill material imported from borrow sources outside the limits of the project site are measured in cubic yards of material furnished, in place (compacted), for the depth directed by the Engineer.
- B. The trench width for measurement and payment is 2.0 feet plus the outside pipe

diameter, with a minimum payment width of 3.5 feet, measured between vertical planes for the depth required.

- C. Payment for imported backfill material is made at the contract unit price bid per cubic yard, which includes furnishing, placing, and compacting the backfill material as specified and all other work necessary or incidental for completion of the item.
- D. No separate measurement and payment is made for this item when, in the Engineer's opinion, suitable surplus material is available within the project limits, in which case all costs for this item are to be included in the unit price bid for pipe, complete in-place.
- E. Payment for Imported Backfill will be made only if the Engineer determines surplus material is not available within the project limits.
- F. Payment is made under: Imported Backfill Material -Per Cubic Yard.

4.6 EXPLORATORY EXCAVATION

- A. Measurement of this item is made for the actual time, to the nearest one-half hour, for which the equipment and personnel are used and authorized by the Engineer for actual exploratory excavation and backfilling operations, including standby time between excavation and backfilling, to allow the Engineer to survey the underground utility.
- B. Payment is made at the contract unit price bid per hour, which includes providing the equipment on-site, with operator and fuel. Where exploratory excavation is outside of planned excavation limits, payment also includes any time required for compaction of the backfill, if necessary.
- C. Surfacing repair will be paid separately if required.
- D. Payment will be made under Exploratory Excavation - Per Hour.

4.7 GEOTEXTILE FABRIC

- A. Measurement and payment for geotextile fabric shall be by the linear foot of the trench.
- B. Payment for this item is full compensation for providing all materials, tools, labor, and equipment necessary to complete the item and all incidental work related thereto, whether specifically mentioned herein or not.

END OF SECTION

SECTION 02234

SUB-BASE COURSE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This work is constructing a sub-base course of either crushed or uncrushed materials meeting the specified gradations and other quality criteria specified herein. In the event that there is any discrepancy between this specification section and the Geotechnical Report within the Project Documents, the Geotechnical Report shall govern.

1.2 REFERENCES

AASHTO T11	Amount of Material Finer Than No. 200 (0.075 mm) Sieve in Aggregate
AASHTO T27	Sieve Analysis of Fine and Coarse Aggregates
AASHTO T89	Determining Liquid Limit of Soils
AASHTO T90	Determining the Plastic Limit and Plasticity Index of Soils
AASHTO T176	Plastic Fines in Graded Aggregates and Soils by the Use of the Sand Equivalent Test
AASHTO T96	Resistance to Degradation of Small-Size Course Aggregate By Abrasion and Impact in the Los Angeles Machine
AASHTO T99 (ASTM D698)	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5-lb (2.5kg) Rammer and 12-Inch (305mm) Drop
ASTM D5821	Determining the percentage of Fractured Particles in Coarse Aggregate
AASHTO T310 (ASTM D6938)	In-Place density and water content of the soil and soil aggregate by Nuclear Method (Shallow Depth)

1.3 DENSITY CONTROL TESTING

- A. Field Density Testing
1. Meet the quality control and quality assurance testing requirements in section 01400, CONTRACTOR Quality Control and Owner Quality Assurance.
 2. In-place field density tests for quality assurance are at Owner expense meeting AASHTO T191 (ASTM D1556) Sand Cone method or AASHTO T310 (ASTM D 6938), Nuclear Densometer method. Quality assurance field density testing frequency is at the discretion of the ENGINEER.

3. Retesting of failing areas is at the expense of the CONTRACTOR.
- B. Laboratory Maximum Density and Optimum Moisture
1. Moisture density curves will be provided by the CONTRACTOR for each base material supplied. These will be provided at the expense of the CONTRACTOR.
- C. Materials Submittals
1. Submit to the ENGINEER gradations, moisture density curves and other preliminary test results for sources to be used for base materials prior to delivery to the site for approval by the ENGINEER. If recycled materials are proposed, CBR test data must be submitted to the ENGINEER to assure consistency with design requirements.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Furnish select sub-base material meeting the applicable aggregate quality and geotechnical recommendations.

2.2 UNCRUSHED SUBBASE

- A. Furnish material consisting of hard, durable stone, gravel or other similar materials mixed or blended with sand, stone dust, recycled concrete and/or asphalt or other binding or filler materials produced from approved sources, providing a uniform mixture meeting these specifications and compacted into a dense and well-bonded subbase. Oversize material of acceptable quality may be crushed and used in the base material, if the blend meets the specified gradations.
- B. Assure the material retained on the No.4 sieve has a wear not exceeding 50% at 500 revolutions as determined by AASHTO T96.

2.3 CRUSHED SUBBASE

- A. Furnish material having both fine and coarse crushed stone or crushed gravel, and/or natural gravel, and when approved, blended with soil, sand, screenings, recycled concrete and/or asphalt or other materials.
- B. Furnish crushed gravel or stone consisting of hard, durable particles, not containing excessive flat, elongated, soft or disintegrated rock, dirt, or other deleterious matter, and having a wear not exceeding 50% at 500 revolutions as determined by AASHTO T96.
- C. Use production methods that produce a percent of fractured rock in the finished product that is constant and uniform. Crush aggregate so that at least 25% of the material is retained on the No.4 sieve and has one or more mechanically fractured

faces.

2.4 GRADATION

- A. Produce material, including any added binder or filler, meeting the following Table of Gradations as determined by AASHTO Methods T11 and T27:

TABLE OF GRADATIONS

PERCENTAGES BY WEIGHT PASSING SQUARE

MESH SIEVES

Passing	4" Minus	3" Minus	2" Minus	1 1/2" Minus	1" Minus
4 Inch	100				
3 Inch	---	100			
2Inch	---	---	100		
1 1/2 Inch	---	---	---	100	
1 Inch	---	---	---	---	100
No.4	25-60	25-60	25-60	25-60	25-70
No.40	10-30	10-30	10-30	10-30	10-30
No.200	2-10	2-10	2-10	2-10	2-10

- B. Up to 5% "oversized" material is permitted provided that the "oversized" material passes the screen size immediately larger than the top size specified. The material between the maximum screen opening and the No.4 sieve shall be reasonably well graded.
- C. Suitability of the aggregate is determined by the gradation testing of material placed in the project as required in the Contract documents, within the allowable limits described by the Table of Gradations for the particular grading specified.
- D. Assure the liquid limit for the aggregate fraction passing a No.40 sieve does not exceed 25, nor the plasticity index exceed 6, as determined by AASHTO T89 and T90.
- E. Crushed leveling base course shall be 3" minus OR one half the thickness of the base course, whichever is less.

2.5 WATERING

- A. Use water from an approved source.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Immediately before placing the base course, blade smooth and shape the underlying

subgrade, subbase or base course to the plan cross-section before the base course is placed on the street. Do not place sub-base course on wet or muddy subgrade or subbase course. Maintain at least 1 completed area of finished and accepted subgrade or sub-base course in advance of placing base course.

3.2 PLACEMENT AND SPREADING

- A. Mix and place the material in maximum 6-inch horizontal layers loose thickness.
- B. Deposit and spread each load of material on the prepared subgrade, or on a completed sub-base course layer continuously without breaks. Assure hauling over the subgrade or over any completed subbase course does not damage the subgrade, sub-base or base course.
- C. Spread using dump boards, spreader boxes, or moving vehicles equipped to distribute the material in a uniform layer or a windrow. Place and spread the material in a uniform layer to the specified depth without causing segregation. Once the base course is spread, blade- mix it the full depth by alternately blading the entire layer to the centerline and back to the roadway edge.
- D. For multiple layers, mix each layer as specified above. Blade smooth and compact each layer before placing the succeeding layer.
- E. Uniformly add water, when required, on site and place in amounts required to compact the material as necessary to aid in densification and to limit segregation. Maintain an adequate water supply during the work. Assure the equipment used for watering is of the capacity and design to provide uniform water application.
- F. Apply water during the work to control dust and to maintain the base course in a damp condition.
- G. Where crushed sub-base is specified, produce a product with at least 25% of the material retained on the No.4 sieve having one or more fractured faces.
- H. Water required for compacting base gravel may be obtained from the municipal system if approved by the Owner, or from other sources.
- I. Compact the material using appropriate tamping equipment or power rollers. Correct all irregularities or depressions that develop under rolling by scarifying the material and adding or removing material, as required, until the surface meets specifications.
- J. Blade and compact alternately, as required to produce the specified surface until final inspection. Tamp the material along curbs, headers, manholes, and similar structures and all places inaccessible to rollers using approved mechanical tampers or hand tampers meet field density requirements.

3.3 FIELD DENSITY REQUIREMENTS

- A. Furnish watering and rolling to obtain a minimum field density of 95% of the maximum dry density determined by AASHTO T99. No separate compensation is allowed for rolling and watering the sub-base course other than the sub-base course bid item or items listed on the Contract documents.

3.4 SURFACE TOLERANCES

- A. Finish the sub-base course so that when tested using a 10-foot straight edge placed on the surface with its center line parallel to the street center, the maximum surface deviation from the straight edge does not exceed ½ inch. Additionally, the finished grade cannot deviate more than 0.1 foot at any point from the staked elevation and the sum of the deviations from two points not more than 30 feet apart cannot exceed 0.1 feet.
- B. Perform all sub-base course corrections to meet the above tolerances using approved methods and materials. Payment for patching aggregate is at the unit price bid for the sub-base course material.

PART 4 - MEASUREMENT AND PAYMENT

4.1 CUBIC YARD BASIS: SUB-BASE COURSE

- A. This item is measured and paid for by the cubic yards of uncrushed or crushed, sub-base course of the specified gradations, complete in place, at the contract unit price bid for _____ " Minus Crushed or Uncrushed Sub-Base Course", which constitutes full compensation for furnishing, loading, hauling, spreading, blending, shaping, watering, and compacting the sub-base course material, and for all tools, labor and incidentals necessary to complete this item.
- B. Payment is made under:
 - 1. _____ " Minus Uncrushed Sub-Base Course - per cubic yard.
 - 2. _____ " Minus Crushed Sub-Base Course - per cubic yard.

4.2 SQUARE YARD BASIS: SUB-BASE COURSE

- A. This item is measured and paid for by the square yard (square meter) of sub-base surface area for furnishing crushed or uncrushed, sub-base course of the thickness and gradations specified, complete in place, at the contract unit price bid for _____ " Thickness of _____ " Minus Crushed or Uncrushed Sub-Base Course", which constitutes full compensation for furnishing, loading, hauling, spreading, shaping, blending, watering and compacting the subbase course material, and for all tools, labor and incidentals necessary to complete this item.
- B. Payment is made under:
 - 1. _____ " Thickness of _____ " Minus Uncrushed Sub-Base Course-per

square yard.

2. _____ " Thickness of _____ " Minus Crushed Sub-Base Course-per square yard.

4.3 LINEAR FOOT BASIS: SUB-BASE COURSE

- A. This item is measured and paid for by the linear feet of trench restored, measured along the trench centerline, with crushed or uncrushed, sub-base course of the gradations specified, complete in place, at the contract unit price bid for _____ " Minus Crushed or Uncrushed Sub-Base Course, which constitutes full compensation for furnishing, loading, hauling, spreading, blending, shaping, watering, and compacting the sub-base course material, and for all tools, labor and incidentals necessary to complete this item.
- B. Payment is made under:
 1. _____ " Minus Uncrushed Sub-Base Course - per linear foot.
 2. _____ " Minus Crushed Sub-Base Course - per linear foot.

END OF SECTION

SECTION 02235

CRUSHED BASE COURSE

PART 1 - GENERAL

1.1 DESCRIPTION

- This work is the placing of one or more base courses composed of crushed gravel, stone or other similar materials meeting the gradation and other quality criteria specified herein. In the event that there is any discrepancy between this specification section and the Geotechnical Report within the Project Documents, the Geotechnical Report shall govern.

1.2 REFERENCES

AASHTO T11	Materials Finer than No. 200 (0.075 mm) Sieve in Aggregate
AASHTO T27	Sieve Analysis of Fine and Coarse Aggregates
AASHTO T89	Determining Liquid Limit of Soils
AASHTO T90	Determining the Plastic Limit and Plasticity Index of Soils
AASHTO T176	Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
AASHTO T96	Resistance to Degradation of Small-Size Coarse Aggregate By Abrasion and Impact in the Los Angeles Machine
AASHTO T99 (ASTM D698)	Moisture-density Relations of Soils and Soil-Aggregate Mixtures Using 5-lb (2.5 kg) Rammer and 12-Inch (305 mm) Drop
ASTM D5821	Determining the Percentage of Fractured Particles in Coarse Aggregate
AASHTO T310 (ASTM D6938)	In-Place density and water content of the soil and soil aggregate by Nuclear Method (Shallow Depth)

1.3 DENSITY CONTROL TESTING

- A. Field Density Testing
 1. Meet the quality control and quality assurance testing requirements in section 01400, CONTRACTOR Quality Control and Owner Quality Assurance.
 2. In-place field density tests for quality assurance are at Owner expense meeting AASHTO T191 (ASTM D1556) Sand Cone method or AASHTO T310 (ASTM D6938) Nuclear Densometer method. Quality assurance field density testing frequency is at the discretion of the ENGINEER.

3. Retesting of failing areas is at the expense of the CONTRACTOR.

B. Laboratory Maximum Density and Optimum Moisture

1. Moisture density curves will be provided by the CONTRACTOR for each base material provided. These will be provided at the expense of the CONTRACTOR.

1.4 MATERIALS SUBMITTALS

A. Submit to the ENGINEER gradations, moisture density curves and other test results for sources to be used for base materials prior to delivery to the site for approval by the ENGINEER. If recycled materials are proposed, CBR test data must be submitted to the ENGINEER to assure consistency with design requirements.

PART 2 - PRODUCTS

2.1 GENERAL

A. Furnish aggregate base material meeting the applicable aggregate quality requirements and geotechnical recommendations.

2.2 CRUSHED BASE MATERIAL

- A. Consists of both fine and coarse fragments of crushed stone or crushed gravel, and/or natural gravel, and when approved, blended with sand, finely crushed stone, crusher screenings, recycled concrete and/or asphalt or other similar materials. Where recycled materials are permitted, project specifications shall state the minimum required CBR value (design minimum) of the Crushed Base Course.
- B. Use crushed stone or gravel consisting of hard, durable particles of fragments of stone, free of excess of flat, elongated, soft or disintegrated pieces, dirt, or other deleterious matter, and having a percent of wear of not exceeding 50 at 500 revolutions when tested under AASHTO T96.
- C. Crush material so that the percentage of fractured particles in the finished product is as constant and uniform as practical. Crush to produce material where at least 50% of the material retained on the No. 4 sieve has at least one fractured face.
- D. Incorporate all material produced in the crushing operation and passing the No. 4 mesh sieve into the base material necessary to meet the gradation requirements.

2.3 GRADATION

A. As determined by AASHTO Methods T11 and T27, furnish material for the grading specified in the contract documents including binder or filler, which may have been added at the plant or at the site, meeting the requirements of that grading in the Table of Gradations below:

TABLE OF GRADATIONS
PERCENTAGES BY WEIGHT PASSING SQUARE
MESH SIEVE

Passing	1½" Minus	1" Minus	¾" Minus
1½ Inch	100		
1 Inch	—	100	
¾ Inch	—	—	100
½ Inch	—	—	—
No. 4 Sieve	25 - 60	40 - 70	40 - 70
No. 10 Sieve	—	25 - 55	25 - 55
No. 200 Sieve	0 - 8	2 - 10	2 - 10

- B. Up to 5% "oversized" material is permitted provided that the "oversized" material passes the screen size immediately larger than the top size specified. The produced material between the maximum screen opening and the No.4 sieve shall be reasonably well graded.
- C. Suitability of the aggregate is based on samples obtained during placement in the project within limits allowed in the table for the particular grading specified.
- D. That portion of the fine aggregate passing the No. 200 sieve must be less than 60% of that portion passing the No. 40 sieve.
- E. The liquid limit for that portion of the fine aggregate passing a No. 40 sieve cannot exceed 25, nor the plasticity index exceed 6, as determined by AASHTO T89 and T90.
- F. Crushed leveling base course shall be 1.5" minus.

2.4 WATERING

- A. Use water from an approved source.

PART 3 - EXECUTION

3.1 GENERAL

- A. Before placing the base course, smooth and shape the surface of the underlying subgrade, sub-base or base course to the cross section shown on the plans before placing the base course.
- B. Do not place base course on a wet or muddy subgrade or sub-base course. Complete at least one area of finished and accepted subgrade, sub-base or underlying base before the placing of any base course.

3.2 PLACEMENT AND SPREADING

- A. Mix and place the material in maximum 8 inches compacted layers unless otherwise

approved. Deposit and spread each load of material on the prepared subgrade, or on a completed sub-base or base course layer continuously without interruption. Discontinue operating haul units over subgrade, or over any sub-base or base course completed if the haul units damage the subgrade, sub-base or base course.

- B. Deposit and spread the material in a uniform layer, without segregation, to a loose depth so that when compacted, and making allowance for any filler to be blended on the road, the layer has the specified thickness.
- C. Spread material using dump boards, spreader boxes, or vehicles equipped to distribute the material in a uniform layer. The material may be deposited in windrows mixed and spread as described below.
- D. Construct each layer meeting these requirements. Blade smooth and thoroughly compact each layer as specified before placing the succeeding layer.
- E. If segregation or moisture problems exist, or if the material was placed on the road in windrows, thoroughly blade-mix the material of the affected layer by alternately blading to the center and back to the edges of the street.
- F. Uniformly add water, when required, on site and place in amounts required to compact the material as necessary to aid in densification and to limit segregation. Maintain an adequate water supply during the work. Assure the equipment used for watering is of the capacity and design to provide uniform water application.
- G. Apply water during the work to control dust and to maintain the base course in a damp condition in accordance with Section 01500 under Dust Control.
- H. Uncontaminated water required for compacting base gravel may be obtained from the municipal system if approved by the owner, or from other sources.

3.3 FIELD DENSITY REQUIREMENTS

- A. Compact placed material the full width by rolling with suitable tamping equipment or power rollers. Correct all irregularities or depressions that develop during rolling by loosening the material in these places and adding or removing material, as required.
- B. Perform blading and compacting alternately as required or directed, to maintain a smooth, even, uniformly compacted surface until the final inspection. Along curbs, headers, manholes, and similar structures, and at all places not accessible to the roller, compact the base course material with suitable mechanical tampers or hand tampers to reach the compaction requirements.
- C. Provide the watering and rolling required to obtain a minimum field density of 95% of maximum dry density as determined by AASHTO T99. No separate compensation is made for rolling and watering the base course other than the base course bid item or items listed on the contract documents.

3.4 SURFACE TOLERANCES

- A. The base course surface when finished and tested with a 10-foot straight edge placed on the surface with its center line parallel to the center line of the street, will not have a surface deviation from the straight edge exceeding 3/8- inch. Additionally, the finished grade cannot deviate more than 0.05 feet at any point from the staked elevation, and further, the sum of the deviations from two points not more than 30 feet apart cannot exceed 0.05 feet.
- B. For base course receiving asphalt concrete surfacing, the finished grade cannot deviate more than 0.02 feet at any point from the staked elevations, and the sum of the deviations from two points not more than 30 feet apart cannot exceed 0.02 feet.
- C. If patching of the base course is necessary to meet the tolerances, perform patching using methods and aggregates approved by the ENGINEER. Payment for patching aggregate is at the unit price bid for the base course material.

PART 4 - MEASUREMENT AND PAYMENT

4.1 CUBIC BASIS: CRUSHED BASE COURSE

- A. This item is measured and paid for by the cubic yards of crushed base course of the gradations specified in the Contract documents, complete in place, at the contract unit price bid for _____ " Minus Crushed Base Course. Price and payment is full compensation for furnishing, crushing, loading, hauling, spreading, shaping, watering and compacting the base course material, and for all tools, labor and incidentals necessary to complete this item.
- B. Payment is made under:
 - 1. _____" Minus Crushed Base Course - per cubic yard.

4.2 SQUARE YARD BASIS: CRUSHED BASE COURSE

- A. This item is measured and paid for by the square yards (square meters) of crushed base course surface area for furnishing crushed base course of the thickness and gradations specified in the Contract documents, complete in place, at the contract unit price bid for _____" Thickness of _____" Minus Crushed Base Course. Price and payment is full compensation for furnishing, crushing, loading, hauling, spreading, shaping, watering and compacting the base course material, and for all tools, labor and incidentals necessary to complete this item.
- B. Payment is made under:
 - 1. _____" Thickness of _____" Minus Crushed Base Course - per square yard.

4.3 LINEAR FOOT BASIS: CRUSHED BASE COURSE

- A. This item is measured and paid for by the linear feet (linear meters) of trench restored, measured along the trench centerline, with crushed base course of the gradations specified in the Contract documents, completed in place, at the contract unit price bid for _____ "Minus Crushed Base Course". Price and payment is full compensation for furnishing, crushing, loading, hauling, spreading, shaping, blending, watering and compacting the base course material, and for all tools, labor and incidentals necessary to complete this item.
- B. Payment is made under:
1. _____ "Minus Crushed Base Course - per linear foot.

END OF SECTION

SECTION 02502
ASPHALT PRIME AND/OR TACK COAT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This work is the single application of asphalt material as specified in the contract documents on a prepared sub-grade, sub-base, base, or asphalt surface meeting the plans and specifications.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Unless otherwise specified, furnish asphalt material grade and typed as specified below.
1. Furnish Liquid Asphalt, MC-70 meeting the requirement of Section 702 of the MDT Standard Specifications for all asphalt prime coat applications.
 2. Furnish Liquid Asphalt, MC-800 and/or MC-3000 meeting the requirement of Section 702 of the MDT Standard Specifications for all chip seal applications on gravel roads.
 3. Furnish Emulsified Asphalt, SS-1 meeting the requirements of Table 1 in this section for all asphalt tack coat applications.
 4. Furnish Emulsified Asphalt, CRS-2 or CRS-2P meeting the requirements of Table 2 in this section for all asphalt chip seal applications.
- B. Furnish Blotter Sand as specified below meeting the requirements of MDT 07.02.2.
1. Blotter material shall be 100% passing the ½-inch screen having a PI of 6 or less.

**TABLE 1
SPECIFICATIONS FOR ANIONIC EMULSIFIED ASPHALTS**

TYPE	RAPID SETTING				MEDIUM SETTING						SLOW SETTING			
	RS-1		RS-2		MS-1		MS-2		MS-2h		SS-1		SS-1h	
GRADE	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Test of Emulsions:	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt-Furol at 77°F (25°C)	20	100	...	...	20	100	100	...	100	...	20	100	20	100
Viscosity, Saybolt-Furol at 122°F (50°C)	...	...	75	400	...	...	...	...	...	...	...	...	...	...
Demulsibility*, 35ml, 0.02N CaCl ₂ , percent	60	...	60	...	...	...	...	...	...	...	...	...	...	...
Residue by Distillation, percent	55	...	63	...	55	...	65	...	65	...	57	...	57	...
Test on Residue from distillation tests														
Penetration, 77°F (25°C), 100g, 5s	100	200	100	200	100	200	100	20	40	90	100	200	40	90
Ductility, 77°F (25°C), 5cm/min, cm.	40	...	40	...	40	...	40	...	40	...	40	...	40	...
Solubility in Trichloroethylene	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...	97.5	...
Suggested Uses:	Surface treatment penetration macadam and tack coat		Surface treatment and penetration macadam		Plant or road mixture with course aggregate, substantially all of which is retained on a No. 8 (2.36 mm) sieve and practically none of which passes a No. 200 (0.075 mm) sieve, tack		Plant or road mixture with course aggregate, substantially all of which is retained on a No. 8 (2.36 mm) sieve and practically none of which passes a No. 200 (0.075 mm) sieve.		Plant or road mixture with graded and fine aggregates, substantially quantity of which passes a No. 8 (2.36 mm) sieve and a portion of which may pass a No. 200 (0.075 mm) sieve. Slurry seal treatment.					
* The demulsibility test shall be made within 30 days from the date of shipment.														

**TABLE 2
SPECIFICATIONS FOR CATIONIC EMULSIFIED ASPHALTS AASHTO M208**

<u>TYPE</u>	<u>RAPID SETTING</u>				<u>MEDIUM SETTING</u>				<u>SLOW SETTING</u>				
GRADE	CRS-1		CRS-2		CMS-1		CMS-2h		CSS-1		CSS-1h		
Test of Emulsions:	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
Viscosity, Saybolt-Furol at 77°F (25°C)	...	...	...	...	...	...	...	...	...	20	100	20	100
Viscosity, Saybolt-Furol at 122°F (50°C)	...	20	100	100	400	50	450	50	450	...	...	...	...
Demulsibility ^A 35ml, 0.08% sodium dioctyl sultrsuccinate, %	40	...	40	...	...	...	...	...	...	...	...	...	...
Particle Charge Test	Pos	...	Pos	...	Pos	...	Pos	...	Pos ^B	...	...	...	Pos ^B
Distillation: Oil distillation by volume of emulsion, percent	...	...	3	...	3	...	12	...	12	...	...	...	...
Residue, percent	60	...	...	65	...	65	...	65	...	...	57	...	57
Test on Residue from distillation tests													
Penetration, 77°F (25°C), 100g, 5s	100	250	100	250	100	250	40	90	100	250	40	90	...
Ductility, 77°F (25°C), 5cm/min, cm.		40	...	40	...	40	...	...	40	...	40	...	40
Solubility in Trichloroethylene	97.5	...	...	97.5	...	97.5	...	97.5	...	...	97.5	...	97.5
Suggested Uses: ^A The demulsibility test shall be made within 30 days from the date of shipment. ^B If the particle charge test result is inconclusive, material having a maximum pH value of 6.7 will be acceptable.	Surface treatment, penetration macadam and tack coat		Surface treatment and penetration macadam		Plant or road mixture with course aggregate, substantially all of which is retained on a No. 8 (2.36 mm) sieve and practically none of which passes a No. 200 (0.075 mm) sieve.				Plant or road mixture with graded and fine aggregates, a substantial quantity of which passes a No. 8 (2.36 mm) sieve and a portion of which may pass a No. 200 (0.075 mm) sieve. Slurry seal treatment.				

PART 3 - EXECUTION

3.1 DISTRIBUTORS

- A. Use a pressure distributor for prime and tack coats that distributes the required amount of asphaltic material at the specified temperature in a uniform spray, without atomization. Assure the distributor is pneumatic tired and does not rut or otherwise damage the surface being sprayed. Equip it with a bitumeter having a dial visible to the truck driver for maintaining the constant speed required for application at the specified rate.
- B. Assure the pump is operated by a separate power unit or by the truck power unit. Equip the pump with a tachometer having a dial readily visible to the operator, registering gallons per minute passing through the nozzles.
- C. The distributor shall be designed so that the normal width of application shall be not less than 12 feet, with provision for the application of lesser or greater width when necessary. The distributor shall be designed or equipped so that the height of the spray bar above the surface to be sprayed, may be set and maintained within a tolerance of 1/2 inch (plus or minus) of the height required to provide a uniform application.
- D. Assure the distributor is equipped and operated so that the asphaltic material is circulated or agitated throughout the entire heating system. Provide a means for constant, accurate temperature indication of the asphaltic material is provided. Assure the thermometer well is placed without contacting the heating tube.

3.2 ASPHALT PRIME COAT

- A. Asphalt prime coat will be applied only if specified in the plans or special provisions.
- B. Apply MC-70 at a rate of 0.20 gallons per square yard on all asphalt prime coat application.
- C. Immediately before applying the prime coat, clean the surface to be primed of all dirt and loose materials using blowers or a power broom, supplemented by hand brooming if necessary. Finish the surface to receive the asphalt material to the specified requirements for smoothness, compaction, and grade. Apply prime coat when the surface is dry or slightly damp and when the air temperature in the shade is not less than 50° Fahrenheit (10° C).
- D. Apply asphalt material using a pressure distributor at the rate or rates directed by the Engineer.
- E. Before spraying, spread building paper over the surface from the joint back, for the distance required for the spray bar to begin spraying and operating at full force when the surface to be treated is reached. Once the asphalt is applied, remove and dispose of the building paper. Assure the spray bar is shut off instantaneously at each

construction joint to assure a straight line and full application of asphalt prime up to the joint. If required to prevent dripping, insert a drip pan under the nozzle where the application ends. Use a hand sprayer to apply primer material to touch up all spots missed by the distributor.

- F. Protect the surfaces of structures and trees adjacent to the area being treated from being spattered or marred. Do not discharge asphalt material into borrow pits or gutters.
- G. After the prime coat has been applied, assure it is left undisturbed for at least 24 hours or until it is cured or blotted. Blot all excess asphalt material remaining on the surface after 24 hours with sand before opening the surface to traffic. Maintain the primed or tacked surface until the surfacing has been placed. Maintenance includes spreading any additional sand required to prevent asphalt material adhering to the tires of vehicles using the surface and patching all breaks in the surface with additional bituminous material. Any area of surface disturbed by traffic or otherwise, is to be cleaned before the next course is placed. Before placing the surface course, sweep all excess and/or loose sand used for blotter from the surface.

3.3 ASPHALT TACK COAT

- A. The asphalt tack coat is the application of a diluted, slow-breaking, SS-1 asphalt emulsion to ensure bond between the surface being paved and the overlying course. Immediately before applying the tack coat, clean the surface to be tacked of all dirt and loose materials using blowers or power brooms, supplemented by hand brooming if necessary.
- B. Apply tack coat when the surface is dry or slightly damp, and when the air temperature in the shade is at least 50° Fahrenheit (10° C).
- C. Dilute the asphalt emulsion, SS-1, with water at one part emulsion to one part water. Apply the diluted emulsion using a pressure distributor at the rate of 0.1 gallon per square yard.
- D. Before application, spread building paper over the surface, from the joint back, for the required distance for the spray bar to begin spraying and operating at full force when the surface to be treated is reached. Once the asphalt is applied, remove and dispose of the building paper. Shut off the spray bar instantaneously at each construction joint to assure a straight line and full application of asphalt tack up to the joint. If required to prevent dripping, insert a drip pan under the nozzle where the application is stopped. Use a hand sprayer to apply primer material for touching up all spots missed by the distributor.
- E. After the tack coat has been applied, assure it is undisturbed until the asphalt emulsion has “broken”, generally within 30 minutes of application. Place the next paving course after the emulsion has broken.

- F. Schedule operations so that all tack coats are placed with the asphalt-paving course in the same day.

PART 4 - MEASUREMENT AND PAYMENT

4.1 ASPHALT PRIME COAT

- A. This item is measured and paid for by the square yard or ton asphalt prime coat material, complete in place, at the contract unit price bid for "MC-70 Asphalt Prime Coat".
- B. Price and payment are full compensation for all demurrage, storage, handling, and other charges; all material (including the asphalt prime coat material), tools, equipment, labor and performance of all work necessary to the furnishing, testing, delivery, unloading, heating, hauling and spreading of the asphalt prime coat, cleaning the surface to be primed, blotting excess prime material, maintaining the primed surface, and all incidentals necessary to complete the item.
- C. Payment is made only for the asphalt prime coat material required and actually used in the work. The Owner accepts no responsibility for any material shipped onto the project in excess of requirements because of tank-truck or tank-car capacities or for other reasons.
- D. Payment is made under:
 - 1. MC-70 Asphalt Prime Coat:
 - a. Per square yard
 - b. Per ton

4.2 ASPHALT TACK COAT

- A. This is measured and paid for by the gallon (liter) or square yard (square meter) of undiluted, asphalt tack coat material, complete in-place, at the contract unit price bid for SS-1 Asphalt Tack Coat.
- B. Price and payment are full compensation for all demurrage, storage, handling, and other charges; all material (including the asphalt tack coat material and water for diluting), tools, equipment, labor and performance of all work necessary to the furnishing, testing, delivery, unloading, heating, diluting, hauling and spreading of the asphalt tack coat, cleaning the surface to be tacked, maintaining the tacked surface, and all incidentals necessary to complete the item.
- C. Payment is made only for the asphalt tack coat material required and actually used in the work. The Owner accepts no responsibility for any material shipped onto the project in excess of requirements because of tank-truck or tank-car capacities or for other reasons.

- D. Payment is made under:
 - 1. SS-1 Asphalt Tack Coat
 - a. per gallon
 - b. per square yard

4.3 TONNAGE BASIS: BLOTTER – SAND

- A. This item is measured and paid for by the ton for the item in the Contract documents at the contract unit price bid for Blotter - sand.
- B. Price and payment are full compensation for the furnishing, delivering, and placing of the material; for brooming, for cleaning the existing surface, for removal of the excess aggregate and cleaning gutters, and for all labor, equipment, tools, and incidentals necessary to complete this item.
- C. Payment is made under:
 - 1. Blotter – Sand
 - a. per ton

END OF SECTION

**SECTION 02504
ASPHALT SEAL COAT**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This work is applying a single application of asphalt material on a prepared asphalt surface, followed by spreading seal coat aggregate meeting these specifications.

1.2 REFERENCES

AASHTO T11	Amount of Material Finer than No. 200 (0.075 mm) Sieve in Aggregate
AASHTO T27	Sieve Analysis of Coarse and Fine Aggregates
AASHTO T89	Determining the Liquid Limit of Soils
AASHTO T90	Determining the Plastic Limit and Plasticity Index of Soils
AASHTO T96	Resistance to Degradation of Small-Size Coarse Aggregate by ASTM C131 Abrasion and Impact in the Los Angeles Machine
MT 309	Determining the Percentage of Adhesion of Bituminous Materials to Aggregate
MT 228	Method of Test for Evaluating Cleanness of Cover Coat Material

PART 2 - PRODUCTS

2.1 ASPHALT

- A. Furnish asphalt material meeting the specifications in Section 02502; ASPHALT PRIME AND/OR TACK COAT and the contract requirements.

2.2 AGGREGATE

- A. Unless otherwise specified, furnish ½ inch seal coat aggregate meeting the requirements of Section 2510: Asphalt Concrete Pavement and Table 1 in this section for all chip seal applications on gravel roads.
- B. Unless otherwise specified, furnish 3/8-inch seal coat aggregate meeting the requirements of Section 2510: Asphalt Concrete Pavement and Table 2 for all chip seal applications on asphalt roads.
- C. Furnish material consisting of crushed stone or crushed aggregate that is clean, durable fragments free from an excess of flat, elongated, soft or disintegrated pieces, clay balls or other deleterious material. Assure the material produced is free from adherent films of clay

or rock dust and is washed thoroughly. No combination of shale, clay, coal, or soft particles can exceed 1.5 percent. Assure the aggregate has a minimum cleanness value of 75 when tested under Montana Test Method MT228.

- D. The material cannot exceed a wear of 40% at 500 revolutions when tested under AASHTO Method T96 Grading C. A minimum of 70% by weight of the coarse aggregate (retained on No.4 Sieve) must have at least one fractured face.
- E. The aggregate, or a composite mixture, must show no detrimental stripping when tested under Montana Test Methods MT-309. If stripping exceeds 5%, the aggregate will be rejected or an alternate grade of asphalt substituted to reduce stripping below 5%.
- F. For all gradings, that portion of the aggregate passing a No. 40 sieve must be non-plastic as determined by AASHTO T89 and T90.
- G. When tested by AASHTO Methods T11 and T27 in conjunction with water wash, chips must meet the grading requirements of the following tables:

TABLE 1
1/2" SEAL COAT AGGREGATE - TABLE OF GRADATION

Sieve Designation	Percentage of Weight Passing Sieve
5/8-inch Sieve	100
3/8-inch Sieve	35 - 55
No. 4 Sieve	0 - 15
No. 8 Sieve	0 - 5
No.200 Sieve	0 - 2

TABLE 2
3/8" SEAL COAT AGGREGATE - TABLE OF GRADATION

Sieve Designation	Percentage of Weight Passing Sieves
1/2-inch Sieve	100
3/8-inch Sieve	85 - 100
No. 4 Sieve	10 - 30
No. 10 Sieve	0 - 10
No. 40 Sieve	0 - 2

TABLE 3
1/4" SEAL COAT AGGREGATE - TABLE OF GRADATION

Sieve Designation	Percentage of Weight Passing Sieves
3/8-inch Sieve	100
1/4-inch Sieve	85-100
No. 8 Sieve	0-25
No. 16 Sieve	0-10
No. 40 Sieve	0-2

TABLE 4
SAND SEAL COAT AGGREGATE - TABLE OF GRADATION

Sieve Designation	Percentage of Weight Passing Sieves
1/4-inch Sieve	100
No. 8 Sieve	10-40
No. 16 Sieve	0-10

PART 3 - EXECUTION

3.1 EQUIPMENT

- A. Distributor
 - 1. Furnish distributors meeting the requirements of Section 02502; ASPHALT PRIME AND/OR TACK COAT.
- B. Brooms
 - 1. Provide power brooms, or a power blower or both.

3.2 AGGREGATE SPREADER

- A. Furnish an independent, self-propelled aggregate spreading equipment (Flaherty Spreadmaster or equal) that can be adjusted to spread the specified quantity of cover aggregate per square yard.

3.3 CONSTRUCTION METHODS

- A. Seasonal Limitations
 - 1. Seal coating operations cannot be performed after September 1 for areas higher than 3,500 feet above sea level. For areas below 3,500 feet above sea level, seal coating operations are not permitted after September 15.
- B. Weather Limitations
 - 1. Do not apply asphalt material when the street face is damp or wet, or when the atmospheric temperature in the shade is less than 65° F (18° C). Do not start work

without the Engineer's approval and terminate work at once in event of rain. Terminate seal coating work just before dark, and stop work during wind that blows sand, dust or other foreign matter into the spread asphalt material before the aggregate is applied.

2. Do not perform seal coat work if the local weather forecast includes a predicted temperature lower than 45 degrees Fahrenheit (7° C) within 12 hours after the intended close of the work for the day.
3. Do not perform seal coat work if the local weather forecast includes a probability of precipitation greater than 45% within the intended schedule of operations for the day. Regardless of the weather forecast, seal coat work may be suspended if impending adverse weather conditions occur in the vicinity of the work.

C. Preparation of Surfaces

1. General

- a. Do not start coat operations until the Engineer determines the asphalt surface course to be seal coated is thoroughly compacted and rolling and all holes and breaks in the surface and edges are repaired. In no event, unless ordered in writing by the Engineer, is the seal coat to be placed on newly constructed or reconditioned surfaces within 7 days of the surface having been placed.

2. Cleaning

- a. Immediately before applying the asphalt material, clean the surface of all dust, dirt, sand or other objectionable material that prevents complete coverage or bond between the asphalt material and the street surface, using a rotary power broom or blower, by hand sweeping, or both, as required. Thoroughly clean the outer edges adjacent to vertical curbs. Do not mix material removed from the surface with the cover aggregate.

D. Application of Asphalt Material

1. Apply asphalt material at a rate of 0.35 gallons per square yard when using Emulsified Asphalt CRS-2 or CRS-2P, and at a rate of 0.50 gallons per square yard when using Liquid Asphalt MC-800 or MC-3000.
2. Apply asphalt material at a rate of 0.20 gallons per square yard for sand seal applications.
3. Apply the asphalt material uniformly at the rate specified.
4. The Engineer may require adjustments in the application during the work. When heating is required, take precautions to avoid fire hazard. Thoroughly clean the distributor before use unless its last use was with the same type of asphaltic

material specified for the work.

5. Before application, spread building paper over the surface, from the joint back, for the distance required for the spray bar to begin spraying and operating at full force when it reaches the surface to be treated. After the asphalt is applied, remove and dispose of the building paper.
6. Shut off the spray bar instantly at each construction joint to assure a straight line and the full application of asphaltic binder up to the joint. If required to prevent dripping, insert a drip pan under the nozzles when the application is stopped.
7. Use a hand sprayer to apply asphaltic binder to touch up all spots missed by the distributor.
8. Before and during seal coating operations, calibrate or check the adjustments on the distributor as follows:
 - a. Tank calibration
 - b. Nozzle adjustment and pressure
 - c. Spray bar height
 - d. Bitumeter calibration
 - e. Transverse and Longitudinal Spread of Asphalt Material.
 - i. Transverse spread variation shall not exceed 15%
 - ii. longitudinal spread variation shall not exceed 10% plus or minus of the rate specified.)

E. Application of Seal Coat Material

1. Apply seal coat material at a rate of 25 pounds per square yard on all chip seal applications. Apply seal coat material at a rate of 15 pounds per square yard on all sand seal applications. During the course of the work, make adjustments in the rate of application as required or as directed by the Engineer.
2. Assure the cover coat material is stockpiled enough in advance of the work so that excess water has drained from the aggregate. Do not spread seal coat aggregate if the moisture content of the aggregate exceeds 2 percent.
3. Uniformly distribute the cover coat at the specified rate using a mechanical or a self-propelled spreader immediately after the asphaltic material application. If weather or surface conditions require, restrict the application of asphalt material to the area coverable by the cover coat material available in the trucks. Assure cover aggregate is available at all times to assure continuous seal coating operations. Do not apply seal coat aggregate to cold, dried or partially dried asphalt material.
4. Immediately after spreading, roll the aggregate with self-propelled,

pneumatic- tired rollers. Roll in a longitudinal direction, beginning at the outer edges of the treatment and working toward the center. Overlap the previous strip by about one-half the roller width. Complete the first rolling of the aggregate within one- half hour of it being spread. Continue rolling until a smooth, thoroughly compacted surface is obtained. Roll at least 3 complete passes with each roller. If the seal coat is finished in partial widths at a time, leave 4 to 6 inches of the inside edge uncovered with aggregate to permit overlap of asphaltic material when the remaining portion of the surface is treated.

5. Remove all loose aggregate from the pavement after the work is completed and dispose of at the specified location. If a location is not designated the chips become the Contractor's property.

3.4 PROTECTION OF STREET SIDE STRUCTURES AND TRAFFIC CONTROL

- A. Protect all signposts, streetlamp posts, trees, shrubs and tops of curbs and gutters from splashing asphaltic material. Compensation for furnishing, erecting, and removing such protection is included in the unit price bid for the application of asphalt material.
- B. Keep traffic off of freshly sprayed asphalt.

PART 4 - MEASUREMENT AND PAYMENT

4.1 TONNAGE BASIS – SEAL COAT AGGREGATE

- A. This item is measured and paid for by the ton of 2,000 pounds for the gradation(s) in the Contract document at the contract unit price bid for Seal Coat-Aggregate Gradation.
- B. Price and payment are full compensation for the furnishing, delivering, and placing of the material; for brooming, compacting and rolling; for cleaning the existing surface; for covering excess asphaltic material; for removal of the excess aggregate cleaning gutters, and for all labor, equipment, tools, traffic control and incidentals necessary to complete this item.
- C. Payment is made under:
 1. Seal Coat Aggregate - 1/2" Gradation - per ton
 2. Seal Coat Aggregate - 3/8" Gradation - per ton
 3. Seal Coat Aggregate - 1/4" Gradation - per ton
 4. Seal Coat Aggregate - Sand Gradation - per ton

4.2 TONNAGE BASIS – EMULSIFIED ASPHALT

- A. This item is measured and paid for by the ton of 2,000 pounds at the contract unit price bid for "CRS-2 Emulsified Asphalt".

- B. Price and payment are full compensation for all demurrage, storage, handling, and other charges, materials (including the asphalt), tools, equipment, labor and performance of all work necessary or incidental to the furnishing, delivering, unloading, heating, hauling and spreading of the asphalt material specified.
- C. Payment is made only for the asphalt required and actually used in the work. The Owner accepts no responsibility for any oil shipped onto the project exceeding that required due to tank-truck or tank-car capacities or for other reasons.
- D. Payment is made under:
 - 1. CRS-2 Emulsified Asphalt - per ton
 - 2. CRS-2Im Emulsified Asphalt - per ton

4.3 SQUARE YARD BASIS – ASPHALT SEAL AND CHIP COAT

- A. This item is measured and paid for by the square yards (square meters) of asphalt pavement surface area at the contract unit price bid for CRS-2 Asphalt Seal and Chip Coat _____ Gradation.
- B. Price and payment are full compensation for the furnishing, delivering, and placing of the aggregate material; for brooming, compacting and rolling; for cleaning the existing surface; for covering excess asphaltic material; and for removal of the excess aggregate and cleaning gutters.
- C. The price and payment are full compensation for all demurrage, storage, handling, and other charges, materials (including the asphalt), tools, equipment, labor and performance of all work necessary or incidental to the furnishing, delivering, unloading, heating, hauling and spreading of the asphalt material specified, and for all labor, equipment, tools, traffic control and incidentals necessary to complete this item.
 - 1. CRS-2 Asphalt Seal and Chip coat, 1/2" Gradation - per square yard
 - 2. CRS-2 Asphalt Seal and Chip coat, 3/8" Gradation - per square yard
 - 3. CRS-2 Asphalt Seal and Chip coat, 1/4" Gradation - per square yard
 - 4. CRS-2 Asphalt Seal and Chip coat, Sand Gradation - per square yard

END OF SECTION

**SECTION 02505
CONSTRUCTION SEAL**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This work is the application of a dilute mixture of an asphalt rejuvenating agent and water.

1.2 REFERENCES

- ASTM D244 Test Methods for Emulsified Asphalts
 ASTM D2006 Maltenes Distribution Ration Test

PART 2 - PRODUCTS

2.1 ASPHALT REJUVENATING AGENT

- A. Furnish an asphalt rejuvenating agent composed of a petroleum, resin-oil base uniformly emulsified with water and meeting the following physical and chemical requirements:

Specification Designation	Test Method	Requirements
Viscosity, S.F., at 77 ⁰ F, sec.	ASTM D244	15 - 40
Residue, % Min. (1)	ASTM D244 (Mod)	60 - 65
Miscibility Test (2)	ASTM D244 (Mod)	No coagulation
Sieve Test, % Max. (3)	ASTM D244 (Mod)	0.10
Particle Charge Test	ASTM D244	Positive
Tests on Residue from	ASTM D244-60 (Mod):	
Viscosity, cs., 140° F	ASTM D445	100-200
Asphaltenes, % Max	ASTM D2006	0.75
Maltenes Dist. Ratio <u>PC + AL (4)</u> S+A2	ASTM D2006	0.3 - 0.5

- B. ASTM D244 Modified Evaporation Test for percent of residue is made by heating 50-gram sample to 300 degrees Fahrenheit (149° C) until foaming ceases, then cooling, immediately and calculating the results.
- C. Test procedure identical with ASTM D244 except that 0.02 normal calcium chloride solution shall be used in place of distilled water.
- D. Test procedure identical with ASTM D244 except that distilled water shall be used in place of 2 percent sodium oleate solution.
- E. In the Maltenes Distribution Ratio Test by ASTM Method D2006:
 - 1. PC = Polar Compounds A I = First Acidaffins
 - 2. A2 = Second Acidaffins S =Saturates
- F. The materials must have a record of satisfactory service as an asphalt rejuvenating agent. Satisfactory service is based on the capability of the material to increase the ductility and penetration of the asphalt binder in the pavement surface.

2.2 WATER

- A. Use water in the seal mixture that is potable and free from harmful, soluble salts.

PART 3 - EXECUTION

3.1 GENERAL

- A. Dilute the asphalt rejuvenating agent following the manufacturer's recommendations, typically at a ratio of 2:1 and apply at a rate of approximately 0.1 gallon per square yard. Follow the manufacturer's recommendations in applying the Construction Seal.

PART 4 - MEASUREMENT AND PAYMENT

4.1 CONSTRUCTION SEAL

- A. The unit of measurement is the gallon. The gallonage paid is the number of gallons of diluted asphalt rejuvenating agent (construction seal) used as ordered for the accepted work. Gallons used are determined by measuring the material at 60 degrees Fahrenheit (16° C).
- B. Payment is made at the contract unit price bid for "Construction Seal (Asphalt Rejuvenating Agent)". Price and payment are full compensation for all demurrage, storage, handling, and other charges, materials (including the asphalt rejuvenating agent and water for dilution), tools, equipment, labor, and the performance of all work necessary or incidental to the furnishing, delivering, unloading, heating, hauling and spreading of the Construction Seal.
- C. Payment is made under:

1. Construction Seal (Asphalt Rejuvenating Agent) - per gallon

END OF SECTION

**SECTION 02510
ASPHALT CONCRETE PAVEMENT**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Work is the production and placement of plant mix asphalt concrete pavement.
- B. Hot plant mix asphalt concrete is a mineral aggregate and asphalt material mixed at a hot plant meeting these specifications and placed in one or more courses on a newly prepared or existing street roadway in accordance with the contract documents.
- C. In the event that there is any discrepancy between this specification section and the Geotechnical Report within the Project Documents, the more stringent requirement shall govern.

1.2 REFERENCES

AASHTO T11 (ASTM D1140)	Amount of Material Finer than No. 200 (0.075 MM) Sieve in Aggregate
ASTM D5361	Standard Practice for Sampling Compacted Bituminous Mixtures for Laboratory Testing
AASHTO T27 (ASTM C136)	Sieve Analysis of Fine and Coarse Aggregate
AASHTO T89 (ASTM D4318)	Determining Liquid Limit of Soils
AASHTO T90 (ASTM D4318)	Determining the Plastic Limit and Plasticity Index of Soils
AASHTO T283 (ASTM D4867)	Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage
AASHTO T176 (ASTM D2419)	Plastic Fines in Graded Aggregates and Soils by Use of The Sand Equivalent Test
AASHTO T96 (ASTM C131)	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
AASHTO T312 (ASTM D6925)	Standard Test Method for Preparation and Determination of the Relative Density of Asphalt Mix Specimens by Means of the Superpave Gyrotory Compactor
ASTM D2041	Theoretical Maximum Specific Gravity and Density of Bituminous Mixtures

ASTM C1097	Hydrated Lime for Use in Asphalt Cement or Bituminous Paving Mixtures
ASTM D3666	Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D5821	Percentage of Fractured Particles in Coarse
ASTM C123	Lightweight Particles in Aggregate
ASTM D6307	Asphalt Content of Asphalt Mixture by Ignition Method
ASTM C142	Clay Lumps and Friable Particles in Aggregates
MS-2	Asphalt Institute – Mix Design Methods

PART 2 - PRODUCTS

2.1 GENERAL

- A. The Asphalt Concrete Surface Course must have at least a 3-bin separation, when continuous flow mixing types of plants are used. When a drum dryer is used with a weight batching system from dry bins, separate and stockpile the crushed aggregate into two sizes.
- B. Unless otherwise specified, furnish Type B or B-Modified aggregate meeting the requirements of Table 1 in this section for all asphalt pavement applications.
- C. Unless otherwise specified, furnish (PGAB) PG58-28 Asphalt Binder Material meeting the requirements of Table 2 in this section for all asphalt pavement application.
- D. Prepare pavement course to conform to the lines, grades, thickness and typical cross sections shown in project documents and plans, and shall be rolled, finished, and approved by the ENGINEER before the placement of the next course.

2.2 PLANT MIX AGGREGATES

- A. Furnish aggregates from acceptable sources approved by the ENGINEER.
- B. Furnish test data as outlined in this section on each source to be used for acceptance by the ENGINEER.
- C. Designation of the source of supply and the acceptability of the material there from, does not extend to the grading of the material as it may naturally come from the pit or crusher. Adjust the crusher and screens to remove certain portions of the material as

may be necessary to furnish gravel that will comply with the specifications in the contract. No additional compensation will be allowed for such adjustment of the equipment or the rejection of waste. It is understood that the ENGINEER may order procurement of material from any portion of any area designated as a pit site and may reject portions of the deposit as unacceptable.

- D. Aggregate materials shall not contain more than 1.5% by weight of clay lumps, shale, or coal, nor shall light weight particles exceed 3.5% by weight. No combination of clay, shale, coal, or lightweight particles shall exceed 3.5% by weight. Do not use Scoria (fired clay). Aggregate materials shall conform to the grading stipulated in the contract documents. Use reasonable care in the selection of material in a pit so that uniform product will be produced at all times. No compensation will be allowed for such stripping of the pit as may be required in order that satisfactory material may be secured.
- E. Aggregate used shall consist of gravel, crushed to the specified size, crushed stone, composed of hard durable pebbles or stone fragments, reclaimed asphalt pavement, and finely crushed stone filler, sand or natural clean material, or other fine mineral material. The portion of the material retained on the No. 4 sieve will be called coarse aggregate and that passing the No. 4 sieve and retained on the #200 sieve will be called fine aggregate. The material Passing the #200 will be called mineral filler. The reclaimed asphalt pavement shall be removed from its original location and reduced by suitable means to such particle size as may be required for use in hot plant mix asphalt concrete.
- F. For all gradings of fine aggregate, including any blended fine aggregate and mineral filler, passing a No 40 sieve, shall have a liquid limit not exceeding 25 and a plasticity index of not more than 6.
- G. Produce coarse aggregate retained on the No. 4 sieve having a minimum of 75% by weight of particles with at least two mechanically fractured faces. When fractures are contiguous, ensure the angle between the fracture planes is at least 30 degrees to count as two fractured faces.
- H. Preliminary acceptance of aggregates proposed for use may be made at the point of production. Final acceptance will be made only after tests of the aggregates are complete and in place.
- I. Surface Course Asphalt Plant Mix Aggregate:

TABLE 1
REQUIREMENTS FOR GRADING OF SURFACE COURSE AGGREGATE

Percentage by Weight Passing Job Mix Target Bands						
Sieve Size	A 1"	B ¾"	C ½"	D 3/8"	E #4	Job Mix Tolerances
1" (25.0 mm)	90 - 100	100				---

3/4" (19.0 mm)	90 Max	90 - 100	100			+/- 5
1/2" (12.5 mm)		90 Max	90 - 100	100	100	+/- 5
3/8" (9.5 mm)			90 Max	90 - 100	95 - 100	+/- 5
No 4 (4.75 mm)				90 Max	90 - 100	+/- 5
No 8 (2.36 mm)	19 - 45	23 - 49	28 - 58	32 - 67		+/- 4
No 30 (0.600 mm)						+/- 3
No 200 (0.075 mm)	1 - 7	2 - 8	2 - 10	2 - 10	6 - 13	+/- 2

1. The above gradation bands represent the job mix target limits, which determine the suitability of aggregate for use. The final job mix target gradation must be within the specified bands and uniformly graded from coarse to fine and not vary from the low limits on one screen to the high limits on the adjacent screen, or vice versa. The final job mix gradation limits are established by applying the job mix tolerances to the job mix targets.
2. The job mix formula establishes target values. During production of the mix, the gradations shall lie within the job mix gradation limits specified in Table 1. For example, "Type A, No. 200" band is "1-7". QA job mix target of 5 has been selected for the final mix. The job mix gradation limits is 5, plus and minus 2. Therefore, the job mix gradation limits for production is 3-7.

2.3 ASPHALT BINDER MATERIAL

- A. Furnish asphalt binder material to be used as specified in the contract documents that meet the type and grade specified requirements in this section in Table 2.
 1. Grades:
 - a. (PGAB) PG 58-28
 - b. (PGAB) PG 64-22
 - c. (PGAB) PG 64-28 (Polymer Modified)
 - d. (PGAB) PG 70-28 (Polymer Modified)
- B. The percentage of asphalt by weight to be added to the aggregate will be, generally, between 4 and 8% of the weight of the total mix. A minimum effective asphalt binder content of 4.5% is required for 3/4" for Type B and 1/2" mixes, 5.0% for 1/2" for Type C mixes. The mix design will establish the exact percentage of asphalt in the mix, based upon preliminary laboratory tests, sieve analysis and grading and character of the aggregate furnished within the specification limits. No claim is allowed for the payment for rejecting any batch or load of mixture containing an excess or deficient amount of asphalt binder varying more than 0.4 of a percent from the fixed mix design percentage.
- C. Obtain ENGINEER approval of the asphalt material source before shipments are made to any project. The source of supply cannot change after work is started unless approved in writing by the ENGINEER. The ENGINEER is not liable for the quantity

shipped.

- D. Samples of asphalt binder material may be taken, as directed by the ENGINEER, and placed in uncontaminated one-quart containers. When sampled, these shall be taken from the tanker car or truck at the point of delivery on the project and submitted to the ENGINEER.
- E. All transport vehicles must be equipped with a spigot or gate valve installed in either: (1) the unloading line, (2) in the tanker at the centerline on the tank, (3) in the pressure line from the unloading pump, or other locations approved by the ENGINEER. Assure the spigot or gate valve has a diameter of between 3/8 inch and 3/4 inch. The spigot valve must be located to prevent contamination from plant dust or other contaminants.
- F. The supplier furnishing the asphalt binder material shall inspect each tanker car or truck before it is loaded and ship only in clean, uncontaminated, fully insulated cars or trucks, sealed after loading by the supplier.
- G. The material supplier shall issue, in duplicate, a certificate showing full compliance with the specifications for the designated grade of material, together with the following information. Project number, date of shipment, source of the material, car or truck initial and number, destination, gross quantity loaded, loading temperature, and net quantity in gallons at 60° F (15.5° C) or tons, whichever unit of measurement is stipulated. Assure the certificate of compliance accompanies the shipment and is furnished to the ENGINEER. The certificate, signed by the supplier representative, must also certify that the conveyance vessel was inspected and found to be free of contaminating material.
- H. The certificate of compliance is the basis for tentative acceptance and use of the material. Samples taken according to applicable sampling methods and retained by the ENGINEER may be tested at the ENGINEER's discretion. Failure of the asphalt material to meet these specifications may result in rejection of the entire, associated work. If rejected, removed and replace rejected work.
- I. Apply asphalt material at temperatures that assure uniform mixing or spreading. Application temperature ranges for each grade of material should be accompanied with the mix design. Application temperature for mixing applications will be in accordance with the mix design.
- J. Upon request by the ENGINEER, furnish the ENGINEER and/or laboratory (responsible for completing the mix design) with data or a report showing the temperature-viscosity relationship of each asphalt binder used on the project. Assure this data covers the range of temperatures used for mixing and compaction. In addition, the ENGINEER may request a complete set of test results from Table 2 for each grade used on the project.

TABLE 2
PERFORMANCE GRADED ASPHALT BINDER (PGAB)

Performance Grade	PG 58		PG 64		PG 70	Test Methods
	-28		-22	-28	-28	
Average 7-day Maximum Pavement Design Temperature, °C	<58		<64		<70	
Minimum Pavement Design Temperature, °C	>-28		>-22	>-28	>-28	
Original Binder						
Flash Point Temp.: Minimum °C	230					AASHTO T48
Viscosity: Maximum, 3 Pa · s (3000 CP), Test Temp, °C	135					ASTM D4402
Dynamic Shear: G* / sin delta, Minimum, 1.00 kPa Test Temp @ 10 rad / s, °C	58		64		70	AASHTO T315
Rolling Thin Film Oven (AASHTO T240) or Thin Film Oven (T179) Residue						
Mass Loss, Maximum, %	1.0					AASHTO T240
Dynamic Shear: G* / sin delta, Minimum, 2.20 kPa Test Temp @ 10 rad / s, °C	58		64		70	AASHTO T315
Pressure Aging Vessel Residue (AASHTO PP1)						
PAV Aging Temp, °C	100		100		100	AASHTO R28
Dynamic Shear: G* / sin delta, Maximum, 5000 kPa Test Temp @ 10 rad / s, °C	19		25	22	25	AASHTO T315
Creep Stiffness ^a : S, Minimum, 300 MPa m-value, Minimum, 0.300 Test Temp, @ 60 sec, °C	-18		-12		-18	AASHTO T313
Direct Tension ^a : Failure Strain, Minimum, 1.0%, Test Temp @ 1.0 mm/min. °C	-18		-12		-18	AASHTO T314

1. If creep stiffness is below 300 MPa, the direct tension test is not required. If the creep stiffness is between 300 and 600 MPa the direct tension failure strain requirement can be used in lieu of the creep stiffness requirement. The m-value requirement must be satisfied in both cases.

2.4 COMPOSITION OF MIXES

A. General

1. Submit to the ENGINEER for approval a mix design for each mix required on the project. Assure the job-mix formula is within the gradation limits in Part 2 Products in this section.
2. Have the job-mix formula prepared by an independent testing laboratory approved by the ENGINEER and performed under the supervision of a Professional ENGINEER. The requirements of ASTM D-3666 are the guidelines for testing laboratory approval. The cost of the job-mix formula(s) is at CONTRACTOR expense.
3. Keep the job mix formula current and contain the following minimum information:
 - a. Gradation of all constituent aggregates.
 - b. Specific gravity of constituent aggregates and asphalt cement.
 - c. Source of supply of all materials and grade of asphalt cement.
 - d. Marshall design curves for stability, unit weight, flow and volumetric requirements (VMA and total voids) at asphalt contents below and above optimum (four points minimum).
 - e. Measured void less (Rice's) specific gravity used in voids computations.
 - f. Composite aggregate grading.
 - g. Recommended asphalt cement content.
 - h. Marshall or gyratory compactive effort.
 - i. Date of mix design (job mix formula).
 - j. Index of retained strength.
4. In addition to the job mix formula, all asphalt concrete surfacing mix submittals will have laboratory tests indicating that the Tensile Strength Ratio (TSR) as determined by AASHTO T-283 is at least 70%. Test shall be performed at 7.0 +/- 0.5% air voids and shall include the freeze cycle. Mixtures that fail to meet this minimum criteria may be resubmitted with and approved anti-strip agent meeting the same 70% criteria.

B. Asphalt Concrete Surface Course

1. The maximum permissible variation from the job-mix formula within the specification limits is as follows:
 - a. Aggregate gradation within job mix tolerances

- b. Asphalt $\pm 0.4\%$ *
- c. Temperature of mix $\pm 20^\circ\text{F}$.

*This tolerance will be permitted only if the job mix parameter curves indicate that the corresponding design limits are not exceeded.

2. Produce Hot Plant Mix Asphalt Concrete Surface courses having the following characteristics as measured by AASHTO T245, ASTM D6726 & D6927 "Resistance to Plastic Flow of Bituminous Mixtures by Means of the Marshall Apparatus":
 - a. Number of compaction blows, each end of specimen 50
 - b. Stability, minimum 1500
 - c. Flow 8 – 18
 - d. Air voids, percent 3-5
 - e. Percent voids in mineral aggregate (minimum)
3. All type B-modified asphaltic concrete surfacing shall meet the following Marshall Design criteria as determined by ASTM D1559.
 - a. Number of Compaction Blows, Each End of Specimen 75
 - b. Stability, Minimum 1500 lbs.
 - c. Flow 8 – 16
 - d. Air Voids, Percent 3 - 5
 - e. Percent Air Voids Filled with Bitumen 65-75
4. As an alternative to Marshall mix production, SuperPave Hot Plant Mix Asphalt Concrete Surface courses can be produced having the following characteristics as measured by AASHTO R 35 and M 323.

**TABLE 3
SUPERPAVE GYRATORY COMPACTION EFFORT**

20-Year Design ESALs" (in millions)	Compaction Parameters			Typical Roadway Applications
	N _{initial}	N _{maximum}	N _{maximum}	

< 0.3	6	50	75	Applications include roadways with very light traffic volumes, such as local roads, county roads and city streets where truck traffic is prohibited or at a very minimal level. Traffic on these roadways would be considered local in nature, not regional, intrastate or interstate. Special-purpose road ways serving recreational sites or areas may also be applicable to this level.
0.3 to < 3	7	75	115	Applications include collector roads or access streets. Medium- trafficked city streets and the majority of county roadways may be applicable to this level.

- a. Air voids, percent3-5
- b. Voids Filled with Asphalt. 65-80
- c. Dust to Effective Binder ratio0.6-1.4
- d. NMax98
- e. NMin91.5
- f. NDesign 95-97
- g. Percent Voids in Mineral Aggregate . . See Table 4.

TABLE 4 REQUIRED VOIDS IN MINERAL	
Nominal particle size (Table 2)	Voids in Mineral Aggregate, Min.
No 4 (4.75 mm)	16
3/8– inch (9.5 mm)	15
½ - inch (12.5 mm)	14
¾ - inch (19.0 mm)	13
1 – inch (25.0 mm)	12
Nominal maximum particle size is one size larger than the first sieve to retain more than 10 percent.	

PART 3 - EXECUTION

3.1 CRUSHING

A. Crushing Equipment

- 1. Fit crushing plant-screening equipment, when required, with blowers or other devices capable of removing excess and undesirable fines.

B. Screening Plants

1. Screening plants consist of a revolving trommel screen, shaker screen, vibrating screen, or other devices capable of removing oversize material, excess and undesirable fines.

C. Scales

1. Furnish scales, when required, satisfactory to the ENGINEER. Test and certify scales prior to their use on the project and as often thereafter as the ENGINEER may consider necessary to ensure their accuracy. Have on hand not less than ten, 50- pound weights for testing scales.
2. House the recording devices of the scales in a suitable manner. Place the scales in a location suitable to facilitate accurate weighing of loads. The scales shall be accurate to one-half of one percent at any weight. Alternate methods or devices for weighing may be acceptable, provided that these methods or devices produce the same degree of accuracy as required of platform scales.

3.2 MATERIAL HANDLING

- A. All work involved in clearing and stripping pits and quarries, including handling unsuitable material encountered, are performed with no additional compensation being allowed for this work. The pits as utilized shall immediately be opened so as to expose the vertical faces of the various strata of acceptable material and, unless otherwise directed, the material shall be secured in successive vertical cuts extending through all the exposed strata.
- B. Provide, unless otherwise specified, material containing as large a proportion as possible of crushed aggregate. Combine the crushed material with the screened material to obtain a uniform product.
- C. No material will be accepted which is loaded into hauling units in a segregated condition or which does not meet the required grading. In case the material deposit contains sand or other material in excess of the specification gradation requirements, or of an unacceptable quality, such excess or undesirable material shall be removed and disposed of prior to crushing, or during screening operations, if crushing is not required.
- D. Provide a storage bin of ample capacity to ensure uniform quality and delivery of material. Loading of trucks directly from the conveyor belt, from the crusher or screening plant will not be permitted.

3.3 STOCKPILES

- A. Grub and clean sites for aggregate stockpiles prior to storing aggregates. Assure the site is firm, smooth and well drained. Maintain a bed of aggregate suitable to avoid the inclusion of soil or foreign material.

- B. Build up coarse aggregate stockpiles in tiers of not more than 4 feet in thickness. Assure each tier is completely in place before the next tier is placed. Do not allow material to “cone” down over the next lower tier.
- C. Dumping, casting or pushing over the sides of stockpiles will be prohibited, except in the case of fine aggregate stockpiles.
- D. Space stockpiles of different gradations of aggregate far enough apart, or separated by suitable walls or partitions, to prevent the mixing of the aggregates.
- E. Any method of stockpiling aggregate, which allows the stockpile to become contaminated with foreign matter or causes excessive degradation of the aggregate, will not be permitted. Excessive degradation will be determined by sieve tests of samples taken from any portion of the stockpile over which equipment has operated and failure of such samples to meet all grading requirements for the aggregate discontinuance of such stockpiling procedures.
- F. Transfer the aggregate from the stockpiles in such a manner that uniform grading of the material is preserved.

3.4 TRUCK STOCKPILING

- A. Materials stockpiled by trucks shall construct the stockpile in tiers approximately 4 feet in thickness. Complete each tier before the next tier is started.

3.5 ASPHALT MIXING PLANTS

- A. Use mixing plants of either the weight batching type, the continuous flow mixing type, or drum dryer type. Use drum dryer mixers specifically designed and constructed for producing hot mix.
- B. Equip all plants with approved conveyors, power units, aggregate handling equipment, aggregate screens and bins that are coordinated and operated to produce a uniform mixture within the specified job mix tolerances.
- C. Use batch-type plants having a minimum batch production capacity of 2,000 pounds. Use continuous flow or drum dryer plants having a minimum production capacity of 60 tons per hour. These capacity requirements may be modified if specified in the Contract Documents.
- D. Stop production and remove from the project mixing plants that fail to continuously produce a mixture meeting requirement as specified.

3.6 INSPECTION AND CONTROL OF ASPHALT MIXING PLANT

- A. For verification of weights and measures, character of materials and determination of temperatures used in the preparation of the paving mixes, the ENGINEER or ENGINEER’s authorized representative will, at all times, have access to all portions of

the mixing plant, aggregate plant, storage yards and other facilities for producing and processing the materials for the work. All sampling and testing of processed and unprocessed material is performed in accordance with the provisions of the Contract Documents.

3.7 MIX DESIGN

- A. The Owner's acceptance testing agency may make gradation analyses of the completed mix to assure that the materials being produced and used are within the tolerances of the mix design and the specifications of the mix being used.

3.8 SAMPLING AND TESTING FOR ACCEPTANCE

- A. Sampling and testing of aggregates or other constituent materials may be performed by the Owner's testing agency at a frequency determined by the Owner or the Owner's representative. Field control is performed under AASHTO T245, ASTM D6926 & D6927, and ASTM D6925. Field density testing is by core testing for acceptance purposes. Densities to conform to Section 2510,3.28. Gradations to be within the job mix gradation limits. Oil content to be within 0.4% of the Mix Design.
- B. Samples will be used to verify compliance with the requirements set forth in this Section. If there is a dispute, a third-party testing firm may be retained by the CONTRACTOR for additional retesting.

3.9 WEATHER LIMITATIONS

- A. When the moisture in the stockpiled aggregate or the dryer adversely affects the quality of mix production, normal plant operations, or when pools of water are observed on the base, mixing and placing of hot-mix asphalt is prohibited.
- B. Do not place asphalt hot-mix surface course mixture when the air temperature is less than 40° F (4° C) and rising. Do not place asphalt hot-mix base course mixtures of compacted lifts 4 inches or more when the air temperature is less than 30° F (-1° C) and rising. Do not place asphalt upon a surface which is frozen or that has a temperature of less than 32° F (0 ° C). Do not place paving during rainfall or in standing water.

3.10 SURFACE PREPARATION

- A. Assure the area to be paved is true to line and grade and has a dry and properly prepared surface before starting paving operations. Assure the surface is free from all loose screenings and other loose or foreign material.

3.11 NEW WORK

- A. For new work, meet the surface preparation requirements in Sections 02230, 02234 or 02235 of these specifications. Prime prepared soil or aggregate bases if indicated as a bid item in the Contract Documents.

- B. Before paving, proof-roll the base with equipment having at least one 18 kip single axle load or equivalent. Excavate and replace areas that yield or crack under these wheel loads as directed. This does not replace or relax the base or subgrade compaction requirements.
- C. Paint the surfaces of curbs and gutters, vertical faces of existing pavements and all structures in contact with asphalt mixes with a thin coating of asphaltic material to provide a water-tight joint.

3.12 OVERLAYS OVER EXISTING PAVEMENTS AND OLD BASE

- A. Where a base is rough or uneven, place a leveling course using a paver or motor grader and compact before the placing of subsequent courses.
- B. When specified, place construction fabric to control reflective cracking.
- C. When a leveling course is not specified, patch or correct all depressions and other irregularities, subject to the ENGINEER's approval, before starting other paving operations. Remove all rich and unsuitable patches, excess crack or joint filler, and all surplus bitumen from the area to be paved. Do not blot excessive deposits of asphalt with sand or stone.
- D. Apply a tack coat when the surface to be paved is an existing Portland Cement concrete, brick or asphalt pavement. When a tack coat is required, use the asphalt material indicated, at the rate specified in Section 02502.
- E. Coat the surfaces of curbs and gutters, vertical faces of existing pavements and all structures in actual contact with asphalt mixes with a thin, complete coating of asphalt material to provide a water-tight joint.

3.13 PATCHING

- A. Weather Limitations
 - 1. Follow procedures set out in section 3.10.
- B. Surface Preparations
 - 1. Assure the area to be paved is true to line and grade, is dry and properly prepared surface before starting paving operations. Clean the surface of all loose screenings and other loose or foreign material.
 - 2. Before paving, proof roll the base. Areas that yield excessively or crack under such wheel loads will be excavated and replaced, to correct yielding and cracking problems. This does not replace the base or subgrade compaction requirements. Cut the edge of existing pavements against which additional pavement is to be placed straight and vertical.
 - 3. Minimum standards for patching new or existing pavement include the following:

- a. Neatly cut all asphalt edges using an asphalt saw.
 - b. Cut asphalt edges to form as regular a patch shape as practical and should, in general, approximate a rectangle.
 - c. Cut asphalt edges at least 12 inches wider than the trench width on each side of trench excavations; and, in general, be cut parallel to the street centerline for mainline construction and perpendicular to the street centerline for service lateral construction.
 - d. Skin patches will not generally be considered a satisfactory method of repair.
 - e. Tack coat all existing edges prior to placing new asphalt concrete.
4. Remove and replace asphalt surface widths of less than 3 feet.
- C. Compaction
1. Compact to a density equal to or greater than 92% of Maximum Theoretical Density (RICE) as determined by ASTM D2041.

3.14 TRANSPORTATION OF MIX

- A. Transport the mix in vehicles cleaned of all foreign material which may affect the mix. The truck beds must be painted, or sprayed with a lime-water, soap or detergent solution at least once a day or as often as required. After this operation elevate the truck bed and thoroughly drain it, with no excess solution being permitted. Dispatch the vehicles so that all material delivered is placed in daylight, unless the ENGINEER approves artificial light. Deliver material to the paver at a uniform rate and in an amount well within the capacity of the paving and compacting equipment.

3.15 SPREADING AND FINISHING

- A. Spread and finish meeting the following requirements;
1. The minimum lift thickness shall be no less than three times the Nominal Maximum Aggregate Size for gradations above the Maximum Density Line, and no less than four times the Nominal Maximum Aggregate Size for gradations below the Maximum Density Line.
 2. The maximum lift thickness is 3 inches for surface courses and 6 inches for base courses.

3.16 MECHANICAL PAVERS

- A. Spread and strike off the base and surface courses with a mechanical paving machine. Operate the paving machine so that material does not accumulate and remain along the sides of the receiving hopper.

- B. Do not use equipment which leaves tracks or indented areas, which cannot be corrected in normal operation, produces flushing or other permanent blemishes, or fails to produce a satisfactory surface.
- C. Construct longitudinal joints and edges to true line markings. Establish lines for the paver to follow in placing individual lanes parallel to the centerline of the proposed roadway. Position and operate the paver to follow closely the established lines.
- D. When using pavers in echelon, assure the first paver follows the marks or lines with the second paver following the edge of the material placed by the first paver. To assure a hot joint and obtain proper compaction, assure the pavers work as close together as possible not exceeding 100 feet apart. In backing trucks against the paver, take care not to jar the paver out of its proper alignment.
- E. As soon as the first load of material has been spread, check the texture of the unrolled surface to determine its uniformity. Segregation of materials is not permitted. If segregation occurs, suspend spreading operation until the cause is determined and corrected.
- F. Offset transverse joints in succeeding courses at least 2 feet. Offset longitudinal joints at least 6 inches.
- G. Correct all irregularities in alignment left by the paver by trimming directly behind the machine. Immediately after trimming, thoroughly compact the edges of the course by tamping. Avoid distorting the pavement during this operation.
- H. Assure edges against which additional pavement is to be placed is straight and approximately vertical. Use a lute or covered rake immediately behind the paver, when required, to obtain a true line and vertical edge. Correct all irregularities in the surface of the pavement course directly behind the paver. Remove excess material forming high spots by a shovel or lute. Fill low areas with hot mix and smooth it with the back of a shovel pulled over the surface. Fanning of material over such areas is not permitted.

3.17 MOTOR GRADER

- A. When motor graders are used for the spreading of leveling courses, place the material on the roadbed so that the proper amount of material is available. Spread the mix to the required thickness, line and grade, with a uniform surface texture, while at a workable temperature.

3.18 HAND SPREADING

- A. In small areas where the use of mechanical finishing equipment is not practical, the mix may be spread and finished by hand, if so directed by the ENGINEER. Wood or steel forms, approved by the ENGINEER, rigidly supported to assure correct grade and cross section, may be used. In such instances, measuring blocks and intermediate

strips must be used to obtain the required cross-section. Perform hand placing carefully. Uniformly distribute the material to avoid segregation of the coarse and fine aggregate. Broadcasting of material is not permitted. During the spreading operation, loosen and uniformly distribute all material using lutes or covered rakes. Reject material that has formed into lumps and does not break down readily. Following placing and before rolling, check the surface with templates and straightedges and correct all irregularities.

- B. Maintain the project heating equipment for keeping hand tools free from asphalt. Exercise caution to prevent heating that may burn the material. Assure the temperature of the tools when used is not greater than the temperature of the mix being placed. Use heat only to clean hand tools; petroleum oils or solvents are not permitted.

3.19 COMPACTION

- A. Furnish the number of rollers necessary to provide the specified pavement density. During rolling, keep the roller wheels moist to avoid picking up the material.
- B. After the longitudinal joints and edges have been compacted, start rolling longitudinally at the sides and progress toward the center of the pavement. For transverse graded streets, begin rolling on the low side and progress to the high side, overlapping passes by at least one-half the width of rollers and uniformly lapping each preceding pass. Operate the rollers at a slow, uniform speed with the drive roll or wheel nearest the paver. Do not exceed 3 miles per hour.
- C. Do not quickly change the line of rolling reversing direction suddenly. If rolling displaces the material, re-work the area using lutes or shovels and restore to the original grade of the loose material before re-rolling. Do not permit heavy equipment or rollers to stand on the finished surface before it has been compacted and has thoroughly cooled.
- D. When paving in single width, roll the first lane placed as follows:
 - 1. Transverse joints
 - 2. Outside edge
 - 3. Initial or breakdown rolling, beginning on the low side and progressing toward the high side
 - 4. Second rolling, same procedure as 3
 - 5. Finish rolling
- E. When paving in echelon, or abutting a previously placed lane, perform the longitudinal joint rolling the same as transverse joint rolling.
- F. When paving in echelon, leave 2 or 3 inches of the edge unrolled, which the second

paver can match unrolled. Then the joint between the lanes can be rolled together. Do not leave edges exposed more than 15 minutes without being rolled.

- G. In laying a surface mix adjacent to any finished area, place it high enough so that, when compacted, the finished surface is true and uniform.
- H. On slight grades, check gutters with a straightedge and test with running water to assure drainage to the planned outlet.
- I. The average density shall be equal to or greater than 93% of the maximum density as determined by ASTM D2041 and no individual sample shall be less than 92% of maximum density.

3.20 TRANSVERSE JOINTS

- A. Construct and compact transverse joints to provide a smooth riding surface. Joints will be straight edged, and string lined to assure smoothness and true alignment.
- B. Joint formed with bulkheads to provide a straight line and vertical face will be checked with a straightedge before fresh material is placed against it to complete the joint. If bulkheads are not used to form the joint and the roller is permitted to roll over the edge of the new material, locate the joint line in back of the rounded edge the distance required to provide a true surface and cross-section. If a joint has been distorted by traffic or by other causes, trim it to line. Paint the joint face with a thin coating of asphalt before the fresh material is placed against it.
- C. Place the material against the joints vertical face with the paving machine positioned so that the material overlaps the edge of the joint 1 to 2 inches. Maintain a uniform depth of the overlapped material. Remove and dispose of the coarse aggregate in the overlapped material that dislodged during raking.
- D. Position rollers on the previously compacted material transversely so that no more than 6 inches of the rolling wheel rides on the edge of the joint. Operate the roller to pinch and press the mix into place at the transverse joint. Continue rolling along this line, shifting position gradually across the joint, in 6-to 8-inch increments, until the joint has been rolled by entire width of the roller wheel.
- E. Keep the number of transverse joints to a minimum. When paving single width and maintaining traffic, pave one lane no farther than one block. Complete all lanes to the same station at the end of each paving day. When paving in echelon, bring the lanes up even as is practical.

3.21 LONGITUDINAL JOINTS

- A. Roll longitudinal joints directly behind the paving operation. Assure the first lane placed is true to line and grade and has a vertical face. Place the material in the lane being paved up firmly against the face of the previously placed lane. Position the paver during spreading to assure the material overlaps the edge of the lane previously placed

by 1 inch to 2 inches. Uniformly maintain the width and depth of the overlapped material at all times. Keep the paver aligned with the line or markings placed along the joint for alignment purposes. Before rolling, remove and dispose of the coarse aggregate in the material overlapping the joint.

- B. Shift rollers onto the previously placed lane so that not more than 6 inches of the roller wheel rides on the edge of the fine material left by brooming. Operate the rollers to compact the fines gradually across the joint. Continue rolling until a compacted, neat joint is obtained. When the abutting lane is not placed in the same day, paint the joint with a very thin coating of asphalt before placing the abutting lane. If the joint is distorted during the day's work by traffic or by other causes, carefully trim the edge of the lane to a neat line.

3.22 EDGES

- A. Roll the pavement edges concurrently with or immediately after rolling the longitudinal joint.
- B. Exercise care in consolidating the course along the entire length of the edges. In rolling pavement edges, extend the roller wheels 2 to 4 inches beyond the pavement edge.

3.23 BREAKDOWN ROLLING

- A. Immediately begin breakdown rolling following the rolling of the longitudinal joint and edges. Operate rollers as close to the paver as required to obtain density without causing undue displacement. Operate the breakdown roller with the drive roll or wheel nearest the finishing machine. The ENGINEER may make exceptions when working on steep slopes or super-elevated curves.

3.24 SECOND ROLLING

- A. Assure the second rolling follows the breakdown rolling as close as possible while the paving mix is still at a temperature that will provide the specified density.

3.25 FINISH ROLLING

- A. Perform the finish rolling while the material is still warm enough to remove roller marks. If necessary, the ENGINEER may require using pneumatic-tired rollers. Complete finish rolling the same day the mixture is placed.
- B. In places inaccessible to standard rollers, perform compaction using trench rollers or others to meet the specified compaction requirements. Operate the trench roller as directed until the course is compacted. Hand, manual or mechanical tamping, may be used in such areas if it is proved to the ENGINEER that the operation will provide the specified density.

3.26 SHOULDERS

- A. Where paved shoulders or curbs are not specified, do not place the shoulder material against the pavement edges until the surface course rolling is completed. Take care to prevent distortion of the pavement edge from specified line and grade. When shoulders are paved (except in conjunction with the traveled way paving), cold joint construction procedure is required to assure a tight bond at the joint.
- B. When the rolling of the surface course has been completed and the edges have been thoroughly compacted, immediately place shoulder material against the edges and roll it.

3.27 DENSITY AND SURFACE REQUIREMENTS

- A. The average mat density shall be equal to or greater than 93% of the maximum density as determined by ASTM D2041 for single lift applications. For two lift applications, the first lift on base course shall be a minimum of 92% of the maximum density and the second lift shall be a minimum of 93% of the maximum density. In both cases individual sample shall be no less than 92% of maximum (Rice's) density, prepared as specified in Part 2-Products in this section and made from plant mix meeting the job-mix formula. Verification of maximum density as determined by ASTM D2041 from plant produced material during production is recommended.
- B. The longitudinal joints shall be compacted to a target density of 91 percent of the theoretical maximum specific gravity as determined by ASTM D2041 and no individual sample shall be less than 89 percent of maximum (Rice's) density. The theoretical maximum specific gravity used to determine the joint density will be the average of the daily theoretical maximum specific gravities for the material that was placed on either side of the joint.
- C. Produce a final surface that is uniform in texture and meets the line and grade specified. Before final acceptance of the project or during the progress of the work, the ENGINEER will determine the thickness of all courses. Repair or replace all unsatisfactory work.
- D. Assure density and thickness meets the plans and specifications. During compaction, preliminary tests to aid in controlling the thickness, may be performed by inserting a flat blade, correctly graduated, through the material to the top of the previously placed base, or by other approved methods.
- E. In checking compacted depth, the cutting of the test holes, refilling with acceptable materials and proper compaction may be performed by the Owner's testing agency.
- F. For testing the surface on all courses, a 10-foot straightedge will be used with the centerline of the straightedge placed parallel to the roadway centerline.
- G. Any variations that exceed 5/16-inch in 10 feet for base course and 1/4- inch in 10 feet

for surface course must be corrected. Correct irregularities that may develop before the completion of rolling by loosening the surface mix and removing or adding materials as is required. If any irregularities or defects remain after the final compaction, remove the surface course and place and compact new material to a true and even surface. All minor surface projections, joints and minor honeycombed surfaces must be rolled smooth to grade, as directed.

- H. Remove and replace areas of new pavement requiring patching as directed. Patching material will be tested for meeting specifications. The cost of testing is at CONTRACTOR expense.

3.28 PAVEMENT AND MATERIAL TESTING REQUIREMENTS

- A. CONTRACTOR will produce their own core samples of the asphalt surface courses under the supervision of the Owner's testing agent and give completed cores to the Owner's testing agency to check in place density and compacted depth. The cores are 4-inch diameter. Materials and acceptance tests will be made by the Owner's testing agency to determine the CONTRACTOR's compliance with the specifications.
- B. Materials failing to meet the tests specified may be retested if approved and as directed by the ENGINEER. The CONTRACTOR shall pay the costs of any required re- testing for acceptance purposes. Re-testing will be performed by the Owner's testing agency unless otherwise approved by the owner. If there is a dispute, a third-party testing firm may be retained by the CONTRACTOR for additional retesting for the ENGINEER's review and consideration.
- C. The costs of the following tests are at CONTRACTOR expense:
 - 1. Initial aggregate quality tests
 - 2. Job-mix formula
 - 3. Any tests the CONTRACTOR requires to control his crushing, screening or other construction operations
 - 4. Retesting of failing tests as provided above
- D. Correct all pavement composition, field density, or thickness, deficiencies at CONTRACTOR expense.
- E. The field density and thickness of the pavement is determined by measuring the cores tested. The actual thickness must be no less than 1/4-inch from the specified thickness.
- F. When the measurement of any core is less than the plan thickness by more than the allowable deviation, the actual thickness of the pavement in this area may be determined by taking additional cores at intervals parallel to the centerline in each direction from the affected location. Continue in each direction until a core is found

which is not deficient by more than the allowable deviation. The ENGINEER will evaluate areas found deficient in thickness and determine which areas warrant removal. Remove and replace the areas with asphaltic concrete of the thickness shown on the plans. Additional coring is considered as re-testing of failing areas.

PART 4 - MEASUREMENT AND PAYMENT

4.1 SQUARE FOOT BASIS

A. Asphalt Concrete Pavement

1. These items are measured by the square foot of asphalt pavement surface area. The quantities measured for payment are the square feet of specified thickness of asphalt paving in the completed and accepted work as measured in the field. _____" Thickness of Asphalt Concrete Pavement Base or Surface Course. Grade is paid for at the unit price bid per square foot.
2. Price and payment is full compensation for cleaning base or underlying course; for producing, furnishing, transporting, stockpiling, heating, drying and screening of aggregate materials; for furnishing, handling, measuring, mixing, manipulating and placing of materials; for hauling, placing, shaping, compacting and finishing of the paving mix; for improving unsatisfactory areas; for furnishing samples; for all materials (exclusive of asphalt and mineral filler), manipulation, labor, tools, equipment and incidentals necessary to complete the work in full compliance with the plans and specifications.
3. Payment is made under:
 - a. Asphalt pavement (light duty – 3") – per square foot.
 - b. Asphalt pavement (heavy duty – 4") - per square foot.
4. Asphalt Cement
 - a. No separate measurement and payment is made for this item. The cost for this item is to be included in the cost for Asphalt Concrete Pavement Base and/or Surface Course.
5. Hydrated Lime
 - a. This item is measured by the ton of 2,000 pounds for the amount of hydrated lime actually used in the completed and accepted work. The quantity of Hydrated Lime, measured as provided above, is paid for at the unit price bid per ton.
 - b. Price and payment is full compensation for furnishing, storing, handling and other charges, all tools, equipment, labor and performance of all work necessary to mix the hydrated lime with the asphalt concrete and all other

incidentals necessary to complete this item.

- c. Payment is made under:
 - i. Hydrated Lime - per ton.

4.2 LINEAR FOOR BASIS

A. Asphalt Concrete Pavement Base and Surface Courses

1. These items are measured by the linear foot of asphalt pavement trench restoration. The quantities measured for payment are the linear feet of specified thickness of asphalt paving in the completed and accepted work as measured in the field along the trench centerline.
2. Price and payment is full compensation for cleaning base or underlying course; for producing, furnishing, transporting, stockpiling, heating, drying and screening of aggregate materials; for furnishing, handling, measuring, mixing, manipulating and placing of materials; for hauling, placing, shaping, compacting and finishing of the paving mix; for improving unsatisfactory areas; for furnishing samples; for all materials (exclusive of asphalt and mineral filler), manipulation, labor, tools, equipment and incidentals necessary to complete the work in full compliance with the plans and specifications.
3. Payment is made under:
 - a. _____ " Thickness of Asphalt Concrete Pavement - Base Course - per linear foot.
 - b. _____ " Thickness of Asphalt Concrete Pavement - Surface Grade _____ Course - per linear foot.
4. Payment is made under:
 - a. Asphalt Concrete Pavement Base Course - per linear foot.
 - b. Asphalt Concrete Pavement Surface Course Grade _____ - per linear foot.

B. Asphalt Cement

1. No separate measurement and payment is made for this item. The cost for this item is to be included in the cost for Asphalt Concrete Pavement Base and/or Surface Courses.

C. Hydrated Lime

1. This item is measured by the ton of 2,000 pounds for the amount of hydrated lime actually used in the completed and accepted work.

2. The quantity of "Hydrated Lime", measured as provided above, is paid for at the unit price bid per ton. Price and payment is full compensation for furnishing, storing, handling and other charges, all tools, equipment, labor and performance of all work necessary to mix the hydrated lime with the asphalt concrete and all other incidentals necessary to complete this item.
3. Payment is made under:
 - a. Hydrated Lime - per ton.

4.3 PATCHING

- A. Patching is paid for at the contract unit price bid. Price and payment is full compensation for work and incidentals necessary to complete this item.
 1. Payment is made by either of the following as identified under in the Contract documents:
 2. Square Foot Basis
 - a. These items are measured by the square foot of asphalt pavement. The quantities measured for payment are the square feet of specified thickness of asphalt paving in the completed and accepted work as measured in the field.
 3. Tonnage Basis
 - a. These items are measured by the ton of 2,000 pounds of asphalt paving mixture, including the weight of the asphalt cement. The quantities measured for payment are the amount of asphalt paving materials actually used in the completed and accepted work in accordance with the plans and specifications.
 - b. Payment will not be made for correction of defective work as described in Section 3.29.
 4. Price and payment is full compensation for cleaning base or underlying course; for producing, furnishing, transporting, stockpiling, heating, drying and screening of aggregate materials; for furnishing, handling, measuring, mixing, manipulating and placing of materials; for hauling, placing, shaping, compacting and finishing of the paving mix; for improving unsatisfactory areas; for furnishing samples; for all materials (exclusive of asphalt and mineral filler), manipulation, labor, tools, equipment and incidentals necessary to complete the work in full compliance with the plans and specifications.
 5. Payment is made under:
 - a. _____" Thickness of Asphalt Concrete Pavement - Base Course - per ton

or square foot.

- b. _____” Thickness of Asphalt Concrete Pavement - Surface Grade _____”
Course - per ton or square foot.

END OF SECTION

**SECTION 02528
CONCRETE CURB AND GUTTER**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This work is constructing combined curb and gutter using structural concrete and meeting the lines, dimensions, and grades shown on the plans and these specifications.

1.2 REFERENCES

AASHTO M 213	Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction
AASHTO M 148	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

PART 2 - PRODUCTS

2.1 PRE-FORMED EXPANSION JOINT MATERIAL

- A. Furnish pre-formed expansion joint material meeting the requirements of AASHTO 213.

2.2 GRAVEL BASE MATERIAL

- A. Furnish gravel base meeting all applicable portions of Section 02221 TRENCH EXCAVATION AND BACKFILL.

2.3 CURING AND PROTECTIVE COATING MATERIALS

- A. Liquid Membrane-Forming Compounds for Curing Concrete
 - 1. Furnish liquid membrane-forming compound meeting the requirements of AASHTO M148, Type 1, clear or translucent.
 - 2. Apply liquid membrane forming compound between April 15 and August 14 of each year unless daily temperatures outside of that date range are between 40- and 90-degrees Fahrenheit.
- B. Emulsified Linseed Oil Compound
 - 1. Assure it meets all requirements of AASHTO M148 and contains at least 2.7 pounds of linseed oil per gallon. Furnish a manufacturer's certification showing that the formulated weight of linseed oil per gallon equals or exceeds this limit.
 - 2. Apply water-soluble or emulsified linseed oil compound between August 15 and April 14 of each year.

PART 3 - EXECUTION

3.1 GENERAL

- A. Concrete curb and gutter may be machine-laid or hand-formed.

3.2 FOUNDATION PREPARATION

- A. Excavate the foundation to the specified depth. Assure the subgrade or base course for the concrete has a firm and even surface and is compacted.
- B. Complete excavation to the lines shown in the contract documents or as specified by the Engineer.
- C. Place at least 6 inches of gravel base material and compact it to 95% of ASTM D- 698. This requirement is waived if curb and gutter is installed on a portion of street base course material of 3 inches or more in thickness.
- D. For new street construction or street reconstructing, place gravel base course for the street 9 inches beyond back of the curb.

3.3 FORMS

- A. Use metal forms unless otherwise approved of the depth equal to the face of the item being constructed. Obtain Engineer approval of in-place forms before placing concrete.
- B. Assure forms produce the shape, lines, and dimensions shown on the plans and/or drawings. Assure forms prevent leakage of mortar and maintain position and alignment. Thoroughly clean and oil before placing and do not remove forms until the concrete has hardened sufficiently to prevent damage.
- C. Where the curb and gutter is to abut an existing sidewalk, use an approved face-of-gutter form secured to maintain an established gutter grade. Vary the curb height to assure the top of curb matches as nearly as possible the standard curb and gutter cross section. Obtain Engineer approval to hand form lengths not exceeding 10 feet.
- D. Form radii using flexible or curved metal forms set to fit the specified curvature. Obtain Engineer approval before using wood forms. Radii may be formed by using segments of straight forms if the length of the straight segment does not exceed 1/10th of the length of the radius.

3.4 REINFORCEMENT

- A. Place reinforcement as required. Place and hold in position before placing concrete.

3.5 PLACING CONCRETE

- A. Place and compact the subgrade to the specified grade before placing concrete. Dampen the subgrade just before placing the concrete. Spade and tamp the concrete thoroughly into the forms to provide a dense, compacted concrete free of rock pockets. Float, finish,

and broom the exposed surfaces. Each placing/finishing crew shall have at least one ACI Flatwork Finishing Technician level or above, on site at all times.

- B. Do not place concrete at a rate that exceeds the finishing operation's ability to meet these specifications.
- C. Machines or equipment that extrude curb and gutter may be used when approved, provided they produce a finished product matching that obtained by the set-form method. Use slip-form machines that are automatically controlled for longitudinal grade, alignment, and transverse slope by sensing devices operating from string lines set from construction stakes placed by the Engineer or a stringless slip-form machine operating from an integrated machine control model.

3.6 STRIPPING FORMS AND FINISHING

- A. Forms
 - 1. Remove forms when the concrete is sufficiently set to prevent chipping or spalling. When forms are removed before the curing period has expired, protect the concrete edges with moist earth or spray edges with curing compound. Clean, oil, and examine all forms for defects before they are used again.
- B. Finishing
 - 1. Finish the surface of concrete curbs and gutters true to the lines and grades shown on the plans. Work concrete until the coarse aggregate is forced down into the body of the concrete and no coarse aggregate is exposed.
 - 2. Fill honeycomb or other blemishes in formed surfaces with grout to the specified finish. Tool all edges to a ¼-inch radius. Float the surface using a magnesium float to a smooth and uniform surface. When the concrete in the curb and gutter has hardened sufficiently, give the surface a broom finish. Obtain Engineer approval of the broom before use. Broom the surface without tearing the concrete. Broom to produce regular corrugations not exceeding 1/8-inch deep.
 - 3. After finishing and brooming, stamp and mark into the concrete to mark sewer and/or water service lines if required by MSU.
- C. Crew
 - 1. Do not apply additional surface water. The Engineer may permit adding water, but it must be applied by fog spray only. Use of an evaporation retardant, Confilm, or equal, following the manufacturer's directions is permitted.

3.7 JOINTS

- A. Place curb and gutter monolithically with no construction joints permitted, except at planned expansion joints.
- B. Construct expansion joints at construction joints, junctions with existing concrete, and opposite to or at expansion joints in adjacent concrete, and at maximum 300-foot

intervals in a continuous run of concrete being placed. Form expansion joints using ½-inch thick, pre-formed expansion joint filler, as specified in Section 02528.2.3.

- C. Form or cut contraction joints 1/8-inch wide to one-fourth the depth of the concrete being placed. Construct the joints to coincide with the joints in adjacent concrete or in uniform sections 10 feet in length. Where required to make a closure, sections less than 10 feet in length will be permitted with the minimum length being 4 feet. When contraction joints are made by approved forming or grooving before the concrete has set, tool the edges to the approved radius.

3.8 CURB BACKFILL

- A. Complete the curb backfill to 6 inches below the top of curb before final grading of the subgrade and placing the street section base course.
- B. Backfill using impervious dirt up to 6 inches below top of curb. Do not use sand or gravel backfill in this area.
- C. In areas of existing lawns, use black loam or approved topsoil for the top 4 inches of backfill. Place it out from the curb and in the amount required to replace the turf or lawn removed during installation. Place the backfill to a point level with the top of the curb, immediately adjacent to the curb, and grade and blend to match the existing undisturbed lawn area.
- D. Where lawns do not exist, place the top 4 inches of backfill using impervious dirt and conforming to the typical sections shown on the plans.
- E. Compact backfill to prevent settlement and level the surface to be free draining. Complete all backfill within 3 days of adequate curing.

3.9 PRIME AND SEAL COAT PREPARATION

- A. Paint the edge of the gutter adjacent to the asphalt surfacing with an asphalt prime coat before placing the pavement surface course. When an asphalt seal coat is specified, apply the oil and cover aggregate 3 inches on to the gutter to provide a good seal on the joint between the concrete and pavement.

3.10 TOLERANCES

- A. Perform the work to produce a curb and gutter meeting the specified line and grade uniform in appearance and structurally sound. Remove and replace at contractor expense curb and gutter having unsightly bulges, ridges, and/or low spots in the gutter, or other defects as directed. Grade cannot deviate more than 1/8-inch, and alignment not vary more than ¼-inch from plan elevation, grade, or alignment. Tolerances may be checked using survey instruments, straight edges, or water puddling. Puddled water cannot exceed ¼-inch in depth.

PART 4 - MEASUREMENT AND PAYMENT

4.1 COMBINED CONCRETE CURB AND GUTTER

- A. This item is measured and paid for by the lineal feet of combined curb and gutter in place at the contract unit price bid for “Combined Concrete Curb and Gutter”. Price and payment is full compensation for all materials, curing of concrete, painting face gutter with primer, all pre-molded mastic material for expansion joints, contraction joints, steel dowels and sleeves, all equipment, tools, labor, and for the performance of all work and incidentals necessary to complete the item. The lineal feet measurement is the horizontal distance measured along the face of the curb.

- B. Curb excavation and backfill is paid for separately, as specified in Section 02230, STREET EXCAVATION, BACKFILL, AND COMPACTION. Payment is made under Combined Concrete Curb and Gutter – per lineal foot.

END OF SECTION

SECTION 02529

CONCRETE SIDEWALKS, PLAZA, DRIVEWAYS, APPROACHES, CURB TURN FILLETS, VALLEY GUTTERS AND MISCELLANEOUS NEW CONCRETE CONSTRUCTION

PART 1 - GENERAL

1.1 DESCRIPTION

- i. This work is the construction of concrete sidewalk, sidewalk finishes, and driveway approaches, curb turn fillets, valley gutters, new street monuments, and all other miscellaneous new concrete construction complete in place. In the event that there is any discrepancy between this specification section and the Geotechnical Report within the Project Documents, the more stringent requirement shall govern.

1.2 REFERENCES

AASHTO M 213	Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction
AASHTO M 148	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

1.3 SUBMITTALS

- A. Samples: 10-lb sample of exposed aggregate. Information from aggregate supplier indicating source, type, color, and gradation of aggregate shall accompany sample.

1.4 QUALITY ASSURANCE

- A. Mockups: Cast mockups of full-size sections of plaza concrete pavement to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.
 1. Build a 4' x 4' mockup on site. If location not indicated, as directed by Owner's representative.
 2. Notify Owner's representative seven days in advance of dates and times when mockups will be constructed.
 3. Obtain approval from Owner's representative before starting mockup construction.
 4. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
 5. Demolish and remove approved mockups from the site when directed by Owner's representative.

PART 2 - PRODUCTS

2.1 STRUCTURAL CONCRETE

- A. Furnish structural concrete meeting the requirements of Section 03310, STRUCTURAL CONCRETE.

2.2 PRE-FORMED EXPANSION JOINT FILLER MATERIAL

- A. Furnish joint material meeting the requirements of AASHTO M213.

2.3 GRAVEL BASE MATERIAL

- A. Furnish crushed base material meeting applicable requirements of Section 02235, CRUSHED BASE COURSE, and meeting the gradation requirements for 1 inch minus material.

2.4 CURING AND PROTECTIVE COATING MATERIALS

- A. Liquid Membrane-Forming Compounds for Curing Concrete
 - 1. Use liquid membrane-forming compounds meeting the requirements of AASHTO M148, Type 1, clear or translucent. Apply the compound between April 15 and August 14 unless daily temperatures outside of that date range are between 40- and 90-degrees Fahrenheit (4-32° C).
- B. Emulsified Linseed Oil Compound
 - 1. Apply water-soluble or emulsified linseed oil compound between August 15 and April 14 as a protective coat. Assure it meets all requirements of AASHTO M148 and contains at least 2.7 pounds of linseed oil per gallon. Furnish a manufacturer's certification showing that the formulated weight of linseed oil per gallon equals or exceeds this limit.

2.5 EXPOSED AGGREGATE CONCRETE MATERIALS

- A. Exposed hard, sound, durable, and free of all deleterious materials and staining qualities. Provide aggregates from a single source.
 - 1. Store select seeding aggregates off the ground and protected from moisture.
 - 2. Water: Potable
 - i. Pea gravel to be used shall consist of naturally occurring, semi-round, smooth, water washed, river stone. Pea Gravel color ranges include brown, tan, white, and buff colors. Aggregate size shall be a minimum of 3/8 inch and a maximum of 3/4 inch. Aggregate size/color to be approved at mockup.
 - ii. Colloidal Silica Concrete Surface Treatment: Single component colloidal silica-based admixture for improving surface properties; Reducing efflorescence in colored concrete, improving workability for consistent aggregate exposure, Improving the bond between aggregate and concrete

paste for more durable exposed aggregate finishes.

3. Surface Retarder: Water based treatment designed to retard the hydration of top layer of concrete paste, producing an exposed aggregate, or sand finish appearance. Exposure depth shall be 3/8" to 1/2".
4. Curing and Sealing: Curing and sealing products to be determined at time of mockup.
 - i. Concrete Surface Sealer: VOC compliant, clear acrylic or penetrating sealer, designed to reduce porosity of exposed aggregate concrete surface.

PART 3 - EXECUTION

3.1 GENERAL

- A. Construct sidewalks and driveway approaches, either new or replacement, valley gutter and curb turn fillets at the locations shown on the plans and where directed by the Engineer meeting these specifications and the applicable portions of Section 03310, STRUCTURAL CONCRETE.
- B. The use of slip form machines is prohibited for items in this section unless otherwise specified or permitted by the Engineer.
- C. During periods of cold weather, Contractor must submit to Engineer a cold weather concreting plan applicable to Section 03310 for approval.

3.2 FOUNDATION PREPARATION

- A. Excavate to the specified depth, or as directed by the Engineer. Assure the concrete subgrade has a firm and even surface and is compacted as specified in Section 02230: Street Excavation, Backfill, and Compaction, as may be modified by the Standard Modifications.
- B. Place and compact at least 3 inches of gravel base material compacted to 95% of ASTM D-698. This requirement is waived for concrete if it is to be installed on street base course material exceeding 3 inches or more in thickness and is approved by Engineer.
- C. Do not remove sidewalks, private driveways, or conduct foundation preparation activities more than 4 days prior to the planned concrete pour.

3.3 FORMS

- A. Furnish forms to produce the shape, lines, and dimensions shown on the plans and/or drawings. Assure forms prevent leakage of mortar and are maintained in proper position and accurate alignment. Thoroughly clean and oil forms with an approved form oil before placing concrete and remove forms only after the concrete has hardened

sufficiently to support all loads without damage.

- B. Form radii using flexible or curved forms set to the required curvature. Use wood forms only with the Engineer's approval. Radii may be formed by using segments of straight forms if the length of the straight segment does not exceed one-tenth of the length of the radius.
- C. Use forms and pre-formed expansion joint filler material for same depth as concrete.

3.4 REINFORCEMENT

- A. Place and hold in position reinforcement meeting the contract requirements, or as directed by the Engineer, before placing the concrete.

3.5 PLACING CONCRETE

- A. Assure the subgrade is compacted and brought to specified grade before placing concrete. During extreme drying conditions, dampen the subgrade immediately before placing the concrete. Spade and tamp the concrete into the forms providing a dense, compacted concrete free of rock pockets. Float, finish and broom the exposed surfaces. Each placing/finishing crew shall have at least one ACI Flatwork Finisher Technician level or above, on site at all times.
- B. Assure the rate of concrete placement does not exceed the rate at which the various placing and finishing operations can be performed in accordance with these specifications.

3.6 STRIPPING FORMS AND FINISHING

- A. Forms
 - 1. Remove forms when the concrete is sufficiently set to prevent chipping or spalling. When forms are removed before the curing period has expired, protect the concrete edges with moist earth or spray edges with curing compound. Clean, oil, and examine all forms for defects before they are used again.
- B. Finishing
 - 1. Finish the concrete surface true to lines and grades shown on the drawings. Work concrete until the coarse aggregate is forced down into the body of the concrete and no coarse aggregate is exposed. Float the concrete surface using a magnesium float to a smooth and uniform surface. Plastering of the surface is prohibited. Edge all outside edges of the slab and all joints using a ¼ inch radius edging tool.
 - 2. Immediately after the forms have been removed, remove all form bolts and tie wires to a depth of at least ½ inch below the surface of the concrete. Clean and fill all holes and depressions caused by the removal or setting back of form bolts or

tie wires with Portland Cement mortar composed of 1 part cement by volume and 2 parts sand. Chip out, clean and fill all rock pockets, honeycombs, and air pockets with mortar, in compliance with instruction of the Engineer. If, in the judgment of the Engineer, rock pockets are of such an extent or character as to materially affect the strength of the structure or to endanger the life of the steel reinforcement, they may declare the concrete defective and order the complete removal and replacement of that portion of the structure so affected.

3. Carefully make all mortar patches using a very dry mortar tamped firmly in the void. Keep the patches wet for a period of 3 days after which it will be inspected for shrinkage cracks. Excessive cracking will require complete removal and replacement of the patch.
4. Screed, float and light broom finish sidewalks, exterior slabs, approaches, etc. and membrane cure. After concrete has hardened sufficiently, give the surface a broom finish. Obtain Engineer approval of the broom before use. Assure the broom strokes are square across the concrete from edge to edge, overlapping adjacent strokes. Broom without tearing the concrete. Assure the broomed finish produces regular corrugations not exceeding 1/8 inch in depth.
5. Steel trowel finish interior floor surfaces which will be exposed after construction is completed, surfaces to be covered with resilient floor coverings or seamless floor coverings, the exposed portion of the top of equipment bases, the top of interior curbs, and other surfaces designated on the drawings. Perform troweling after the second floating when the surface has hardened sufficiently to prevent an excess of fines from being drawn to the surface. Produce a dense, smooth, uniform surface free from blemishes and trowel marks.
6. Apply liquid or shake-on floor hardener to all interior concrete floors which are subject to foot or equipment traffic and are not required to be covered with resilient floor coverings or seamless flooring. Prior to application, thoroughly clean the floor of all dirt, grease, and other foreign matter. Do not apply curing compounds to floors scheduled to receive floor hardener unless compatibility with the hardener is demonstrated in manufacturer's data.
7. Do not apply additional surface water. The Engineer may permit adding water, but it must be applied by fog spray only. Use of a film forming evaporation retardant, following the manufacturer's directions, is permitted.
8. Exposed Aggregate Finish:
 - i. Do not use tools that may force the aggregate away from the surface creating a non- uniform surface after exposure.
 - ii. Finish slab surface to be uniform, flat, without low spots or ridges. Do not overwork the surface to be exposed.

iii. COLLOIDAL SILICA SURFACE TREATMENT INSTALLATION

- (a) Apply per manufacturer's recommendations based on application time.
- (b) Prevent overspray of material to adjacent equipment and construction materials.

iv. CONCRETE SURFACE RETARDER INSTALLATION

- (a) Protect all adjacent concrete surfaces, pavers, stones, borders, etc. that are not to receive retarder finish prior to concrete placement and retarder application.

(b) Application

1. Spray the Concrete Surface Retarder with low-pressure sprayer at a rate of 250- 300 ft²/gallon.
2. Maintain an even continuous application.
3. Once dry, Concrete Surface Retarder will yield a coating that provides intermittent rain protection. Protect the surface if heavy extended rains are predicted or during extremely hot weather to retain moisture and protect the etch retention.

(c) Removal

1. Concrete Surface Retarder can be removed when the underlying concrete has sufficiently hardened, typically ranging from 5 to 12 hours after initial placement. Do not exceed 24 hours before removing
2. Wash surface with running water with a push broom, high pressure washing, or a rotary buffer with bristle attachment and water.
3. Timing and removal should be determined by the project testing and jobsite samples. When using light etches, it is generally better to remove Surface Retarder the same day.
4. Dispose of wash water slurry in accordance with environmental regulations per relevant jurisdictional authority.

- (d) Curing Compound, as determined: After water from removal has dissipated from the slab, apply curing compound uniformly. Follow manufacturer's recommendations for coverage, methods, and environmental allowances.

- (e) Sealer, as determined: After recommended cure time has been achieved, apply surface sealer. Follow manufacturer's recommendations for coverage, methods, and environmental allowances.

3.7 CURING

- A. Cure meeting Section 03310, STRUCTURAL CONCRETE requirements.

3.8 JOINTS

- A. Plaza areas within the project shall conform to the jointing requirements as indicated in the Project Plans.
- B. Extend isolation joints the full depth of the concrete and fill using ½-inch thick, pre-formed expansion joint filler material as specified in Section 02529.3.3. Place isolation joints meeting this requirement where new concrete abuts existing concrete. Form isolation joints around all appurtenances, such as manholes, utility poles, etc. extending into and through the concrete.
- C. Install pre-formed joint filler between concrete and any fixed structure, such as a building or bridge. Assure all expansion joint materials extend the full depth of the concrete. Place isolation joints at radius points, junctions with existing concrete, and opposite to or at expansion joints in adjacent concrete. Form cold joints at unions of consecutive pours as shown on the plans or directed by the Engineer. Assure the cold joint is vertical, the full depth of the concrete, and tooled to a ¼-inch radius.
- D. Divide sidewalk into sections using contraction joints formed by a jointing tool or other approved methods. Extend the contraction joints into the concrete for at least 25% of its depth and be approximately 1/8-inch wide. Unless otherwise directed, space contraction joints at maximum 10-foot intervals or at a distance equal to the sidewalk width, whichever is less. In continuous sidewalk runs, install isolation joints every 100 feet at intervals equal to the nearest multiple of the contraction joint interval.

3.9 BACKFILL

- A. In areas adjacent to existing lawns, backfill the top 4 inches using black loam or good topsoil suitable for lawn growth. Place it out from the sidewalk or driveway to replace turf or lawn removed during installation. Place the backfill level with the top of the curb, immediately adjacent to the curb, graded and blended to match the existing undisturbed lawn area.
- B. Where lawns do not exist, backfill the top 4 inches with impervious dirt and place to meet the typical sections shown on the plans.
- C. Compact backfill to prevent settlement and level the surface to a neat appearing and free draining surface within 4 days after concrete is placed. Where required by the contract, topsoil shall be placed to the lines and grades of the work. The addition of topsoil, seed, and/or sod and all finish grading work shall be completed and ready for inspection within 6 days of concrete placement.

3.10 TOLERANCES

- A. Assure all items of construction covered by this section present clean, uniform surfaces and lines free of irregularities and distortions. Plane surfaces and vertical tangent lines are tested with a 10-foot straightedge and cannot deviate more than ¼-inch from the straightedge.

3.11 MISCELLANEOUS NEW CONCRETE CONSTRUCTION

- A. Construct new street monuments, new street light bases, and other miscellaneous concrete construction in accordance with detail drawings, or as directed by the Engineer.
- B. New concrete construction required to maintain or restore existing structures will be considered incidental to the cost of pipe installation and no additional payments made. Include the concrete costs associated with thrust blocks with the unit costs bid for the valve, fittings, or appurtenance requiring the thrust block. New concrete work not included above, or specifically called out on the drawings, must first be approved by Engineer.
- C. Construct all curb ramps with detectable warning surfaces in conformance with the requirements of the Americans with Disabilities Act Accessibility Guidelines (ADAAG). Detectable warning surfaces shall be considered deficient and subject to replacement by the Contractor if more than 5% of the truncated domes on a ramp surface are missing or damaged, if the detectable warning product has lost any adhesion to the concrete, or if the detectable warning product is cracked or shows other signs of distress, at the end of the two-year warranty period.

PART 4 - MEASUREMENT AND PAYMENT

4.1 CURB TURN FILLETS

- A. This item is measured and paid for by the number of curb turn fillets constructed, complete in place, including curb, at the contract unit price bid for “Curb Turn Fillets”. Price and payment are full compensation for all material, excavation, backfill, curing of concrete, pre-molded mastic material, equipment, tools and labor, and for the performance of all work and incidentals necessary to complete this item.
 - 1. Payment is made under Curb Turn Fillets – Per each.

4.2 CONCRETE VALLEY GUTTERS

- A. This item is measured and paid for by square foot at the contract unit price bid for “Concrete Valley Gutters”. Price and payment are full compensation for all material, excavation, backfill, curing of concrete, pre-molded mastic material, reinforcing steel, equipment, tools and labor, and for the performance of all work and incidentals necessary to complete this item.
 - 1. Payment is made under:

- i. Concrete Valley Gutters (4' wide) – per lineal foot.
- ii. Concrete Valley Gutters (2" wide) - per lineal foot.

4.3 CONCRETE DRIVEWAY APPROACH

- A. This item is measured and paid for per each (as defined on the plan detail and excluding curb) at the contract unit price bid for "Concrete Driveway Approach". Price and payment are full compensation for all material, excavation, backfill, curing of concrete, pre-molded mastic material, equipment, tools and labor, and for the performance of all work and incidentals necessary to complete this form.
 - 1. Payment is made under: Concrete Driveway Approach (Traffic-rated pad) – each

4.4 CONCRETE SIDEWALK AND PLAZA

- A. This item is measured and paid for by the square foot. Price and payment are full compensation for all material, excavation, backfill, curing of concrete, pre-molded mastic material, equipment, tools and labor, and for the performance of all work and incidentals necessary to complete this item. Item includes formwork, grading, preparation, and installation of all ADA appurtenances including truncated domes (Detectable Warning Surfaces), and all other items to ensure ADA compliance of ADA pedestrian access ramps.
 - 1. Payment is made under:
 - i. Plaza concrete flatwork (heavy duty – 5" + fiber mesh additive – per square foot.
 - ii. Concrete Sidewalk – per square foot.

4.5 STREET MONUMENTS

- A. This item is measured and paid for by the number of monuments constructed as shown on the plans at the contract unit price bid for "Install Monuments, Type I or II". Price and payment are full compensation for all materials, excavation, backfill, forming and curing of concrete, equipment, tools and labor, and for the performance of all work and incidentals necessary to complete this form.
 - 1. Payment is made under Install Monuments:
 - i. Type I – per each.
 - ii. Type II – per each.

END OF SECTION

**SECTION 02530
ADA PARKING IMPROVEMENTS**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This specification covers the installation of American with Disabilities Act (ADA) parking lot improvements to pavement markings, grading improvements, sidewalk improvements, and truncated domes as per the Drawings and Specifications.

1.2 REFERENCES

American with Disabilities Act of 1990 (ADA) Standards for Accessible Design

American with Disabilities Act Accessibility Guidelines (ADAAG) 2010

ASTM D 2628 - Standard Specification for Preformed Polymeric Pavement Marking Tape for Nonairfield Applications

ASTM D 794 - Standard Test Method for Shear Strength of Plastics by Punch Tool

ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension

ASTM D 638 - Standard Test Method for Tensile Properties of Plastics

ASTM D 695 - Standard Test Method for Compressive Properties of Rigid Plastics

ASTM D 792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

ASTM D 882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting

ASTM E 1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

ASTM E 303 - Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester

PART 2 - PRODUCTS

2.1 GENERAL

- A. Pavement Markings
 - 1. All pavement markings shall be preformed polymeric pavement marking tape as per ASTM D 2628.

2. All pavement markings shall be installed in accordance with the manufacturer's recommendations.
 3. All pavement markings shall be reflective.
 4. All pavement markings shall have a minimum shear strength of 15 pounds per inch as per ASTM D 794.
- B. Grading Improvements
1. All grading improvements shall be made in accordance with the requirements of the ADA Standards for Accessible Design and the ADAAG 2010.
 2. All grading improvements shall be compacted to a minimum of 95% of maximum density as determined by ASTM D 695.
- C. Sidewalk Improvements
1. All sidewalk improvements shall be constructed in accordance with the requirements of the ADA Standards for Accessible Design and the ADAAG 2010.
 2. All sidewalks shall have a minimum width of 36 inches.
 3. All sidewalks shall have a maximum cross slope of 2% and a maximum running slope of 5%.
- D. Truncated Domes
1. All truncated domes shall be constructed in accordance with the requirements of the ADA Standards for Accessible Design and the ADAAG 2010.
 2. All truncated domes shall be made of durable material that is resistant to wear and weathering.
 3. All truncated domes shall be placed at a spacing of 24 inches center-to-center in a grid pattern.
 4. All truncated domes shall have a maximum height of 0.2 inches and a minimum height of 0.1 inches.
 5. All truncated domes shall have a base diameter of 0.9 inches and a top diameter of 0.45 inches.
 6. All truncated domes shall be tested for slip resistance.

PART 3 - EXECUTION

3.1 PREPERATION

- A. The CONTRACTOR shall ensure the parking lot area designated for ADA access is graded to the required slope and cross slope.

3.2 PAVEMENT MARKINGS & SIGNS

- A. The CONTRACTOR shall apply ADA markings, if required, in accordance with the approved Drawings and Specifications. The pavement markings shall be applied using traffic paint or thermoplastic material. The CONTRACTOR shall ensure that the pavement markings have a non-slip surface.
- B. The CONTRACTOR shall install ADA Accessible Parking signs in accordance with the approved Drawings and Specifications. MSU shall provide the signs.

3.3 GRADING IMPROVEMENTS

- A. The CONTRACTOR shall install the sidewalks in accordance with the approved Drawings and Specifications. The CONTRACTOR shall ensure that the sidewalks have a minimum width of 36 inches and shall have a non-slip surface. The CONTRACTOR shall also ensure that the sidewalks have a running slope of no more than 4.8%.

3.4 TRUNCATED DOMES

- A. The CONTRACTOR shall install the truncated domes in accordance with the approved Drawings and Specifications. The CONTRACTOR shall ensure that the truncated domes are made of durable and non-slip material. The color of the truncated domes shall be yellow.

PART 4 - MEASUREMENT AND PAYMENT

4.1 PAVEMENT MARKINGS & SIGNS

- A. Payment is made under ADA Parking sign and pavement marking – per each.

4.2 GRADING IMPROVEMENTS

- A. No separate measurement and payment is made for this item. The cost for this item will be included in SECTION 02529 - CONCRETE SIDEWALKS, PLAZA, DRIVEWAYS, APPROACHES, CURB TURN FILLETS, VALLEY GUTTERS, AND MISCELLANEOUS NEW CONCRETE CONSTRUCTION.

4.3 TRUNCATED DOMES

- A. No separate measurement and payment is made for this item. The cost for this item is to be included in SECTION 02529 - CONCRETE SIDEWALKS, PLAZA, DRIVEWAYS, APPROACHES, CURB TURN FILLETS, VALLEY GUTTERS, AND MISCELLANEOUS NEW CONCRETE CONSTRUCTION.

END OF SECTION

**SECTION 02581
PAVEMENT MARKINGS AND MARKERS
(PRE-FORMED PLASTIC, PAINTS AND ENAMELS)**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This work is painting pavement lines, words and symbols, or applying plastic lines, words, symbols, channelization buttons, and other reflective markers meeting these specifications, the standard drawings, and in reasonably close conformity with the lines and dimensions shown in the contract documents or established by the Engineer.

PART 2 - PRODUCT

2.1 PRE-FORMED PLASTIC PAVEMENT MARKING MATERIAL

- A. Furnish plastic pavement markings and legends consisting of reflectorized, pre-fabricated, homogeneous, thermoplastic ribbon of the specified thickness. Assure the plastic contains reflective glass spheres uniformly distributed throughout its cross section and is capable of being affixed to bituminous or Portland Cement concrete pavements using a liquid contact cement or pre-coated, pressure-sensitive adhesive. Furnish white and yellow meeting standard highway colors. Assure the white plastic material is non-yellowing, and the yellow plastic material is non-fading for their expected useful life.
- B. For strip line widths of 6 inches or less, furnish plastic pavement striping material in a single manufactured width equal to the specified width. For specified stripe line widths exceeding 6 inches, furnish plastic pavement striping material in a single manufactured width equal to the specified width or in two or more widths totaling the specified width.
- C. Cut the plastic marking material edges clean and true. Use at least 0.09-inch thick plastic material for inlaying into new asphaltic surfaces. Use at least 0.06-inch-thick plastic material for application to existing surfaces or to hardened new surfaces.
- D. Assure plastic pavement markings for inlay into new asphaltic surfaces are capable of being applied just before the final rolling of the new surface and can be rolled into place with conventional pavement rollers. For inlay applications, assure the plastic and adhesive are not damaged by pavement temperatures exceeding 175° F (79° C) or by water on roller drums.
- E. Assure the plastic pavement marking material and its adhesive are tack free to provide easy handling without using a protective backing and can be repositioned on the surface before being permanently fixed in position. Pre-coated adhesive must be uniformly distributed over the entire contact surface of the plastic material.
- F. Furnish plastic pavement marking material capable of molding itself to pavement contours, breaks, and other surface irregularities under traffic at normal pavement

temperatures. Assure the plastic material will fuse with itself and with previously applied markings of the same composition under normal use conditions.

- G. Assure pavement legends and symbols meet the applicable shapes and sizes specified by the “Manual on Uniform Traffic Control Devices” as adopted by the FHWA.
- H. Assure product agents or distributors furnish the manufacturer’s specifications showing that the material furnished meets or exceeds these requirements and submit evidence of successful product use over a one-year period under similar climatic conditions. Plastic pavement marking material not meeting this use requirement will be rejected.
- I. Submit a 4-inch by 1-foot sample from each lot of plastic material proposed for use on the project to the Engineer for approval. Use only approved plastic pavement marking material on the project.

1. Composition Requirements

- i. Furnish pre-formed plastic pavement marking material consisting of plasticizers, pigments, and graded glass spheres combined and proportioned to meet the following requirements.
 - a) Pigments: Minimum 20 percent titanium dioxide of total pigment for white marking material; minimum 18 percent medium chrome yellow of total pigment for yellow marking material. Use graded glass spheres that are clean, transparent, and meet the requirements of Section 02581.2.02.A.1. Assure the glass spheres are uniformly distributed throughout the entire material.

2. Physical Requirements

- i. Tensile Strength
 - a) Assure the plastic material has a minimum tensile strength of 40 psi of cross section when tested under ASTM D638. The break resistance is based on an average of at least three (3) samples tested at a temperature of 70° – 80° F (22° – 27° C) using a jaw speed of 0.25 inches per minute.
- ii. Plastic Pull Test
 - a) A 1”-6” sample of the plastic material must support a dead weight of 0.66 lb per 0.01 inch of material thickness for at least 5 minutes at 70° –80° F (22°-27° C).
- iii. Bend Test
 - a) The plastic material must be flexible so that at 80° F (27° C), a 3” by 6” sample of the material can be bent over a 1” diameter mandrel until

the end faces are parallel and 1” apart without showing any fracture lines in the uppermost surface under unassisted visual inspection.

- iv. Skid Resistance
 - a) The surface friction of the plastic cannot be less than 35 BPN when tested under ASTM E303.
- v. Reseal Test
 - a) The plastic must reseal to itself without adhesives when tested as follows: Overlap 2 1-inch by 3-inch piece face-to-face so that they form a single 1-inch by 5-inch with a 1 square inch overlap in the center.
 - b) Place the piece on a hard surface with a 1000-gram weight resting uniformly on the entire overlap area and maintain at 140° to 190° F (60°-88° C) for 2 hours. The actual temperature to be maintained depends on the material being tested but must be within the specified range. After cooling to room temperature, the pieces must not separate without tearing.
- vi. Reflectivity
 - a) Furnish reflective pavement marking material having reflective values not less than those listed in the table below. Reflective values are measured under Federal Specifications L-S-300C. The reflective values must be measured on a 2 by 2-1/2 foot panel at 85° incidence and be expressed as average candlepower per foot-candle per 5 square feet of material.

Divergence Angle White Yellow

0.2 Degrees	0.20	0.15
0.5 Degrees	0.15	0.10

2.2 WATERBORNE PAVEMENT MARKING PAINT

A. Waterborne Pavement Marking Paint

- 1. Furnish acrylic latex white and lead-free yellow waterborne pavement marking paint meeting the following requirements.
 - i. Composition – The exact composition is at the manufacturer’s discretion except that the vehicle is to be 100 percent acrylic polymer and the paint is not to contain any ingredient listed below.
 - a) Lead or chromate compounds; mercury; lead; chromate compounds; chlorinated solvents; hydrolysable chlorine derivatives; ethylene-

based glycol ethers and their acetates.

b) Meet the following requirements:

	<u>White</u>	<u>Yellow</u>
Pigment, % solids ASTM D-3723	68 max	68 max
Total Solids, % by weight ASTM D-2369	75 min	75 min
Titanium Dioxide, lbs./gal. ASTM D-4563 & D-1394	1 lb. min.	0.15 lb.
% Non-volatile vehicle of total vehicle weight ASTM D-2697	41 min.	41 min.
VOC content, maximum EPA Method 24	150 g/L	150 g/L
pH, min. ASTM E-70	9.6	9.6
	<u>White</u>	<u>Yellow</u>
Viscosity (Krebs Stormer), K.U., ASTM D-562 @ 77°F, (25° C)	80-95	80-95
Grind, Hegman, min. ASTM D-1210	2	2
Deviation in percent weight per gallon, max. (from manufacturer specified weight)	±.30	±.30
Daylight ¹ Reflectance, min. ASTM D-2805	85	59.1 ²
Contrast Ratio, 15 mils wet min., ASTM D-2805	0.92	0.88

¹The Y-Tristimulus value (luminance) is obtained using a standardized Tristimulus colorimeter using a C illuminant at a two-degree observation angle. The paint sample is drawn to a 15-mil wet film thickness over a white substrate. The department uses a Hunter Lab Miniscan XE Colorimeter and Leneta Corporation Form 5C opacity charts to determine this value.

²Color to match the V+ color on the Hale color chart ±6%.

ASTM TEST

WHITE AND YELLOW

D 711 mod.¹ Dry Time, 15 mil wet film, 65% RH, minutes, max. 10

D1640 mod.²
130 Dry Through @ 90% RH, 15 mil wet film, minutes, max.

ASTM TEST

WHITE AND YELLOW

D 2243³ Freeze-Thaw, White and Yellow Pass

D 2486 Scrub Resistance, cycles min.....
600

D-969 Bleeding Ratio, min.....
- - -

¹Use a wet film thickness of 15 plus or minus 1 mil. Immediately place in a humidity chamber controlled at 65±3% relative humidity and 72.5° F ± 2.5° F (22.5°C ± 1.4° C) with minimal airflow.

²Apply a 15± 1 mil thick film to a non-absorbent substrate and place in a humidity chamber controlled at 85±5% R.H. and 72.5°F ± 2.5°F (22.5°C ± 1.4°C). Determine dry through time under ASTM D 1640 exerting the minimum pressure needed to maintain contact with the thumb and film.

³See B(7), Freeze-Thaw Stability.

c) Titanium. Use Titanium Dioxide meeting ASTM D-476, Type I or II.

ii. Characteristics

a) Flexibility and adhesion. Apply 15 mil wet film thickness to a 3" by 5" (75 mm by 130 mm) tin panel. Dry at 77°F (25°C) for 24 hours followed by two hours at 122°F (50°C). Bend sample over a ½-inch (13 mm) mandrel. Paint to adhere firmly without showing cracking or flaking.

b) Water resistance. Apply 15 mil wet film thickness to a 4" by 8" (102 mm by 203 mm) glass plate. Dry at 77°F (25°C) for 72 hours. Immerse in distilled water at 77°F (25°C) for 24 hours. Air dry for two hours on a flat surface. Paint to not show blistering or adhesion loss.

c) Skinning and lumps. Fill a pint (0.473 L) container ¾ full of paint and

seal tightly. After 72 hours, strain paint through a 100 mesh screen. No lumps or skin retained on the screen is permissible.

- d) Settling. Fill a centrifuge tube with paint and revolve for two hours at 1112 Newtons (250 ft/lbs). Separation from top of vehicle to top of pigment not to exceed 13 mm (1/2- inch).
 - e) Skinning. Fill ½ pint (0.236 L) container half full of paint and seal. Let stand for 24 hours. No skinning to be visible.
 - f) Bleeding. When tested under ASTM D-969, paint to not show perceptible bleeding when painted on a bituminous surface.
 - g) Freeze-thaw stability. When tested under ASTM D-2243, paint to not show coagulation or viscosity change exceeding 10 Krebs units.
 - h) Static heat stability. Pour paint into a pint (473 mL) within 0.25 inches (6.4 mm) of the top, put the lid on and seal with tape, and place the container in an oven heated to 60°C ± 1°C (140°F ± 2°F) for seven days. Equilibrate the paint at standard conditions and thoroughly mix by stirring for at least five minutes. Ensure the paint does not show signs of livering, hard settling, coagulation, lumps or coarse particles. Perform a consistency test meeting ASTM D-562 at 25°C (77°F). Paint viscosity to not vary 10 K.U. from the original viscosity measured at 25°C (77°F).
- iii. Packaging and Marking. Meet subsection 714.04.9 requirements.
 - iv. Sampling and Acceptance. Draw three samples meeting subsection 714.04.8 requirements.
 - v. Retro-reflective Glass Beads. Use silene-coated moisture resistant glass beads meeting subsection 714.05 requirements.
 - vi. Application. Follow the manufacturer's requirements for pavement cleaning and traffic paint application or as follows, whichever is more restrictive.
 - a) Apply to a dry surface.
 - b) Clean the pavement of all loose rock, dirt, and debris immediately before applying the traffic paint.
 - c) Do not heat the traffic paint to exceed 110°F (43.3°C) before and during application.
 - d) Apply the traffic paint when the ambient temperature is 50°F (10°C) and rising. Stop application when the temperature is 50°F (10°C) and dropping and when rain or other weather adverse to the traffic paint

during its drying time is imminent.

- e) Apply traffic paint at 15 mils (0.38 mm) wet thickness in a single application meeting subsection 620.03.3(A).
- f) Remove and replace all defective pavement marking damaged by weather at Contractor expense.
- g) Re-paint, at Contractor expense, all striping represented by paint samples where any specified property is outside 20 percent of the specified value.

vii. Reflective Glass Beads

- a) Glass beads for use in reflectorizing traffic paint markings on pavement by the drop-on method must be spherical and transparent with smooth, lustrous surfaces. The beads, as delivered, must be spherical and transparent with smooth, lustrous surfaces. The beads, as delivered, must be free from extraneous material and clumps of beads that cannot be broken up easily when applying to the stripe.
- b) Imperfections – The glass beads cannot include more than 25 percent irregularly shaped particles when tested under ASTM D1155. Assure the beads are free of scratches, pits, milkiness, dark particles, and excessive air bubbles.
- c) Color – The glass beads must be colorless to the extent that they do not impart a noticeable daytime hue to white pavement markings.
- d) Chemical Stability – The beads must withstand refluxing in distilled water in a Soxhlet extractor for 90 hours without noticeable dulling of surface luster and not more than 2.5 percent loss in weight.
- e) Index of refraction – The glass from which the beads are made must have an index of refraction of at least 1.50 by the immersion method using tungsten light.
- f) Gradation – Assure the glass beads meet the following gradation requirements when tested under the Standard Method of Test for Sieve Analysis of Glass Spheres, ASTM D1214.

<u>Sieve No.</u>	<u>Total Percent Passing</u>
20	100%
30	75-95%
50	15-35%
100	0-5%

- g) Packaging and Marking – Furnish glass beads in bags containing 50

lb. (26 kg) net. Assure the shipping bags are moisture proof, paper-lined burlap bags meeting specification ICC-36-C under Interstate Commerce Commission Regulation Section 78-234. Mark each bag with the name of contents, manufacturer of beads, and net weight.

- h) Certification – Submit certification from a testing laboratory approved by the Engineer certifying the beads meet these expectations.

PART 3 - EXECUTION

3.1 APPLICATION OF PLASTIC PAVEMENT MARKING MATERIAL

- A. Apply plastic pavement marking materials only to clean, dry surfaces free of paint, dirt, and foreign matter. On newly constructed surfaces to which a sealer has been applied, clean the surface receiving the plastic pavement marking to neutralize any acid and remove the sealer.
- B. Apply following the manufacturer's recommended procedures. Apply plastic pavement marking materials only to surfaces at temperatures within the range specified by the manufacturer for optimum adhesion.
- C. When activators are required for the adhesive or when various special coatings are required for different pavement surfaces, supply such information to the Engineer, indicating special application procedures.
- D. Assure the width and layout of stripes or the area of application of plastic pavement markings and legends meet the dimensions shown in the contract documents or standard drawings.
- E. Before applying the plastic striping material, the Engineer will establish control points on the roadway for striping alignment. The Engineer will establish control points every 100 feet on tangent, at least every 100 feet on curves of 2 degrees or less, and at 50-foot intervals for curves over 2 degrees. The Engineer will also designate other pavement striping locations such as stop bars, crosswalks, and the like. Maintain all lines within 2" of established lines.
- F. Place asphaltic surfacing on the roadway just before final compaction and roll into the new surface during final completion. Assure pavement markings or legends are flush with the finished surface.

3.2 PAINTING TRAFFIC LINES

- A. Clean the surface to be painted for dirt, rocks, gravel and any other foreign matter. Apply the paint by hand or mechanical means consistent with the scope of the job. Assure the width and layout of stripes or the area to be painted meets the plans or standard drawings.
- B. Paint the top and traffic side of curbs at those locations where parking is to be

restricted, as shown in the contract documents or in the pavement marking manual. Paint the top and traffic sides of all island curbs, median curb, and other specified curb. Paint by uniformly applying one (1) coat of yellow traffic line paint meeting the requirements of Section 02581.2.2.A.1 as applicable. Paint the curb after it has cured at least 30 days after being cast. Apply the paint at a rate that the curb surface is completely covered and hidden. Assure surfaces to be painted are clean and free of all foreign matter before painting.

- C. Before applying paint, mark the roadway between control points established by the Engineer. The Engineer will establish such control points on tangent every 100 feet and on curves at least every 100 feet for under 2- degree curves and at 50-foot intervals on curves over 2-degree curvature. Maintain the line within 2" of the established lines. The Engineer will also designate other pavement striping locations such as stop bars, crosswalks, and the like.
- D. Apply highway traffic striping during daylight hours when the air and pavement temperatures are 40° F (4° C) or higher, the pavement surface is dry and the weather is not foggy, rainy, or stormy.
- E. Apply paint and glass beads with equipment manufactured specifically for that purpose and using workmen experienced in operating such equipment. Locate the bead applicator directly behind and synchronized with the paint applicator. Assure both devices are shielded to avoid spraying of paint or loss of beads outside of the designated width of line. Assure the equipment is also capable of painting a stripe or stripes of the specified width with a tolerance of plus or minus ¼ inch. In "no passing zones", the machine must be able to paint three (3) stripes simultaneously. For centerline painting, assure the machine is equipped with an automatic skip control giving the specified broken-line pattern within a tolerance of 6 inches over each cycle.
- F. Use hand-operated equipment to stripe stop bars, crosswalks, and other areas not readily accessible to the pavement striping machine.
- G. Apply the pavement striping paint at the following rates per gallon:
 - 1. Four-inch stripe – at least 250 but not more than 275 linear feet per gallon.
 - 2. Four-inch dashed stripe (9-foot stripe-15 foot gap) – at least 665 but not more than 735 linear feet per gallon.
 - 3. Four-inch dashed stripe (10 foot – 30-foot gap) at least 1000 but not more than 1100 linear feet per gallon.
- H. Apply beads at the rate of 6 pounds per gallon of paint, plus or minus 0.1 pound.
- I. For quality control, the Engineer will check the application at the beginning of each day's paint striping and as often as considered necessary. If equipment settings fail to produce quality striping within the limits specified, stop striping work until corrected.

- J. Protect all markings until dry by placing approved guarding or warning devices as necessary. Correct all markings smeared or otherwise damaged at no expense to the owner.
- K. Sufficient quantities of paint have been included in the contract to provide for an interim application and a final application of traffic line paint. The need for applying an interim application will be determined by the Engineer.
- L. When plastic pavement markings are specified, use paint for the interim markings of the specified color and apply as specified in the contract documents. The final application must be plastic.
- M. Apply two (2) full applications of the specified centerline and shoulder line striping on open graded friction course and seal coat pavement surfaces meeting the following table. Apply the second application a minimum of 30 days after the first application.

3.3 PAVEMENT STRIPING – OGFC AND SEAL COATED SURFACES

Pavement Surface Type	Number of Applications	Striping Application		Direction of Travel	
		First Application	Second Application	First Application	Second Application
2 lane	2	Not Specified	Not Specified	Apply in opposite direction of first application	Apply in opposite direction of first application
OGFC and Seal Coated Surfaces	2-way	2	Apply in same direction as traffic flow	Apply in same direction as traffic flow	Apply in same direction as traffic flow
	4-way			Apply in same direction as traffic flow	Apply in same direction as traffic flow

*All transverse lines must receive two (2) applications applied in opposite directions

3.4 REMOVAL OF PAVEMENT MARKINGS

- A. As shown in the contract documents or directed by the Engineer, remove temporary pavement markings or markings that are no longer appropriate to the roadway.
- B. Approved methods of removing markings include sand blasting with air or water; high pressure water; steam or superheated water; mechanical grinders, sanders, scrapers, brushes, burning, and the like.
- C. Choose, subject to Engineer approval, the removal method best suited to the existing condition of the paint and pavement surface.
- D. No other methods of removal other than those specified here will be allowed. The contractor may make written request to the Engineer for approval to use other methods, materials, or equipment. The Engineer may subsequently disapprove any prior approved method should it prove detrimental to the pavement surface or inadequate in removing the markings.
- E. Remove sand or other material deposited on the pavement resulting from removing traffic markings as the work progresses. If the striping removal results in light or discolored lines on the roadway, cover the areas with a thin asphalt fog coat. Repair all

damage to the pavement or surfacing caused by pavement marking removal at no cost to the owner.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Plastic pavement striping is measured for payment by the number of linear feet of line of the specified width and thickness in place and accepted. Length of dashed, longitudinal pavement line is the actual length placed, e.g. 25% of the total roadway length where 10-30 lines gap ratio is used.
- B. Plastic pavement marking words and symbols are measured for payment by the number of square feet of words and symbols in place and accepted.
- C. Painted traffic lines, words, and symbols are measured for payment by the number of gallons of paint used and accepted.
- D. Unless otherwise provided in the contract, removal of pavement markings is measured for payment by the linear foot. Words and symbols are measured by the square foot and converted to the equivalent linear foot of 4 inches wide line.
- E. Paint and painting of curbs, island curbs, and median curbs in accordance with Section 02581.3.2 are measured by the actual gallons of paint used and accepted.
- F. Plastic pavement striping is paid for at the contract unit price per linear foot of striping of the specified width and thickness.
- G. Plastic pavement marking words and symbols are paid for at the contract unit price per square foot of plastic words and at the contract unit price per square foot plastic words and symbols. Payment for plastic lines, words, and symbols is full compensation for furnishing all necessary materials and equipment and doing all required work.
- H. Painting of traffic lines and words and symbols is paid for at the contract unit price per gallon for "Highway Traffic Striping" complete in place, including the furnishing and application of beads. Payment is full compensation for all work necessary to complete the item.
- I. Removal of pavement markings is paid for at the contract unit price per linear foot.
- J. The cost of paint and the painting of curbs, island curbs, and median curbs in accordance with Section 02581.3.2 are paid for at the contract unit price per gallon for curb marking.

END OF SECTION

**SECTION 02720
STORM DRAIN SYSTEMS**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Furnish and install all storm drains, including manholes, inlets, service lines and other appurtenant structures as specified in the Contract and this section. Pipe strength classifications are specified on the plans, listed in the Contract Documents or herein.

1.2 CERTIFICATION BY MANUFACTURER

- A. Furnish a manufacturer's certification on all pipe, certifying that the pipe and fittings meet the contract requirements.

1.3 REFERENCES

AASHTO M36	Corrugated Steel Pipe, Metallic Coated, for Sewers and Drains
AASHTO M196	Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M245	Corrugated Steel Pipe, Polymer-Precoated, for Sewers and Drains
AASHTO M274	Steel Sheet, Aluminum Coated (Type-2), For Corrugated Steel Pipe
AASHTO M294	Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60- in.) Diameter
ASTM C76	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C361	Reinforced Concrete Low Head Pressure Pipe
ASTM C443	Joints for Circular Concrete Sewer and Culvert Pipe, using Rubber Gaskets
ASTM C478	Circular Precast Reinforced Concrete Manhole Sections
ASTM C506	Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C507	Reinforced Elliptical Culvert, Storm Drain and Sewer Pipe

ASTM C655	Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer
ASTM C665	Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
ASTM C789	Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers
ASTM C850	Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers with less than 2 ft of Cover Subjected to Highway Loadings
ASTM D1784	Rigid Polyvinyl Chloride (PVC) Compounds and chlorinated Polyvinyl Chloride (CPVC) Compounds
ASTM D3034	Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
ASTM 3350	Polyethylene Plastics Pipe and Fittings Material
AWWA C151	Ductile Iron Pipe, Centrifugally Cast
ASTM F949	Polyvinyl Chloride (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
ASTM M294	High Density Polyethylene Pipe (HDPE)

PART 2 - PRODUCTS

2.1 GENERAL

- A. Furnish all storm drain piping as specified in the Contract Documents and meeting the materials and testing requirements of this Section. Furnish wye and tee branches of the same material and design as the specified storm drain pipe. Furnish the pipe sizes and strength classifications shown in the Contract documents.
- B. References to ASTM, ANSI or AASHTO designation, means the latest revision at the time of call for bids.
- C. Assure all pipe is clearly marked with type, class and/or thickness as applicable. Assure lettering is legible and permanent under normal handling and storage conditions.
- D. Furnish the joint type, class, thickness designation, casting, lining, marking, testing, etc. as specified.

2.2 PIPE MATERIALS

- A. Concrete Pipe

1. Furnish concrete storm drain and culvert pipe meeting ASTM C76 or C655. Use round reinforced pipe having O-ring rubber gasket joints meeting ASTM C443 with the O-ring gasket confined in the pipe tongue groove.

B. Polyvinyl Chloride (PVC) Pipe

1. Furnish PVC pipe produced by a continuous extrusion process employing a prime grade of unplasticized polyvinyl chloride. Assure the grade used is highly resistant to hydrogen sulfide, sulfuric acid, gasoline, oil, detergents and other chemicals found in sewage and industrial wastes. Assure the material meets "Rigid Polyvinyl Chloride Compounds", ASTM D1784 requirements. Assure the pipe has self-extinguishing flammability characteristics. Assure the pipe meets ASTM D3034, "Standard Specifications for Polyvinyl Chloride Sewer Pipe and Fittings", with an SDR of 35 4"-15" ASTM F679, "Standard Specification for PVC Large Diameter Plastic Gravity Sewer Pipe and Fittings: 18" – 36", or ASTM F949, "Standard Specification for PVC Corrugated (Open Profile) Sewer Pipe With a Smooth Interior and Fittings", 12" – 36".
2. The nominal laying length is a minimum 12.5 feet, 13 feet or 20 feet except shorter lengths are permitted adjacent to manholes, lampholes or other appurtenances. Assure each pipe length is marked with size, SDR, "Sewer Pipe" and Code Number. Assure each pipe length has a bell providing a watertight joint when jointing the bell and spigot with a rubber ring. Make the rubber gasket joint using a rubber gasket compressed between the outer surface of the spigot and the inner surface of the bell. Assure the joint is completely sealed by the gasket providing a watertight joint under all service conditions, including expansion, contraction, settlement and pipe deformation. Assemble the rubber ring joint assembly following the manufacturer's recommendations.
3. Furnish wye or tee fittings of the same material, construction and joint design as the main sewer pipe.

- C. An Owner may allow 'ULTRA FLO' or approved equivalent steel pipe. Connections must be made with minimum coupling band width of 10-1/2" and appropriate gasketing material. When specified by the Engineer, materials shall meet the following standards:

ASTM A760 (AASHTO M36)	Specifications for Corrugated Steel Pipe, Metallic-coated for Sewers and Drains
ASTM A762 (AASHTO M245)	Specifications for Corrugated steel Pipe, Polymer Pre-coated for Sewers and Drains
ASTM A742 (AASHTO M246)	Specifications for Steel Coated and Polymer Sheet, Metallic Pre-coated for Corrugated Steel Pipe

ASTM A929 (AASHTO M274) Specifications for Steel Sheet Metallic Coated for the Hot Dip Process for Corrugated Steel Pipe

D. Other Pipe Material

1. An Owner may select other materials as appropriate for applications where an Engineer has reviewed the circumstances and provided specifications for installation. When specified by and Engineer, materials shall meet the following standards:

ASTM C 76	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C 506	Reinforced Concrete Arch Culvert, Storm Drain, and
Sewer Pipe ASTM C 507	Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
ASTM C 655	Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
ASTM C 789	Precast Reinforced Concrete Box Sections for Culverts, Storm Drains and Sewers
ASTM C 850	Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers with less than 2 ft of Cover Subjected to Highway Loadings
ASTM 3350	Polyethylene Plastics Pipe and Fittings Material
AASHTO M 36	Corrugated Steel Pipe, Metallic Coated, for Sewers and Drains
AASHTO M 196	Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M 245	Corrugated Steel Pipe, Polymer-Precoated, for Sewers and Drains
AASHTO M 274	Steel Sheet, Aluminum Coated (Type-2), For Corrugated Steel Pipe
AASHTO M 294	Corrugated Polyethylene Pipe 300- to 1500-mm (12- to 60-in.) Diameter
ASTM M294	High Density Polyethylene Pipe (HDPE)

2.3 MANHOLES

A. General

1. Furnish manholes constructed of precast concrete sections with frames, covers and steps meeting Standard Drawing Details.

B. Precast Concrete Sections

1. Furnish manholes meeting ASTM C478: "Precast Reinforced Concrete Manhole Sections".

C. Steps

1. Furnish non-corrosive type, 12 inches in width, of 1/2-inch steel rod encased with polypropylene. Assure steps withstand 400 pound vertical loads and 1,000 pound pull-out resistance.

D. Frames and Covers

1. Furnish frames and covers. Furnish 2 hole type covers unless noted or specified otherwise.

E. Concrete Bases

1. Concrete bases may be precast or field-poured on undisturbed earth.

2.4 INLETS AND CATCH BASINS

- A. Furnish standard cast iron inlet frames and grates meeting standard drawing requirements or as specified.

PART 3 - EXECUTION

3.1 PIPE AND SERVICE LINE INSTALLATION

A. Excavation and Backfill

1. Excavate and backfill pipelines meeting the applicable portions of SECTION 02221: TRENCH EXCAVATION AND BACKFILL FOR PIPELINES AND APPURTENANT STRUCTURES.

B. Responsibility for Materials

1. Be responsible for all material furnished. Replace all material found defective in manufacture or damaged in handling after delivery by the manufacturer. This includes furnishing all material and labor required for the replacement of installed material discovered defective before final acceptance of the work or during the guarantee period.
2. Be responsible for the safe storage of material for the work until it has been incorporated in the completed project.

C. Handling of Pipe

1. Deliver and distribute all Contractor furnished pipe. Load and unload pipe, fittings and accessories by lifting with hoists or skidding so as to avoid shock or damage. Do not drop the materials. Do not skid or roll pipe handled on skidways against

pipe already on the ground.

2. In distributing the material at the work site, unload each piece opposite or near the place where it is to be laid in the trench. Keep the pipe interior and other accessories free from dirt and foreign matter at all times.
3. Handle pipe to prevent coating or lining damage. Repair or replace all coating or lining damage in a manner satisfactory to the Engineer.

D. Laying Pipe

1. Lay and maintain all pipe to the specified lines and grades with fittings, tees and manholes at the specified locations.
2. Install wye or tee fittings in the mainline sewer for service line connections. Furnish wye or tee fittings of the same material, design and specifications as the sewer main pipe. Joint service pipe to tee branches or main line pipe other than PVC using special joint adapters manufactured specifically for jointing the two types of pipe.
3. Use tools and equipment meeting Engineer approval for the safe and convenient prosecution of the work. Carefully lower all pipe and fittings into the trench preventing damage to pipe materials and protective coatings and linings. Do not dump or drop materials into the trench.
4. Exercise care to prevent foreign material from entering the pipe as it is installed. When pipe laying is not in progress, close the open ends of pipe using a plug or other means approved by the Engineer. Remove and clean all sand, gravel, concrete and cement grout that has entered the lines during construction.

E. Tolerances

1. Install pipe within 1/2-inch of the specified alignment and within 1/4- inch of the specified grade for pipe 15-inch in diameter and smaller and 1/2-inch of specified grade for pipe larger than 15-inch diameter. These tolerances apply to any point along the entire pipe length.

3.2 MANHOLES

A. Construction

1. Construct manholes to the specified dimensions. Assure invert channels are smooth and semi-circular in shape conforming to the inside of the adjacent pipe section. Make flow direction changes with a smooth curve of as large a radius as the size of the manhole will permit. Make changes in channel size and grade gradually and evenly. Form the invert channels directly in the manhole base concrete or by laying a half-pipe in the concrete. Smooth and slope the manhole floor outside the channel toward the channel at one inch per foot.

2. Joint all connections between manhole walls and base and between wall sections making the manhole watertight.
3. Install adjusting rings on each manhole to adjust the manhole top elevation to the existing or specified ground elevations, with the total ring height of 2-inch minimum and 12-inch maximum. Assure adjusting rings are reinforced with the same percentage of steel as the riser and top.

3.3 INLETS AND CATCH BASINS

- A. Construct inlets and catch basins meeting the standard drawing for the type specified.
- B. Construct inlet structures to the line, cross-section and dimensions specified. Inlet structures may be precast or cast-in-place.

3.4 STORM DRAIN SERVICE LINES

- A. Install the service line to the property line. Plug the end of the service line with a stopper and gasket, using a gasket of the same type used for pipe jointing. Do not grout the plugs.
- B. Mark the sanitary sewer and storm drain service line ends at the property line using a steel fence post 5 feet (1.5 m) long, buried at least 2 feet. Place a 2" X 2" wood marker extending from the pipe invert to ground line. Wire the 2" X 2" marker to the steel fence post. Where applicable, mark the concrete curb to identify the service locations. Paint sanitary sewer service markers green and storm drain service markers gray.

3.5 TESTS

- A. Light Test (Visual)
 1. Once the trench is backfilled, perform a light test between manholes to check alignment and grade for pipe displacement. Except for specified curved alignments, the completed pipeline must permit a true circle of light to be seen from manhole to manhole.
 2. If alignment or grade does not meet specifications, correct alignment or grade at Contractor expense.
- B. Leakage Test
 1. Unless specified, a leakage test will not be required. Obvious and concentrated leaks, such as open joints, pinched gaskets, cracked barrels or bells, are not allowed.
- C. Deflection Test
 1. The Engineer may require deflection testing of all flexible pipe installations to assure the construction quality.

2. Conduct deflection tests meeting ASTM D3034 and satisfy either of the following deflection limitations:

**TABLE 3.1
DEFLECTION TESTING LIMITATIONS**

Minimum Period Between Trench Backfilling & Testing	Minimum Mandrel Diameter as a Percent of Inside Pipe Diameter
7 Days	95.0
30 Days	92.5

3. Mandrels must have at least nine arms. Perform the mandrel test without mechanical pulling devices.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. The following are pay items for the work covered under this section. Payment for these items is full compensation for providing all materials, tools, labor, and equipment necessary to complete the item and all incidental work related thereto, whether specifically mentioned herein or not.

4.2 STORM DRAINS

- A. Measurement of storm drain pipe is lineal feet of the various sizes and classes along the centerline of pipe from center to center of manholes, or center of inlet to center of manhole. Payment for storm drain pipe is made at the contract unit price bid per lineal foot of the various sizes and classes called for, which includes furnishing and installing pipe, trench excavation and backfill, furnishing and placing Type I bedding, specials required for connection to manholes and inlets, testing and all other work necessary or incidental for completion of this item.

4.3 MANHOLES

- A. Measurement of each manhole for payment is made in two parts: (1) for a basic manhole, and (2) for any additional vertical height over and above the basic depth. A basic manhole is defined as 5 feet deep from the lowest invert to the top of the manhole frame and cover. Any manhole less than 5 feet deep is considered as one basic manhole. Any manhole over 5 feet deep is considered as one basic manhole plus a vertical height measurement to the nearest 0.1 foot. Basic manholes are measured by numerical count and the additional vertical feet of manhole. The measurement of the additional vertical height of manhole is the vertical height of the manhole from the lowest invert to the top of the cast iron frame minus 5 feet.
- B. Payment for furnishing and installing a basic manhole complete, is made at the contract unit price bid per each for "Basic Manholes", 5.0 feet deep. Payment includes base, manhole sections, steps, cast iron ring and cover, joint sealer and all other

incidentals required to complete the item.

- C. Payment for furnishing and installing manholes deeper than the basic manhole depth is made at the contract unit price bid per vertical foot for “Additional Manhole Depth” and includes manhole sections, steps, joint sealer and all other incidentals to complete the item.
 - 1. Payment is made under:
 - a. Basic Manhole, 5’0” Depth – Per each
 - b. Additional Manhole Depth – Per vertical foot

4.4 STORM DRAIN INLETS

- A. Storm drain inlets shall be measured and paid for by the number of drain inlets installed, complete in place, at the contract unit price bid for the various types of inlets listed in the Contract documents, which price and payment shall constitute full compensation for all excavation and backfill, furnishing and installing all materials required (including grates), compaction, labor, tools and incidentals necessary to complete the item.

4.5 STORM DRAIN SERVICE LINES

- A. Measurement is made along the pipe from the tee or wye of the main sewer through tees, wyes and other fittings to the street margin or right-of-way margin. Measurement is to the nearest foot.
 - 1. Payment for services is based on the following bid items as specified in the contract:
 - a. Trench excavation and backfill is included in in the linear foot price bid for sewer service pipe.
 - b. (size)(class) Sewer Service Pipe in Place, per linear foot.

4.6 GENERAL

- A. The contract bid prices are full payment for labor, materials, tools, and other incidentals as may be required to complete the items of work in the Contract.

END OF SECTION

**SECTION 02810
IRRIGATION SYSTEM**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of each Contract, including General Conditions and Supplementary Conditions, apply to work of this section.

1.2 DESCRIPTION

- A. The work of this section consists of all items necessary to install the proposed irrigation system as indicated on the plans, and the protection and splicing required to maintain all parts of the existing irrigation system in operation, with the exception of those parts designated to be removed or abandoned. This includes required sleeves for pipe and wire, back-flow prevention devices, reconnections, and miscellaneous modifications to the existing irrigation distribution lines including, but not limited to:
 - 1. Automatic controller and remote-control valves.
 - 2. Lawn and planting beds sprinkler system.
 - 3. Connection to proposed irrigation water source and power supply.

1.3 RELATED WORK DESCRIBED ELSEWHERE

- A. Plants Section 02940
- B. Turf & Grass Section 02930

1.4 QUALITY ASSURANCE

- A. Qualifications of Installer
 - 1. Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials of installation and who shall direct all work performed under this section. All work of this section and related work listed above shall be performed by the same CONTRACTOR.
- B. Codes and Standards
 - 1. In addition to complying with all pertinent codes and regulations, comply with the latest rules of the National Electrical Code for all electrical work and materials.
 - 2. Comply with National Plumbing code at all connections to potable water systems.
 - 3. Where provisions of pertinent codes and standards conflict with the requirements of this section of these Specifications, the more stringent provisions shall govern.

1.5 SUBMITTALS

A. Material List

1. Before any irrigation system materials are delivered to the job site, submit to the OWNER'S REPRESENTATIVE a complete list of all irrigation system materials to be furnished and installed.
 - a. Show manufacturer's name and catalog number for each item, furnish complete catalog cuts and technical data, and furnish the manufacturer's recommendations as to method of installation. Note selected materials if multiple materials are shown on one page. Where materials proposed differ from those specified, furnish complete shop drawings and design calculations to demonstrate equivalent performance of the proposed installation.
 - b. Do not permit any irrigation system component to be brought onto the job site without prior approval by the OWNER'S REPRESENTATIVE. Provide one sample of each element of the system to the OWNER'S REPRESENTATIVE for approval (sprinkler heads, valves, couplings, etc.). These samples will be returned to the CONTRACTOR, and if approved, may be used in the project.

B. Shop Drawings

1. CONTRACTOR shall submit Five (5) copies of the proposed sprinkler layout in a schematic form to the OWNER'S REPRESENTATIVE for approval. Any modifications to these proposed drawings will be returned to the CONTRACTOR for the preparation of five (5) copies of the final revised layout. The material list will be coordinated with the final shop drawings by the CONTRACTOR. Show all sleeve locations.

C. Field Verification

1. CONTRACTOR shall field verify all dimensions, existing and proposed conditions, and as required to provide one complete and operable system. The proposed system shall be laid out above ground using locate flags to show location of all sprinkler heads, valves, and sleeve locations. This layout shall be signed off on by MSU Irrigation Manger before any excavation shall begin.

D. As-built Drawings

- a. Provide a complete set of Mylar reproducible as-built shop drawings to the OWNER'S REPRESENTATIVE for approval prior to final payment.

1.6 PRODUCT HANDLING

A. Protection

1. Use all means necessary to protect irrigation system materials before, during, and after installation and to protect the installed work and materials of all other trades.

B. Replacements

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the OWNER'S REPRESENTATIVE and at no additional cost to the OWNER.

1.7 PERFORMANCE REQUIREMENTS

A. Minimum Requirements

1. The following shall be the minimum requirements of the system. They are not intended to limit the overall intent, which is to obtain a fully operational and completely automatic sprinkler system. Specific requirements of this project manual shall apply to all elements typically. Conflicts between the drawings and the project manual or between specific and general performance of material requirements shall be assumed to be the most expensive.

B. Project Zones

1. Refer to the drawings for the general zones to be served by this system.
 - a. Irrigation layout must be adaptable to the future modification of the system to smaller heads, more intense head arrays and minimal spraying over the sidewalks.
 - 1) This should be accomplished by running the laterals near sidewalk edges whenever possible, and by positioning the mains with this future intent.
 - b. CONTRACTOR will advise himself of all existing and proposed site conditions and related planting and grading as required to coordinate and schedule with the work of other contractors.
 - c. Heads shall be positioned to prevent damage from spraying on the building envelope and/or causing inside flooding in any and all cases.
 - d. Organize zones to allow walking across the area on dry sidewalk while the irrigation system is on.

PART 2 - MATERIALS

2.1 PIPE

A. PVC Pipe

1. PVC pipe 4" and under in diameter shall be rigid non-plasticized Schedule 40 PVC IPS solvent-welded conforming to ASTM D-1784 and D-2241 standard specifications for PVC plastic pipe. Plastic pipe 6" and larger in diameter shall be rigid non-plasticized Class 200 PVC IPS gasket fit conforming to ASTM D-1784 and D-2241 standard specifications for PVC plastic pipe. The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, deleterious material, wrinkles, and dents.
2. All pipes shall be continuously and permanently marked with the following information:
 - a. Manufacturer's name or trademark, size, schedule and type of pipe, working pressure at 73 deg. F and National Sanitation Foundation (N.S.F.) approval.

3. All main lines shall be a minimum of two inches (2") in diameter, unless otherwise noted. Only full inch increment pipe sizes may be used.
4. All lateral lines shall be a minimum of one and one-half inches (1-½") in diameter, unless otherwise noted.
5. All plastic pipe fittings to be installed shall be molded fittings manufactured of the same material as the pipe, rated as a pressure fitting (no DWV fittings shall be allowed) and shall be suitable for solvent weld, slip joint ring-tight seal, or threaded connections. All pipe six inches (6") in diameter and above shall be Class 200 PVC IPS gasket end. All smaller pipes shall be Schedule 40 PVC IPS solvent-welded.
6. Slip fitting socket taper shall be so sized that a dry, unsoften pipe end, conforming to these specifications, can be inserted no more than halfway into the socket. Plastic saddle and flange fittings will not be permitted. Only schedule 80 pipe may be threaded.
7. When connection is plastic to metal, Schedule 80 PVC plastic male adapters shall be used. Joint compound shall be Teflon Tape on Water Based Teflon Paste. Male adapters will be visually inspected for leaks.
8. All mainline pipes that are not located in the same trench as the control wire shall require a traceable purple or blue-colored 14-gauge single strand direct burial wire. The wire should be free from moving valve parts to prevent damage. The tracer wire shall surface at and be secured to the controller. This is not necessary for lateral pipelines with irrigation heads attached.
9. All lateral line pipe size shall stay consistent throughout the zone. Do not reduce the lateral pipe size as the lateral line progresses away from the control valve, unless otherwise specified by the OWNER.

B. HDPE Pipe

1. All HDPE pipe must be SDR11 manufactured in accordance with AWWA C901/C906, ASTM D2239, ASTM D2737, ASTM D3035, ASTM F714 and ANSI/NSF 14/16 listings.
2. HDPE pipe as noted on the drawings shall be manufactured with PE4710 resin.
3. Pipe shall conform to ASTM D3350 with the cell classification of 445574C/E.
4. Pipe pressure design shall be DR 11, rated to 200 PSI.
5. Marking:
 - a. The following shall be clearly marked on the exterior surface of the pipe:
 - 1) Class and size
 - 2) Date of manufacture
 - 3) Name or trademark of manufacturer
 - 4) Deflection angle for bends
6. All fittings and joints must be fusion welded using butt joints with mechanical fittings or electro fusion fittings designed for use with HDPE.
7. Fittings
 - a. Elbows and fitting shall be mitered from pipe sections welded together on the interior and exterior of all junctions and follow manufacturer's instructions.

- b. All fusion welds must be done by a certified technician. Certification to be provided to OWNER at time of submittal.
8. Joints
- a. Watertight joints shall be accomplished by rubber gasket in accordance with ASTM D3212.
 - b. All fusion welds must be done by a certified technician. Certification to be provided to OWNER at time of submittal.

C. Pipe Sleeves

- 1. Pipe sleeves shall be Schedule 40 PVC pipe, in sizes shown in the schedule below, or equal approved by OWNER'S REPRESENTATIVE.

a.

ITEM	REQUIRED SLEEVE SIZE & QUANTITY
Irrigation Mainline & Lateral Line	6" PVC (1)
Control Wires	4" PVC (1)
Empty	4" PVC (1)

2. Installation

- a. Provide empty sleeves along all paved driveway and pathways as noted on the drawings. Extend sleeves at least one foot (1') beyond pavement on both sides. Sleeves shall be installed 18 inches below finished grade. All sleeves shall be installed at a depth in line and grade with existing or proposed irrigation lines. Sleeves with excessive or shallow invert depth will be rejected. Cap ends of empty sleeves with duct tape.
 - 1) Coordinate sleeve placement during grading/ paving work.

3. Sleeve Location Marking

- a. New Pavement
 - 1) The location of each sleeve must be marked along both of the extreme edges of any new pavement installed over the sleeve. This shall be accomplished by pressing the end section of pipe, between the diameters of 1" to 2," into the uncured pavement surface to make an imprint.
- b. Existing Pavement
 - 1) For sleeves pushed under existing pavement, sleeve locations shall be marked along the extreme edges of the pavement on both sides where the sleeve emerges from under the pavement. Markings shall consist of scoring the surface of the existing pavement with a core drill, between the diameters of 1" to 2," just enough to make the impression of a circle in the pavement surface.

2.2 RISERS/SWING JOINTS

A. Flexible Risers

- 1. Stationary Pop-up and Surface Sprinkler Heads shall be installed using "funny pipe" or four-piece swing joints. Sprinkler Heads with one-half inch (1/2") and/or three-quarter inch (3/4") inlets shall connect with "funny pipe" exclusively, in

lengths no longer than two feet (2'). Sprinkler Heads with one-inch (1") inlets shall connect with four-piece swing joints only.

2. Installation with "funny pipe", which is one-half inch (1/2") low density, polyethylene pipe, rated 80 PSI at 100 deg. F, must use Teflon-taped barbed street ells. Use of flexible pipe such as "funny pipe" is limited to connecting laterals to irrigation heads.
3. Four-piece swing joints for 1" inlet heads shall consist of an assembly using three (3) one-inch (1") Marlex street elbows, with a 1" SCH 80 Nipple of required length to set head at grade. Three-quarter inch (3/4") swing joints for Quick Couplers shall consist of the same combination of like parts in three-quarter inch (3/4").

2.3 VALVES

- A. Valve will be located in greenspace lawns only, with a minimum distance of 4 feet away from hard surfaces/sidewalks/buildings. Valves/boxes must remain a minimum distance of 4 feet away from trees/ornamental plantings.
- B. All valves will be installed using SCH 40 PVC Male Adapters (SCH 80 PVC for metal valves) and glued directly onto the pipe incoming and outgoing from the valve.
- C. Ball Valves
 1. Only use ball valves when detailed. Not to be used above ground unless approved by the Irrigation Department.
 2. All manual ball valves, sizes 1-1/2" inches and smaller, shall be schedule 80 PVC or all bronze double with integral taper seats and with rising stem.
 3. All valves 2" and larger shall be gate valves.
 4. All ball valves shall be, schedule 80 PVC, or full port, with chromium or stainless ball with Teflon seats 150 PSI rated, Hammond.
- D. Pressure Reducing Valves
 1. Provide pressure-reducing valves on main lines only, Watts, Series U5, U5B 1/2" to 2" Standard Capacity.
- E. Gate Valves
 1. All manual gate valves, sizes four-inch (4") and smaller, shall be made in the U.S.A., brass body, threaded, non-rising stem, full port, 200 PSI/13.8 bar non-shock cold working pressure up to 180 deg. F./82 deg. C., NSF/ANSI 61-8 compliant: NIBCO model TI-8.
 2. All gate valves of 6-inch (6") size or larger shall be at least 150 PSI rated, AWWA-C509 resilient wedge gate valve, made in the U.S.A., featuring non-rising stem, iron body, epoxy coated interior, mechanical joint with appropriate size gaskets for corresponding pipe as per drawing.
- F. Automatic Remote Control Valves

1. Rain Bird PESB Series, 24 volts, contamination resistant valve with a pressure operating range of 20-200 psi and a 0.25 to 200 g.p.m. flow range. Glass-filled nylon construction, one-piece solenoid with captured plunger, flow control handle adjusts, manual internal and external bleeds, stainless steel studs molded into the body, nylon screen scrubber and purple flow control handles for easy identification of non-potable water systems.
 - a. All bubbler zones must be controlled by a Rain Bird PESB Series Valve incorporating a Rain Bird PRS regulator.

2.4 VALVE BOXES

- A. All remote-control valves, pressure regulating valves, manual control valves, zone shut-off valves, quick coupler valves, gate valves or globe valve filters and drains, unless otherwise indicated, shall be installed in a valve access box of proper size as required for no less than 4" of spherical access to the valve.
- B. Valve boxes/valves will be located in greenspace lawns or planting beds only, prioritize locating in greenspace lawns where feasible, with a minimum distance of 4 feet away from hard surfaces/sidewalks/buildings. Valves/boxes must remain a minimum distance of 4 feet away from trees/ornamental plantings.
 1. Valve box to be Carson brand, with round, locking green cover ten inches (10") in diameter for single valve application or a twelve-inch minimum (12") standard rectangular box for multiple valve assemblies or described otherwise in the contract drawings. A maximum of two (2) valves is allowed in any 12" standard valve box. Bolt on and Purple Top valve boxes are not necessary. All round valve boxes shall be supported underneath the bottom edges with two bricks (minimum) and all standard rectangular valve boxes shall be supported underneath bottom edges with four bricks (minimum). The base of the valve box should be at or below the body of the valve. The lid of the valve box should be flush or within 1" of turf grade.
 2. Valve boxes installed within pavement shall be Tier 15 rated boxes for heavy duty non-deliberate traffic.

2.5 AUTOMATIC IRRIGATION CONTROLLER

- A. Controller Type
 1. Contractor shall connect to existing controllers at locations identified on the plans. Contractor shall field verify equipment is the same as, or compatible with, listed standard remote access equipment listed below. The Contractor shall field verify capacity of controller to meet system requirements in coordination with the Owner.
 - a. The automatic controller shall be 120-volt input, soft-wired, 26.5 volt output, capable of controlling the number of zone valves indicated on the plans. It shall be a Rain Bird IQ ESP-LXME2 PRO with an IQNCC-RS Radio Cartridge or IQNCC-EN Ethernet Cartridge. Controller station capacity must meet or exceed the quantity specified per drawing. Station wiring and run time schedule specified per drawing. All station wiring must be terminated in the pedestal or wall mounted wire trough. If a Radio Cartridge is used, the controllers must be equipped with a Rain Bird RBSS-TN9B radio with a

University licensed and authorized frequency. The radio will be hooked to a Rain Bird TRA9023NP Omni Antenna or GSP-YAGI-6 Antenna or Owner approved substitute. All Rain Bird IQ components must be ordered and installed by a certified installation technician.

B. Electrical Power

1. Contractor shall field verify power at the existing controller. Any impacts to power for the controllers by the construction of the project shall be the responsibility of the sprinkler installer to rectify.
 - a. Meet all electrical specifications for installation of controllers and power to the controllers. The controllers must be wired to the power source in the pedestal or wall via an Isobar Ultra 4 surge protector and a two-receptacle Ground Fault Interrupter (GFI) outlet. A pigtail that can reach from the controller to the outlet is required. Power source must be pre-approved by Owner prior to connection.

C. Flow Meter

1. A Rain Bird IQ-compatible flow meter must be installed at every point of connection. This may be either a Rain Bird Brass Insert Sensor (FS350B) for pipe three inches or larger, or a Rain Bird PVC Tee Sensor of the appropriate size: FS150P for 1-1/2" pipe, FS200P for 2" pipe, and FS300P for 3" pipe. The flow meter must be directly connected to the controller using PE43 communication cable (the blue/blue white wire pair must be used for the flow meter/pulse transmitter connection) and a PT 322 pulse transmitter. All splices using this type of cable must meet Rain Bird IQ standards. Programming and hook up of the PT322 shall be completed by MSU Irrigation Employee.

D. Certified Installation

1. All Rain Bird IQ components must be ordered and installed by a certified installation technician.

2.6 IRRIGATION HEADS

A. Rotary Sprinklers

1. All rotary sprinkler heads shall be Rain Bird 5004+PCSAMRNP Series, manufactured by Rain Bird Sprinkler Mfg. Corp., Glendora California; or Owner approved equivalent rotor head.
 - a. Provide Match Precipitation Rate nozzles as indicated on the plans.

B. Spray Heads

1. All spray head sprinklers shall be Rain Bird Models RD-04-SP30F-NP and 1812 Series SAM with MPR nozzles, manufactured by Rain Bird Sprinkler Mfg. Corp., Glendora California or approved equal. Rain Bird 1812 SAM Spray Heads with Side Inlet feature is allowed however, the use of the side inlet feature is **prohibited**. 1806 Series SAM heads are allowed upon approval by Owner.

C. Bubblers

1. All bubbler zones must be controlled by a Rain Bird PESB Series Valve incorporating a Rain Bird PRS regulator. There must be a Rain Bird WYE Filter System installed directly downstream of the valve, located inside the valve box in a manner that allows easy maintenance. The bubbler heads must be Rain Bird 1400 Series Full-Circle Bubbler mounted on a rigid riser or approved equal. A minimum of 2 bubbler heads will be set at each tree at a minimum of 1' off of trunk. Please refer to Landscape Spec or OWNER for clarification.

D. Drip Irrigation

1. No drip irrigation systems are allowed at Montana State University.

2.7 CONTROL CABLE

A. Type

1. All electrical control and ground wire shall be Baron irrigation control cable or approved equal, 14-gauge unless otherwise indicated on the drawings. All wiring to be used for connecting the automatic remote control valve to the automatic controllers shall be Type "UF", 600 volt, solid copper, single conductor wire with PVC or polyethylene insulation and bear UL approval for direct underground burial feeder cable.

B. Insulation

1. Insulation shall be four-sixty-fourths inch (4/64") thick minimum covering of ICC-100 compound for positive waterproofing protection. All control or "hot" wires shall be red and all common or "ground" wires shall be white. A minimum of one black extra wire shall be included in the wiring run for every four (4) wires installed. All black extra wires shall be intact and usable from the controller to the end of each mainline run with slack wire available at each valve location.

C. Code Compliance

1. Verification of wire types and installation procedures shall be checked to conform to local codes.

D. Splices

1. All splices are to be completed within valve boxes using one-piece, jelly-filled, water-proof wire connectors with a minimum of twelve inches (12") of extra wire per side, per splice, allowing for repair work to be completed at ground level. A 6" round valve box will be acceptable for splices under 10 zone wires. Above 10 zone wires will require a 10" round valve box or larger. Self-connecting wire splices will not be allowed. All splices shall be located on as-built drawings.

E. Trench Installation

1. Tape and bundle all wiring at ten-foot (10') intervals.
2. Attach tracer wire to main line pipes that are not along the control wire path. See Part 2.01, Point 8.

3. All 120-volt wiring shall be in conduit with marker tape installed in the ditch six inches (6") above the conduit.
4. All wiring under pavement and through sleeves shall be in conduit.
5. Tie a loose twenty-inch (20") loop in wiring at all changes in direction greater than 30 degrees. Untie all loops after making connections.

2.8 TRACER WIRE

1. Tracer wire shall be solid copper per ASTM B-3.
2. Insulation shall be yellow color.
3. Wire size shall be 14 AWG, nominal thickness .030 inches.

2.9 OTHER MATERIALS

A. Concrete

1. Provide and coordinate installation of all concrete thrust blocks. Refer to Division 3 for concrete requirements. Provide thrust blocks for all lines larger than 3-inch diameter, at all tees and ells.

B. Other Materials

1. All other materials not specifically described but required for a complete and proper irrigation system installation, shall be new, first quality of their respective kinds, and subject to the approval of the OWNER'S REPRESENTATIVE.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that such work is complete to the point where this installation may properly commence.
2. Verify that irrigation system may be installed in strict accordance with all pertinent codes and regulations, the original design, the referenced standards, and the manufacturer's recommendations.

B. Discrepancies

1. In the event of discrepancy, immediately notify the OWNER'S REPRESENTATIVE.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 FIELD MEASUREMENTS

- A. Make all necessary measurements in the field to ensure precise fit of items in accordance with the original design.

3.3 TRENCHING AND BACKFILLING

A. General

1. Perform all trenching required for the installation of items where the trenching is not specifically described in other sections of these specifications.
2. Make all trenches in accordance with OSHA Requirements with sufficient width to provide free working space at both sides of the trench and around the installed item as required for gluing, joining, backfilling, and compacting while minimizing width of trenches.
3. The CONTRACTOR will be required to conduct his work so that trenches will remain open a minimum possible time.

B. Depth

1. Trench as required to provide the elevations shown on the Plans.
2. Trench to sufficient depth to give a minimum of eighteen inches (18") of fill above the top of the pipe measured from the adjacent finished grade under driveways and sidewalks.
3. All mainline and control cables shall have a minimum cover of eighteen inches (18") above the pipe or wire. All laterals shall have a minimum cover of twelve inches (12") above the pipe.
4. All sleeves shall be installed at a depth in line and grade with existing or proposed irrigation lines. Sleeves with excessive or shallow invert depth will be rejected.

C. Correction of Faulty Grades

1. Where trench excavation is inadvertently carried below proper elevations, backfill with material approved by the OWNER'S REPRESENTATIVE and then compact to provide a firm and unyielding sub grade to the approval of the OWNER'S REPRESENTATIVE and at no additional cost to the OWNER.

D. Trench Bracing

1. Properly support all trenches in strict accordance with all pertinent rules and regulations.
2. Brace, sheet, and support trench walls in such a manner that they will be safe and that the ground alongside the excavation will not slide or settle, and that all existing improvements of every kind will be fully protected from damage.
3. In the event of damage to such improvements, immediately make all repairs and replacements necessary to the approval of the OWNER'S REPRESENTATIVE and at no additional cost to the OWNER.

4. Arrange all bracing, sheeting, and shoring so as to not place stress on any portion of the completed work until the general construction thereof has proceeded far enough to proven, sufficient strength.
- E. Removal of Trench Bracing
1. Exercise care in the driving and removal of sheeting, shoring, bracing, and timbering to prevent collapse or caving of the excavation faces being supported.
- F. Grading and Stockpiling Trenched Material
1. Control the stockpiling of trenched material in a manner to prevent water from running into the excavation.
 2. Do not obstruct surface drainage but provide means whereby storm and wastewater are diverted into existing gutters, other surface drains, or temporary drains.
- G. Methods
1. All trench excavation shall be made by open cut. During excavation, material suitable for backfilling shall be piled in an orderly manner, a sufficient distance from the banks of the trench to avoid overloading, and to prevent slides or cave-ins. All material not required for backfill or not suitable for backfill shall be removed from the site by the CONTRACTOR. Banks of trenches shall be kept as nearly vertical as possible and shall be properly sheeted and braced as may be necessary to prevent caving.
 2. The CONTRACTOR shall provide, place, maintain, and remove all necessary barricades, warning signs, and other safety devices from the start to the finish of the project to prevent pedestrians from falling in open trenches.
 3. Trench widths in paved streets or in areas where proximity to other structures requires vertical cuts, shall not be wider than is required for proper handling, jointing and bedding of the pipe.
 4. The bottom of the trenches shall be accurately graded to line and grade and provide uniform bearing and support for each section of the pipe on undisturbed soil, at every point along its entire length. Depressions for joints shall be dug after the trench bottom has been graded, and shall be only of such length, depth, and width as required for properly making the particular type joint. Care shall be taken not to excavate below the depths indicated.
 5. Where rock occurs in trench excavation, the rock shall be removed to a depth of six inches (6") below the established grade line, and to a width of twelve inches (12") greater than the outside diameter of the pipe to be installed in the trench.
 6. No water shall be permitted to rise or stand in trenches not yet backfilled until after the pipe has been placed, tested and covered with backfill for a depth of at least ten inches (10"). Any pipe having its alignment or grade changed as a result of a flooded trench shall be removed and re-laid after the trench is graded once again at no additional cost to the OWNER.
- H. Pavement Removal

1. Where excavation of trenches requires the removal of pavement, the pavement shall be cut in a straight line along the edge of the excavation by use of a spade-bit air hammer, concrete saw or similar approved equipment to obtain straight, square and clean break. After backfilling and sub grade preparations are completed, the pavement section and surfacing shall be replaced.
2. Pavement replacement shall utilize the same materials and design as the original pavement.
3. Excess material, including rock, broken concrete, bituminous materials, debris, or other materials not suitable for backfill, shall be removed from the site and disposed of by the CONTRACTOR.

3.4 BORING

A. Locations

1. Boring shall be used to route pipe, wiring, or both under structures such as walks or curbs where trenching is impractical. Sleeves shall be installed in all bored holes.

B. Method

1. Boring shall be accomplished with a drill, auger, water jet, or any other instrument approved by the OWNER'S REPRESENTATIVE capable of producing a precise hole. Boring shall not disturb overlaying structures or cause settlement and damage to those structures.

3.5 SLEEVES

A. Locations

1. Sleeves shall be installed wherever routing of a pipe, wiring, or both crosses a paved area or passes through a bored hole.

B. Methods

1. Sleeves laid in open trenches shall be uniformly and evenly supported by undisturbed soil on the trench bottom. Backfill shall conform to standards hereinafter specified.
2. Sleeves installed in borings shall be forced through and shall have a snug fit throughout the length of the bored hole. Sleeves cracked or broken shall not be accepted.

3.6 BACKFILL

A. Material

1. Backfill material shall be free of clods, lumps of frozen material, or stones larger than one inch (1") in their maximum dimension. The bedding and select material under, around and six inches (6") above the top of the pipe shall be placed by hand

in maximum layers of six inches (6") and carefully compacted in a manner which will not displace the pipe. Compaction of the select backfill shall be at least ninety percent (90%) of the maximum density as determined by AASHTO T-180. Water settling will not be allowed.

B. Inspection

1. The trenches shall not be backfilled until inspection has been completed and the pipe installation, including the grade, alignment and jointing has been found to be in compliance with the requirements of the plans and specifications.

C. Around and Over the Pipe

1. Select backfill material consisting of sand, fine gravel or select earth, free of large lumps or rocks larger than three-quarters of an inch ($\frac{3}{4}$ ") shall be used in backfilling around and over the installed pipe.
2. The select material shall be obtained from the excavation material removed from the trench and shall be processed by screening, sifting, or selective sorting, so as to produce the type of backfill herein specified. The CONTRACTOR may at his option and expense provide an acceptable imported material.
3. This backfill material shall be carefully deposited around and over the pipe in layers not more than six inches (6") thick, loose measurement, unless otherwise permitted by the OWNER'S REPRESENTATIVE, wetted to optimum moisture content and uniformly compacted to at least ninety-five percent (95%) of the maximum density obtainable at optimum moisture content as determined by ASTM D698 (latest revision), until the pipe has a cover depth of at least one foot (1').

D. Remainder of Trench Backfill

1. The remaining depth of the trench shall be backfilled with excavation material removed from the trench, which shall be wetted or dried to near optimum moisture content.
2. This material shall be carefully deposited in layers not to exceed six inches (6") in compacted thickness and compacted to at least ninety-five percent (95%) of the maximum density as determined by ASTM D698 (latest revision). The method of compaction selected by the CONTRACTOR shall not cause damage of any nature to the installed pipe. Replace topsoil on trench fill and compact to eighty-five percent (85%) of maximum density at optimum moisture.
3. The use of water settlement for this portion of the trench backfilling is permissible if the specified density can be obtained and the backfill material is suitable for this type of trench compaction.

3.7 INSTALLATION OF PIPING

A. General

1. Layout the piping system in strict accordance with the Plans.
2. Where piping is shown on the Plans to be under paved areas but running parallel and adjacent to planted areas, the intention is to install the piping in the planted areas.

B. Line Clearance

1. All lines shall have a minimum clearance of four inches (4") from each other, and six inches (6") from lines of other trades, except through pipe sleeves.
2. Parallel lines shall not be installed directly over one another.

C. Inspection of Pipe and Fittings

1. Carefully inspect all pipe and fittings before installation, removing all dirt, scale, and butts and reaming as required; install all pipe with stamped markings oriented up to allow visual inspection and verification.

D. Plastic Pipe

1. Plastic pipe shall be installed in a manner so as to provide for expansion and contraction as recommended by the manufacturer.
2. All plastic pipe joints shall be solvent-weld joints or gasket fit joints. Only the solvent cement recommended by the pipe manufacturer shall be used and it must be a two-part system consisting of primer and cement. No single part cement system shall be used. All plastic pipe and fittings shall be installed as outlined and instructed by the pipe manufacturer and it shall be the CONTRACTOR's responsibility to make arrangements with the pipe manufacturer for any field assistance that may be necessary. The CONTRACTOR shall assume full responsibility for the correct installation.
3. All plastic (PVC) to metal joints shall be made with Schedule 80 PVC plastic threaded male adaptors into metal threaded female fittings.
4. The solvent-weld joints shall be made on dry pipe.
5. The solvent-weld joints shall be allowed to set at least 24 hours before pressure is applied to the system on PVC pipe.

E. Thrust Blocks

1. Provide concrete thrust blocks for all pipes as shown on the plans. All thrust blocks shall bear directly on undisturbed earth. Center the pipe in the middle of the thrust block.

3.8 INSTALLATION OF EQUIPMENT

A. General

1. All fittings, valves, etc., shall be carefully placed in the trenches with concrete thrust blocks, placed where required.
2. All sprinklers, having adjustable nozzles, shall be adjusted for proper and adequate distribution of the water over the coverage pattern of the sprinkler.
3. All nozzles on stationary pop-up sprinklers or stationary spray heads shall be tightened after installation. All sprinklers having an adjusting screw, adjusting stem or adjusting friction collars shall be adjusted as required for the proper arc of coverage, radius, diameter and/or discharge.

4. All control wires shall be clearly labeled by station, using weatherproof material, at the controller and at the valve ends. Mark the underside of all valve box covers, indicating the valve controller station number. All markings shall be made in a neat and legible manner using white enamel paint.
5. All control or "hot" wires shall be red and all common or "ground" wires shall be white. A minimum of one black extra wire shall be included in the wiring run for every four (4) wires installed.

B. Sprinkler Heads

1. Install lawn sprinkler heads where indicated on the plans and in strict accordance with the manufacturer's recommendations and as necessary to provide complete uniform coverage and precipitation.
2. Upon completion of installation, reset all lawn sprinkler heads flush with grade and firmly anchored with soil.

C. Master Automatic Control Valves

1. A master automatic control valve shall be installed at the point of connection to the main for any remotely controlled portion of the irrigation system. In cases where there are multiple points of connection, a master valve shall be installed for each, with no more than three points of connection allowed. Each master valve will have its own separate yellow "hot" wire.

3.9 TESTING AND INSPECTION

A. Covering or Enclosing Work Prior to Inspection

1. Do not allow or cause any of the work in this section to be covered up or enclosed until it has been inspected, tested, and approved by the OWNER'S REPRESENTATIVE.

B. Flushing

1. Before backfilling the mainline, and with all control valves in place, but before lateral pipes are connected, completely flush and test the mainline and repair for all leaks; flush out each section of lateral pipe before sprinkler heads are attached. Complications due to this not being done during install will result in charges to the contractor.

C. Testing

1. Make all necessary provisions for thoroughly bleeding the line of air and debris.
2. After valves have been installed, test all live water lines hydrostatically for leaks at a pressure of one hundred fifty (150) psi for a period of two (2) hours, with all couplings exposed and with all pipe sections center loaded.
3. Furnish all necessary testing equipment and personnel.
4. Correct all leaks and retest until acceptance by the OWNER'S REPRESENTATIVE and THE OWNER.

D. Final Inspection

1. Thoroughly clean, adjust, and balance all systems.
2. Demonstrate the entire system to the OWNER'S REPRESENTATIVE and OWNER, proving that all remote control valves are opening and closing on command, that all heads are properly adjusted for radius and arc of coverage, that all emitters are functioning, and that the installed system is workable, clean, and efficient.
3. Existing irrigation system(s) or portions of systems which have had their performance altered by any of the work related to this project shall be repaired or adjusted using materials and installation methods in accordance with this specification and in a manner to restore head-to-head sprinkler coverage, uniform precipitation rates, control zone integrity, and elimination of the spraying of water on building walls and sidewalks.

3.10 CLEANUP

- A. Upon completion of the work, the entire site shall be cleared of all debris, and ground surfaces shall be finished to smooth, uniform slopes and shall present a neat and workmanlike appearance. Cleanup shall be considered an incidental item, and no additional payment shall be made for any cleanup item. All improvements or other obstructions removed during construction shall be replaced in a condition at least equal to their existing condition.

3.11 MAINTENANCE

- A. The CONTRACTOR shall, for a period of one (1) year after completion and final acceptance of the work, maintain and repair any trench or boring settlement which may occur, and shall make suitable repairs to any pavements, or other structures which may become damaged as a result of settlement. All such maintenance and repair shall be at the CONTRACTOR's expense.
- B. The CONTRACTOR shall inform the OWNER of the location and the nature of all damage done to the existing irrigation system not slated for demolition within eight hours of the occurrence of the damage.
- C. The CONTRACTOR shall maintain the existing and proposed irrigation system in operation during the construction period. Upon completion of the proposed irrigation work the CONTRACTOR shall balance and adjust the entire (new and existing) system.

3.12 AS-BUILT DRAWINGS, CHARTS AND EQUIPMENT MANUALS

- A. Record Drawings
1. Accurately record on one set of black and white prints of the site plan all installed work including both pressure and non-pressure lines.

2. Upon completion of each increment of work, transfer all such information and dimensions to the print. The dimensions shall be recorded in a legible and workmanlike manner.
3. Dimension from two permanent points of reference (buildings, monuments, sidewalks, curbs, pavement, etc.). Locations shown on as-built drawings shall be kept day-to-day as the project is being installed. All dimensions noted on drawings shall be one-eighth inch (1/8") in size (minimum).
4. Show locations and depths of the following items:
 - Point of connection
 - Routing of pressure lines (max. dimension=one hundred feet {100'} along lines)
 - Gate valves
 - Sprinkler control valves
 - Quick coupling valves
 - Routing of control wires
 - Sprinkler heads
 - Other related equipment
5. Maintain as-built drawings on site at all times.
6. Make all notes on drawings in pencil (no ball point pen).

B. Controller Charts

1. OWNER'S REPRESENTATIVE must approve as-built drawings before charts are prepared.
2. Provide one controller chart for each controller supplied showing the area covered by automatic controller, of the maximum size controller door will allow.
3. The chart is to be a reduced drawing of the actual as-built system.
4. Chart shall be black line print and different colored shading used to show area of coverage for each station.
5. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic.
6. The chart shall be mounted using Velcro or equal type of semi-permanent fastening device.
7. These charts must be completed and approved prior to final acceptance of the irrigation system by the OWNER.

C. Operation and Maintenance Manuals

1. Prepare and deliver to the OWNER'S REPRESENTATIVE within ten calendar days prior to completion of construction, all required and necessary descriptive material in complete detail and sufficient quantity, properly prepared in two (2) individually bound copies of the operations and maintenance manual. The manual shall describe the material installed and shall be in sufficient detail to permit operating personnel to understand, operate and maintain all equipment. Spare parts lists and related manufacturer information shall be included for each equipment item installed. Each complete, bound manual shall include the following information:

- a. Index sheet stating CONTRACTOR's address and telephone number, duration of guarantees period, list of equipment with names and addresses of local manufacturer representatives.
 - b. Complete operating and maintenance instructions on all major equipment.
 - c. System start-up and shut down instructions.
2. In addition to the above maintenance manuals, provide the maintenance personnel with instructions for system operation and show written evidence to the OWNER at the conclusion of the project that this service has been rendered.

3.13 GUARANTEE

A. Warranty

1. The entire irrigation and water system shall be guaranteed to give satisfactory service for a period of one year from the date of acceptance by the OWNER.
2. Should any trouble develop within the time specified above due to inferior or faulty materials or workmanship, the trouble shall be corrected at no expense to the OWNER.
3. Any and all damages resulting from faulty materials or workmanship shall be repaired by the CONTRACTOR to the satisfaction of the OWNER, at no cost to the OWNER.

PART 4 - MEASUREMENT AND PAYMENT

- A. The engineer will measure actual quantities of work completed as described in subsections for individual pay items.
- B. The engineer will measure the completed work as follows:
 1. Lump Sum:
 - a. West Side Irrigation System
 - b. East Side Irrigation System
 2. HDPE Mainline replacement includes new HDPE mainline, and isolation valves.

END OF SECTION

**SECTION 02930
TURF & GRASSES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Seeding.
2. Hydromulch.
3. Turf area topsoil preparation.
4. Application of lime and fertilizers.
5. Maintenance of turf areas.
6. Condition and Inspection for Final Acceptance.

- B. Related Requirements:

1. Section 02940 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings.
2. Section 02810 "Irrigation" for complete irrigation systems.
3. The Montana Department of Transportation Standard Specification for road and bridge construction, 1987 Edition, Section 610, roadside development shall govern the work as if bound herein. Where provisions of this section and the referenced standard conflict, this section shall govern.

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and

slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- F. Topsoil: Topsoil refers to the uppermost layer of soil and includes fine particles, small roots, rocks, and cobbles. It is usually darker in color and is the layer in which most roots grow, and beneficial microorganisms exist.
- G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at project site prior to initiating seeding work.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging. No seed shall be sown until the Contractor has submitted these certificates, or as approved by the Owner.
- C. Product Certificates: For fertilizers, from manufacturer.
- D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.
- E. Manufacturer Product Data:
 - 1. Submit material specifications and installation instructions where applicable attesting that the following materials meet the requirements specified
 - a. Fertilizer.
 - b. Seed.
 - c. Lime.
 - d. Fiber hydromulch.
- F. Soil Test Reports:
 - 1. Material Test Reports: For existing in-place surface soil and imported topsoil. Report shall contain recommendations for conditioners to achieve planting soil as outlined in "Quality Assurance" Article.

2. Prior to placing the topsoil, submit soil test report to the Owner for review and approval. Do not place materials until approval has been obtained.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

1.7 SUBMITTAL SCHEDULE:

- A. Before installation:
 1. Manufacturer's product data for seed.
 2. Soil test reports.
- B. After installation and before Final Acceptance
 1. Maintenance Manual.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
 1. Installer's Field Supervision: Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the best methods for their installation and who shall direct all work performed under this section.
- B. Pesticide Applicator: State licensed, commercial.
 1. The Contractor shall have at least two (2) years of weed control spraying experience. Proof of experience will be required. The Contractor must have a valid Montana Commercial Herbicide Applicator's License.
- C. Chemical Registration
 1. All weed control chemicals must be registered with the Environmental Protection Agency and the State of Montana.
- D. Equipment Requirements
 1. The Contractor shall furnish, operate, and maintain suitable and adequate equipment necessary to perform the above operations in an approved and workman-like manner without delays. Spray nozzles shall be raindrop or similar drift control type.
- E. Liability and Contractor's Responsibilities

1. Weather conditions must be such that no damage outside the sprayed area will occur and the Contractor will cease spraying whenever the application of spray could cause such damage.
2. The Contractor agrees to hold harmless the Owner and Landscape Architect and/or Engineer against any and all claims for damage arising from operations covered in this proposal.

F. Time of Application

1. Because of varied climatic conditions, it will be the Contractor's responsibility to coordinate spraying activities to achieve the best results. To avoid possible chemical exposure and general alarm among campus users, time of application must not coincide with other nearby outside campus activities. If nearby activity encroaches during spraying operations, spraying must cease immediately until people leave the area.

G. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

H. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating:

- a. percentages of organic matter;
 - b. gradation of sand, silt, and clay content;
 - c. cation exchange capacity;
 - d. deleterious material;
 - e. pH;
 - f. mineral and plant-nutrient content of the soil
 - g. a test for electrical conductivity (EC)
2. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 3. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from the Owner. A minimum of six representative samples shall be taken from varied locations at the project site.
 4. Report suitability of tested soil for turf growth.
 - a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
 - c. Results of tests shall be reviewed by the Owner prior to purchase of fertilizer.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk materials with appropriate certificates.
 - 4. Store materials in a manner that their effectiveness and usability will not be diminished or destroyed. Materials shall be uniform in composition, dry, unfrozen, and free flowing.
- C. Any material which has become caked or otherwise damaged or which does not meet specified requirements will be rejected.

1.10 FIELD CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods, except as otherwise authorized in writing by the Owner. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion through establishment period until Final Acceptance.
 - 1. Spring Planting: April 15 to June 1.
 - 2. Fall Planting: August 10 to September 10.
 - 3. Irrigation system must be operational prior to seeding.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.
- C. The Contractor shall provide a weed control plan and schedule prior to bed preparation, for approval of the Owner's Representative.

1.11 CONDITIONS & INSPECTION FOR FINAL ACCEPTANCE

- A. Inspection and Final Acceptance:
 - 1. Landscape turf acceptance will occur after completion of Turf Maintenance & Establishment Period. Contractor to have completed, located, and installed all turf according to drawings and specifications. All turfgrass are expected to be living and in healthy condition at time of inspection and acceptance.

2. Upon written request of the Contractor, the Owner will inspect all vegetated areas to determine completion of work. This request must be submitted at least one week prior to the anticipated inspection date.
3. If the vegetated areas are not acceptable, the Owner will indicate corrective measures to be taken and shall extend the Turf Maintenance & Establishment Period as necessary for the completion of the work. The Contractor shall request a second inspection of the vegetated areas after corrective measures have been accomplished. This process shall be repeated until the total vegetated area being inspected is acceptable.
4. When the vegetated areas are acceptable, a meeting of the Contractor and Owner will be arranged to accept the vegetated work. A final inspection will be a part of this meeting. At this meeting, the Contractor shall be furnished with a written acceptance of the vegetated area being approved.
5. Following the acceptance of vegetated areas, the Contractor shall provide the Owner with access to all vegetated areas as required for the Owner's maintenance work.

B. Conditions of Final Acceptance:

1. Acceptance shall be given for the entire portion of the vegetated areas. No partial acceptance will be given.
2. Satisfactory Seeded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, bare areas, and surface irregularities.
 - a. Vegetated areas shall exhibit a uniform, thick, well-developed stand of grass. Vegetated areas shall have no bare spots in excess of five inches in diameter with coverage exceeding 95 percent over any 10 square feet, applicable to the total vegetated area.
 - b. Vegetated areas shall not exhibit signs of damage from erosion, washouts, gullies, or other causes.
 - c. Turfgrass has obtained minimum of 98 percent generally weed free surface cover.
3. Finish grades at the edges of sidewalks, curbs or other hard surface boundaries must be at a level such that the established turf surface will be one (1) inch below the plane of the hard surface for a minimum distance of six (6) feet from the edge.
4. Pavement surfaces and site improvements adjacent to vegetated areas shall be clean and shall be free of spills or overspray from placing or handling of topsoil and seeding operations.

C. Site Cleanup:

1. The Contractor shall leave the site in a clean and neat condition. Final Acceptance will not be granted until this condition is met.

PART 2 - PRODUCTS

2.1 SOILS

- A. Refer to Montana Standard Specifications Subsections 203.80 Topsoil Salvaging and placing, 610.00 Topsoiling and 713.06 Topsoil Material.
- B. Imported Topsoils
 - 1. In the event sufficient quantities of native topsoil cannot be salvaged from the site, the Contractor shall provide imported topsoil to supplement the project requirements. The Contractor shall provide topsoil that meets or exceeds the quality of the native topsoil material available on site. Contractor shall provide source and analysis information to the Owner's Representative, for his approval, prior to delivery. The Contractor shall incorporate into the topsoil, amendments necessary to provide topsoil fertility and quality, equal to or exceeding the characteristics of the native topsoil. Planting Soils
- C. Planting Soil: Existing or imported topsoil with Amendments as recommended by soil testing laboratory with pH range of 6.5 to 7.5, a minimum of 5 percent organic material content; free of stones 1-1/2 inch or larger in any dimension and other extraneous materials harmful to plant growth.

2.2 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species:
 - 1. Quality, State Certified: State-certified seed of grass species as listed below for solar exposure.
 - 2. Sun and Partial Shade, Cool-Season Grass: Seed of grass species as follows, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed. Germination Test date no older than 6 months:
 - a. Turf Type Tall Fescue/ Kentucky Bluegrass seed mix, or approved equal. Seed at a rate of 10 lbs/1000 SF.
 - 1) 90% by weight Turf Type Tall Fescue, minimum 2 types
 - 2) 10% by weight 'Midnight' Kentucky Blue Grass

2.3 SOIL CONDITIONING MATERIALS

- A. INORGANIC SOIL AMENDMENTS
 - 1. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

2. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.
3. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.
4. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
5. Aluminum Sulfate: Commercial grade, unadulterated.
6. Perlite: Horticultural perlite, soil amendment grade.
7. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.

B. ORGANIC SOIL AMENDMENTS

1. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 2. Organic Matter Content: 50 to 60 percent of dry weight.
 3. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
 4. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or granular texture, with a pH range of 3.4 to 4.8.
 5. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
 6. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
 7. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with ammonium nitrate at a minimum rate of 0.15 lb/cu. ft. of loose sawdust or ground bark, or with ammonium sulfate at a minimum rate of 0.25 lb/cu. ft. of loose sawdust or ground bark.
 8. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

C. FERTILIZER:

1. Fertilizer shall be a complete, standard product complying with state and federal fertilizer laws. The fertilizer shall be uniform in composition, dry and free flowing, and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis, and submitted to the Owner for approval.
2. Exact percentages of fertilizer may vary in accordance with the soil test report.

3. Any fertilizer that becomes caked or otherwise damaged (making it unsuitable for use) will be rejected. If stored at the site, protect fertilizer from the elements at all times.
4. Fertilizer shall be manufactured by Anderson ProTurf, or equal approved by the Owner. Application rates shall be in accordance with manufacturer recommendations. Fertilizer shall be complete, uniform in composition, dry and free flowing. The fertilizer shall be delivered to the site in the original waterproof containers, each bearing the manufacturer's statement of analysis.
5. Fertilizer to be spread on areas to be seeded shall be commercially prepared by Anderson ProTurf or an equal product pre-approved by the Owner. Fertilizer shall be a slow release, Poly-S urea, and shall contain the following percentages by weight:
 - a. 10% Nitrogen
 - b. 20% Phosphorus
 - c. 10% Potassium
 - d. 12% Sulfur
6. Grow - in Fertilizer shall be a slow-release, Poly-S urea, and shall be formulated as 25-3-4-Fe-2% and commercially prepared by Anderson ProTurf or equal approved by the Owner.

2.4 PESTICIDES

- A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer. Roundup, or approved equal, provide compatible surfactant and drift control agents as required.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated. "TRIMEC" 2.4.D.M.C.P.P. DICAMBA (BANVIL) manufactured by P.B.I. Gordon 816-421-4070 distributed by Wilbur Ellis Company (406)-248-1176 or West Chemical Agricultural Chemicals, Inc., (406)-252-3834, or other appropriate control which best fits the weed problem and necessary applications.

2.5 MULCHES

- A. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5. Weyerhaeuser, Conweb, or approved equal.
- B. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

1. Mulch tackifier must be natural, non-asphaltic, vegetable gum with gelling and hardening agents, Terra Tack or approved equal.

2.6 WATER

- A. Water will be available on site. Provide necessary hoses and other watering equipment required to complete work.
- B. Water shall be clean irrigation quality water.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 2. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Owner and replace with new planting soil.
 3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 4. Uniformly moisten excessively dry soil that is not workable or which is dusty.
 5. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
- B. Identify and review all underground utility locations before commencing work and exercise caution when working close to utilities. Notify Owner of apparent conflicts with construction and utilities to plan adjustment before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
 2. Protect grade stakes set by others until directed to remove them.
 3. Protect existing construction and completed work from damage.

- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

- A. Obtain Owner's written approval of rough grading work before incorporating organic soil amendments.
- B. Limit turf subgrade preparation to areas to be planted.
- C. Do not handle subsoil or organic soil amendment material when wet or frozen.
- D. Newly Graded Subgrades:
 - 1. Preparing areas: Decompect the site prior to topsoil application. Scarify and loosen subgrades too compact to drain water or based upon compaction tests to a minimum depth of 6 inches prior to placing topsoil. Soil decompaction shall be done with equipment that has ripping teeth, placed a maximum of 12 inches apart, then regrade surface. Clean subgrade of stones larger than 1-1/2 inches and debris or rubbish and remove from project site. Pressing rocks into the soil is not an acceptable method of removing rocks from the surface.
 - a. After ripping subgrade for topsoil bonding, place and uniformly spread topsoil to a minimum 6 inches deep. Spread approximately 1/2 the thickness of topsoil over loosened subgrade. Mix thoroughly into the top 4 inches of subgrade to avoid soil layering. Spread additional topsoil as required to meet finish grades.
 - b. Do not spread topsoil when frozen or excessively wet or dry.
 - c. After the topsoil has been spread, large stiff clods, stones, or other foreign material that would seriously affect the effectiveness or appearance of the topsoil, shall be raked up and removed from the area to provide a uniform textured soil.
 - d. Correct irregularities in finished surfaces to eliminate depressions.
 - e. Following topsoil placement there shall be no traffic on the placed topsoil.
- E. Unchanged Subgrades:
 - 1. If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
 - a. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
 - b. Loosen surface soil to a depth of at least 6 inches. Soil decompaction shall be done with equipment that has ripping teeth, placed a maximum of 12 inches apart, then regrade surface.
 - 2. Remove rocks, debris, clods and other undesirable substances larger than 1-1/2 inches and maintain grading and drainage patterns. Pressing rocks into the soil is not an acceptable method of removing rocks from the Seeding shall be done immediately after final grading, provided the bed has remained in a good, friable condition, and has not become muddy or compacted. Any undulations or irregularities in the surface resulting from fertilizing, tilling, or other causes, shall be regraded prior to seeding. The surface shall be free of stones, cleared of all

trash, debris, roots, brush, wire, grade stakes, and other objects that would interfere with establishment of vegetation and vegetation maintenance operations.

a. surface.

1) Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

F. Application Of Fertilizer And Soil Amendments For Turfgrass Areas

1. Apply soil amendments as recommended by soils report.

2. Apply organic amendments to depth sufficiently greater than specified depth so after natural settlement and light rolling, specified minimum settled depth conform to lines, grades and elevations indicated on drawings. Incorporate soil amendment by disc harrowing, rototilling or other means in uniform manner. Incorporate organic matter deep enough to produce finished soil with organic matter content of between 4 and 6 percent. Provide additional organic soil amendment material, after in-place testing and approval, as required for organic matter content and finished grades at no additional cost to Owner.

a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.

b. Incorporate soil amendments into soil to a minimum depth of 4 inches in finish grading operation.

1) At existing trees, the depth shall be adjusted to avoid disturbance of the tree roots.

G. Finish Grade:

1. Immediately restore soil to an even condition before seeding. Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation.

2. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3. Limit finish grading to areas that can be planted in the immediate future.

4. Set sufficient number of grade stakes to check finished grades. Set stakes in bottom of swales and at top of slopes. Connect contours and spot elevations with even slope.

5. Complete seed installation only after areas are brought to finished grade. Lawn areas will be left at ± 0.1 feet of finish grade as shown on plans. Before planting, obtain Owner's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

6. Protect areas from damage by vehicular or pedestrian traffic.

H. For areas disturbed outside of the project limits, restore as outlined in "Turf Renovation" Article.

I. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.4 WEED CONTROL

- A. Prior to application of seed or sod, the bed shall be roughed up to a depth of 1/8th inch.
- B. Moisten the seedbed to a depth of 1" to promote germination of any seeds contained in the topsoil. If rhizomatous grasses, field bindweed (morning glory) or noxious weeds are evident, the Contractor shall be required to eliminate those undesirable plants prior to seeding or sodding, at the discretion and direction of the Owner's Representative.
- C. Spray areas showing weed growth with approved herbicides, mow, and remove clippings prior to final grading. Seeding and sodding shall be executed 72 hours following Roundup application.

3.5 SEEDING

- A. Seeding shall be done immediately after final grading, provided the bed has remained in a good, friable condition, and has not become muddy or compacted. Any undulations or irregularities in the surface resulting from fertilizing, tilling, or other causes, shall be regraded prior to seeding. The surface shall be free of stones, cleared of all trash, debris, roots, brush, wire, grade stakes, and other objects that would interfere with establishment of vegetation and vegetation maintenance operations.
- B. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
 - 1. Plant turfgrass seed before application of mulch material.
 - 2. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other. Drag seeded area using approved device.
 - 3. Do not use wet seed or seed that is moldy or otherwise damaged.
 - 4. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- C. Sow seed at a total rate of **10 lbs/1000 sq. ft.**
- D. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- E. Compact seeded areas using a roller or other acceptable method prior to hydromulching
- F. In areas having slopes 1:4 or steeper, and in drainage swales, the Contractor shall carry out a separate overseeding operation immediately after sowing the specified seed mix. The overseeding shall be sown at the rate of 5 lbs. per 1,000 square feet. Protect seeded areas with slopes exceeding 1:4 with application of tackifier at a rate of 100 pounds per acre.

3.6 HYDROMULCHING

- A. Hydro Mulching: Mix slow-release starter fertilizer and approved wood cellulose mulch material, and tackifier in required amount of water to produce homogenous slurry, using

equipment specifically designed for hydromulching application. Uniformly apply slurry under pressure to deliver recommended quantity of fertilizer per 1000 sq. ft.

- B. Protect seeded areas from erosion by applying matrix mulch hydromulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch and roll surface smooth.
- C. Hydromulch application shall follow seeding as soon as practical, with consideration for minimal soil erosion through washing. All seeded areas shall be mulched before work is terminated on any day.

3.7 TACKIFIER

- A. Mulch tackifiers shall be mixed with water at a rate specifically by the manufacturer and shall be applied at a minimum rate of 40 pounds per acre.

3.8 TURF RENOVATION

- A. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
 - 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
 - 2. Install new planting soil as required.
- B. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- C. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- D. Mow, dethatch, core aerate, and rake existing turf.
- E. Remove weeds before turf installation. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- F. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- G. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.
- H. Apply soil conditioning material required for establishing new turf as indicated in accordance with the soil test report and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.
- I. Apply seed as required for new turf.
- J. Water newly planted areas and keep moist until new turf is established.

3.9 Staking and Fencing

A. General

1. All newly sodded or seeded areas are to be fenced so as to prevent trampling by foot or vehicular traffic. Fencing shall be removed by Contractor when Owner has determined that the lawn area is successfully established, as dictated in this section.

B. Materials

1. Posts to be five-foot minimum, six foot maximum green steel t-posts.
2. Fencing to be four-foot Tenax in guardian orange, length variable. Color substitutions allowed only with the direction and approval of the Project Manager.

C. Performance

1. Staking shall not be performed without prior identification of underground utilities, including but not limited to irrigation.
2. Stakes shall be installed every 16 feet or less, using a t-post driver.
3. Fencing to be attached to posts with nylon fence ties, zip ties or flexible wire.

3.10 TURF MAINTENANCE & ESTABLISHMENT PERIOD

A. Maintenance of turf areas shall begin immediately after installation, with Owner's approval, and continues through growing season sufficiently long for turfgrass to become established and prove satisfactory to the Owner, but in no case less than forty-five (45) days.

1. Maintenance includes watering, weeding, mowing and edging, reseeding, disease and insect pest control, repair of all erosion damage, and any other procedures consistent with good horticultural practice, required to ensure normal, vigorous, and healthy growth.
 - a. Maintenance shall continue until Final Acceptance of the work, as defined in "Conditions & Inspection for Final Acceptance" Article.
2. Roll, regrade, and replant bare or eroded areas to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - a. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
4. Eradicate weeds. Water, fertilize, overseed, and perform other operation necessary to promote growth of turfgrass. Remove weeds and foreign grasses in planted areas at least once per week. Herbicides may be used only when approved by the Owner's Representative.

- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 2 inches. Coordinate with Irrigation Contractor.
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 - 1. Mow Tall Fescue Turf grass to a height of 3 inches each time its height reaches 4 inches. Maintain through a minimum of three mowings to provide an even stand over the entire seeded area, until final inspection and acceptance.
- D. Provide a "grow-in" fertilizer, as specified, for all irrigated lawns. Apply six weeks after seed germination. In the case of fall seeding, apply prior to May 1, the following year.
- E. Apply post emergence herbicide per the manufacturer's recommendations and application rates, whenever and wherever weed growth jeopardizes or inhibits the development of a mature grass lawn. Apply herbicide in late spring or early summer. Apply only when mean high temperatures are between 60° and 85° F with wind velocities less than five (5) miles per hour. Prior to application, Contractor shall notify Owner, in writing, of the proposed schedule for applying herbicides. Written notice shall include the following items:
 - 1. Date of proposed application
 - 2. Specific area of proposed application
 - 3. Proposed herbicide for application
 - 4. Proposed concentration and application rate.
- F. The application area must be signed with Owner-approved signs informing the public of the application and duration of restricted use.
- G. Fencing: Provide four (4') foot tall orange plastic snow fencing and metal tee fence post spaced at a maximum of eight (8') feet apart around all walks at seeded and sodded areas. Maintain until lawn is accepted.

3.11 SATISFACTORY TURF

- A. Turf installations shall meet the conditions for Final Acceptance as outlined in "Conditions & Inspection for Final Acceptance" Article.

3.12 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.13 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- D. Remove nondegradable erosion-control measures after grass establishment period.

3.14 MAINTENANCE SERVICE

- A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, and until Final Acceptance by Owner.
- B. When the initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season until Final Acceptance condition and inspection is achieved.
- C. See "Conditions & Inspection for Final Acceptance" Article for information on Final Acceptance.

PART 4 - MEASUREMENT AND PAYMENT

- A. The engineer will measure actual quantities of work completed as described in subsections for individual pay items.
- B. The engineer will measure the completed work as follows:
 - 1. Lump Sum:
 - a. Site seeding and turf establishment

- 1) Seeding will include all items contained in this specification including associated soil testing and preparation, amendments, mulches, erosion control material, installation, staking and fencing and required maintenance through Final Acceptance.

END OF SECTION

SECTION 02940 PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

- A. The work in this section includes landscape construction, protection of existing site and landscape conditions and landscape maintenance during construction.
- B. See drawings for extent of landscaping.

1.3 SUMMARY

- A. Section Includes:
 - 1. Plant materials.
 - 2. Fertilizers.
 - 3. Weed-control barriers.
 - 4. Mulches.
 - 5. Herbicides and pesticides.
 - 6. Tree-stabilization materials.
 - 7. Landscape edgings.
 - 8. Boulders.
- B. Related Requirements:
 - 1. Section 02810 "Irrigation" for complete irrigation systems.
 - 2. Section 02930 "Turf & Grasses" for turf (lawn) and soil testing and preparation requirements.

1.4 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than sizes indicated; wrapped with burlap, tied, rigidly

supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than sizes indicated.
- D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of plant required.
- E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- F. Finish Grade: Elevation of finished surface of planting soil.
- G. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- H. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- I. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- J. Planting Area: Areas to be planted.
- K. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- L. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- M. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- N. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- O. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

- P. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.
- Q. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- R. Topsoil: Top layer of soil not containing more than 40 percent clay in a portion passing through a no. 10 sieve. Topsoil shall contain between 5 and 20 percent organic matter.

1.5 REFERENCED STANDARDS

- A. ANSI Z60.1: American Standard for Nursery Stock, latest edition, American National Standards Institute.
- B. Hortus Third: A Concise Dictionary of Plants Cultivated in the United States & Canada, Staff of the L.H. Bailey Hortorium, Cornell University, 1999.
- C. ASTM C33: Specification for Concrete Aggregate, American Society of Testing Materials.
- D. Alex Shigo, Tree Pruning, Shigo & Tree Associates, LLC, 1989.
- E. Guide for Plant Appraisal, latest edition, Council of Tree and Landscape Appraisers.
- F. Species Ratings and Appraisal Factors Guide, latest edition, International Society of Arboriculture, Rocky Mountain Chapter.
- G. ANSI A300: Standards for Tree Care Operations, American National Standards Institute.
- H. Tree Planting Specifications, Dr. Delmar Gilman, University of Florida, <http://hort.ifas.ufl.edu/woody/summary-planting.shtml>, Copyright 2011, University of Florida
- I. Guideline Specifications for Nursery Tree Quality, Dr. Delmar Gilman, University of Florida, <http://search.ufl.edu/web/#gsc.tab=0&gsc.q=Guideline%20Specifications%20for%20nursery%20stock%20%20site%3Ahort.ifas.ufl.edu> , Copyright 2011, University of Florida.
- J. International Society of Arboriculture (ISA) Best Management Practices publications

1.6 COORDINATION

- A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
 - 1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.7 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.8 ACTION SUBMITTALS

- A. Product Data:
 - 1. Plant materials.
 - 2. Soil Test Reports.
 - 3. Fertilizers.
 - 4. Weed-control barriers.
 - 5. Mulches.
 - 6. Herbicides and pesticides.
 - 7. Tree-stabilization materials.
 - 8. Landscape edgings.
 - 9. Boulders.
- B. Product Data Submittals: For each type of product indicated.
 - 1. Plant Materials: Include quantities, plant dimensions, container/root ball size, quality, and verified sources and suppliers for plant materials. Each plant of the same species shall be supplied by one grower only unless otherwise approved the Owner. Submit within 30 days after award of contract, complete list of materials to be furnished under this section and confirmed sources for materials.
 - a. Requests for substitution of plants not available in size, quantity or type specified must be made in writing prior to Contract award. Submit written evidence that a specified plant cannot be obtained.
- C. Samples for Verification: Actual sample of finished products for each of the following:
 - 1. Organic Mulch: 1-quart volume of each organic mulch required; typical of the lot of material to be furnished, in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Provide an accurate representation of color, texture, and organic makeup.
 - 2. Mineral Mulch: 5 lb of each mineral mulch required; typical of the lot of material to be furnished, in sealed plastic bags labeled with source of mulch. Provide accurate indication of color, texture, and makeup.
 - 3. Weed-Control Barrier: 12 by 12 inches.
 - 4. Edging Materials and Accessories: Manufacturer's standard size, to verify color selected.
 - 5. Pictures or samples of Selected Boulders.

1.9 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of Owners' contact persons.
- B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with manufacturer's certified analysis of standard products.
- C. Material Test Reports: For existing in-place surface soil and imported topsoil.
 - 1. See Section 02930 "Turf & Grasses" for planting soils testing and preparation requirements.
- D. Identify source location of topsoil proposed for use on the project if imported from off-site.
 - 1. See Section 02930 "Turf & Grasses" for requirements.
- E. Pesticides and Herbicides: Product label and manufacturer's written application instructions specific to Project.
- F. Warranty.

1.10 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.11 QUALITY ASSURANCE

- A. Comply with applicable Federal, state and local regulations governing landscape materials and work.
- B. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.
 - 1. Experience: Three years' experience in landscape installation.
 - 2. Installer's Field Supervision: Maintain an experienced full-time supervisor on Project site when work is in progress.
 - 3. Pesticide Applicator: State licensed, commercial.
- C. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- D. Measurements: Measure in accordance with ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- E. Plant Material Observation: Owner may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Owner retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Owner's representative reserves right to review and reject materials at growing site and as delivered to site. Remove rejected trees or shrubs immediately from Project site.
1. Notify Owner's representative of delivery schedule 48 hours in advance so plant material may be observed upon arrival at job site and can be inspected immediately after being unloaded at site.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.
- B. Bulk Materials:
 - a. Do not dump or store bulk materials near structures, utilities, or walkways and pavements; or on existing turf areas or plants.
 - b. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - c. Accompany each delivery of bulk materials with appropriate certificates.
- C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- D. Handle planting stock by root ball.
- E. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.
- F. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.
- G. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees

in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots that are in less than moist condition in water for two hours. Reject plants with dry roots.
2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.13 FIELD CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 1. Spring Planting: April 15 to June 15.
 2. Fall Planting: August 15 to September 31.
 3. Irrigation system must be operational prior to planting.
- C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions in accordance with manufacturer's written instructions and warranty requirements.

1.14 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
 - b. Structural failures, including plantings falling or blowing over.
 - c. Faulty performance of tree stabilization.
 - d. Warranty excludes replacement of plants after final acceptance because of injury by storm, drought, drowning, hail, freeze, insects, or disease. Materials damaged by "Acts of God" prior to final acceptance are responsibility of Contractor.

2. Warranty Periods: From date of Final Acceptance. See Article "Conditions & Inspection for Final Acceptance."
 - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
 - d. Trees should be replaced at start of next planting or digging season. In such cases, remove dead trees immediately. Protect irrigation system and other piping conduit or other work during replacement. Repair damage immediately.
 - e. Provide extended warranty for period equal to original warranty period, for replaced plant material.
 - f. At end of warranty period, remove staking and guying materials from the site.

1.15 CONDITIONS & INSPECTION FOR FINAL ACCEPTANCE

A. Inspection and Final Acceptance:

1. Landscape plant acceptance will occur after completion of PLANT MAINTENANCE & ESTABLISHMENT PERIOD. Contractor to have completed, located, and installed all plants according to drawings and specifications. All plants and turfgrass are expected to be living and in healthy condition at time of inspection and acceptance.
2. Upon written request of the Contractor, the Owner will inspect all vegetated areas to determine completion of work. This request must be submitted at least one week prior to the anticipated inspection date.
3. If the vegetated areas are not acceptable, the Owner will indicate corrective measures to be taken and shall extend the PLANT MAINTENANCE & ESTABLISHMENT PERIOD as necessary for the completion of the work. The Contractor shall request a second inspection of the vegetated areas after corrective measures have been accomplished. This process shall be repeated until the total vegetated area being inspected is acceptable.
4. When the vegetated areas are acceptable, a meeting of the Contractor and Owner will be arranged to accept the vegetated work. A final inspection will be a part of this meeting. At this meeting, the Contractor shall be furnished with a written acceptance of the vegetated area being approved. The Contractor shall turn over maintenance of the vegetated areas to the Owner at this meeting.
5. Following the acceptance of vegetated areas, the Contractor shall provide the Owner with access to all vegetated areas as required for the Owner's maintenance work.

- B. Conditions of Final Acceptance:
 - 1. Acceptance shall be given for the entire portion of the vegetated areas. No partial acceptance will be given.
 - a. Planter beds and earth mound water basins are properly mulched and free of weeds.
 - b. Tree support stakes, guys, and turnbuckles are in good condition.
 - c. Total plants on site as required by specifications and required replacements have been installed.
 - d. Remedial measures directed by Owner have been completed.
 - 2. Pavement surfaces and site improvements adjacent to vegetated areas shall be clean and shall be free of spills or overspray from placing or handling of topsoil and sodding operations.
- C. Site Cleanup:
 - 1. The Contractor shall leave the site in a clean and neat condition. Final Acceptance will not be granted until this condition is met.

PART 2 - PRODUCTS

2.1 PLANT MATERIALS

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 - 1. Trees with damaged, crooked, or multiple leaders; with tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); with crossing trunks; with cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable.
 - 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare in accordance with ANSI Z60.1.
- D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for plant.
- E. Special Requirements

1. Shade trees are to be procured a minimum of 30 days prior to scheduled installations. Trees to be shipped in enclosed truck or the branches/leaves protected by appropriate fabric during shipping. Trees are to be healed in at job site or at Contractor's holding facility and maintained until site is ready. Owner's representative will review trees at holding area prior to planting.

2.2 FERTILIZERS

- A. Type A – as recommended by testing agency.
- B. Type B – Scotts "Osmocote" at a 14-14-14 ratio, incorporated into the soil according to instructions on the bag.

2.3 PLANTING SOILS

1. Existing Soil with Amendments as recommended by soil testing laboratory, with a pH range of 5.0 to 8; 5 to 12 percent organic material content total dry weight; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.
2. Imported Topsoil
 - a. In the event sufficient quantities of native topsoil cannot be salvaged from the site, the Contractor shall provide imported topsoil to supplement the project requirements. The Contractor shall provide topsoil that meets or exceeds the quality of the native topsoil material available on site. Contractor shall provide source and analysis information to the Owner's Representative, for his approval, prior to delivery. The Contractor shall incorporate into the topsoil, amendments necessary to provide topsoil fertility and quality, equal to or exceeding the characteristics of the native topsoil.

2.4 SHARP SAND

- a. Sharp sand shall be clean, washed and fine aggregate and shall meet ASTM C33 standards.

2.5 PEAT MOSS

1. Peat moss shall be commercially produced, sterilized, reed-sedge peat, equivalent to Martins Peat, Big Fork, Montana. Peat must have a pH between five and seven and organic matter content not less than 90 percent.

2.6 WEED-CONTROL BARRIERS

- A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, composed of fibers inert to biological degradation and naturally resistant to chemicals, alkalis, and acids, formed into a stable network so that fibers retain their relative position.
 1. Class A type equal to DMS-6200 Type 1, 4.0 oz per sq. yd. to 6.0 oz. per sq. yard or approved equal.

2.7 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 - 1. Type: Shredded medium grade, Douglas Fir Bark, free of wood chips and sawdust
 - 2. Size Range: Chip size of 1-1/2 to 2-1/2 inch average
 - 3. Color: Natural.
 - 4. As manufactured by Model Log Homes, 75777 Gallatin Road, Gallatin Gateway, Montana, 59730, or approved equal.

- B. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of the following type, size range, and color:
 - 1. Type: Black Basalt Rock Mulch, or equal, as approved by the Owner.
 - 2. Size Range: 1-1/2 inches minimum, 3 inches maximum
 - 3. Color: Uniform dark gray with tans color range as acceptable to the Owner.

2.8 HERBICIDES AND PESTICIDES

- A. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

- B. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

- C. Pesticides: Registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended in writing by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

2.9 ANTI-DESICCANT

- A. Protective film emulsion for protection of plant surfaces during transport. Permeable to permit transpiration, as manufactured by Wilt Pruf, Inc., P.O. Box 4280, Greenwich, Connecticut, 06830. Mixed and applied in accordance with manufacturer's instructions.

- B. Owner's representative approved equal.

2.10 DRAINAGE FILL

- A. No drainage without Owner's written permission.

2.11 TREE-STABILIZATION MATERIALS

A. Trunk-Stabilization Materials:

1. Metal posts: 8'-0" t-stakes
2. Tree-Tie Webbing: UV-resistant nylon webbing with brass grommets.
3. Guy Straps: Fabric or nylon designed specifically to guy newly planted trees. Wire will not be permitted.
4. Eye Bolts: Galvanized or cadmium plated steel with 1 inch diameter eye and minimum 1 1/2 inches screw length.
5. Turnbuckles: Galvanized or cadmium plated steel with minimum 3-inch-long openings fitted with screw eyes.
6. Turnbuckles: Galvanized or cadmium plated steel with minimum 3-inch-long openings fitted with screw eyes.
7. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.
8. Proprietary Staking-and-Guying Devices: Proprietary stake or anchor and adjustable tie systems to secure each new planting by plant stem; sized as indicated and in accordance with manufacturer's written instructions.

2.12 LANDSCAPE EDGINGS

A. Aluminum Edging: Standard-profile extruded-aluminum edging, ASTM B221, Alloy 6063, fabricated in standard lengths with interlocking sections with loops stamped from face of sections to receive stakes.

1. Edger to be Permaloc Cleanline, or approved equal.
2. Edging Size: 3/16 inch thick by 5-1/2 inches deep
3. Stakes: Heavy Duty Aluminum per manufacturer, 12 inches long. Spaced per manufacturer recommendation.
4. Finish: Black DuraFlex, or as approved by Owner.

2.13 BOULDERS

- A. To be natural stone in three approximate varying sizes: 24", 36", and 48" diameter. Refer to plan for boulder locations. Vary sizes per grouping.
- B. Boulders shall be similar in shape and size as depicted on the plan, rough face, firmly anchored, and level. All boulders shall be free of sharp edges and surfaces that could be harmful to pedestrians. Contractor to provide samples or images for approval by Owner prior to delivery.
- C. Type: Native Boulder sourced in the Gallatin Valley region, free of sharp edges.
- D. Color: Natural Dark Grays, Tans, and Golds to match mineral mulch selection.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
 - 3. Suspend planting operations during periods of excessive soil moisture until moisture content reaches acceptable levels to attain required results.
 - 4. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove soil and contamination as directed by Architect and replace with new planting soil.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Owner's acceptance of layout before excavating or planting. Make minor adjustments as required.

3.3 PLANTING AREA ESTABLISHMENT

- A. Loosen subgrade of planting areas to a minimum depth of 6 inches. Remove stones larger than 1 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property. Pressing rocks into the soil is not an acceptable method of removing rocks from the surface.
 - 1. Spread topsoil over loosened subgrade, apply soil amendments and fertilizer on surface as recommended by soils report, and thoroughly blend planting soil. Incorporate soil amendment by disc harrowing, rototilling or other means in uniform manner. Incorporate organic matter deep enough to produce finished soil with

organic matter content of between 4 and 6 percent. Provide additional organic soil amendment material, after in place testing and approval, as required for organic matter content and finished grades at no additional cost to Owner.

- a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
2. Spread planting soil to a depth of 12 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately one-half the thickness of planting soil over loosened subgrade. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil.
- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- C. Before planting, obtain Owner's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits.
1. Excavate planting pits with sides sloping inward at a 60-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
 2. Excavate approximately three times as wide as ball diameter for balled and burlapped and container-grown stock.
 3. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
 4. Do not excavate deeper than depth of root ball, measured from the root flare to the bottom of root ball.
 5. If area under the plant was initially dug too deep, add soil to raise it to correct level and thoroughly tamp the added soil to prevent settling.
 6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 7. Maintain supervision of excavations during working hours.
 8. Keep excavations covered or otherwise protected when unattended by Installer's personnel.

- B. Backfill Soil: Subsoil and topsoil removed from excavations may not be used as backfill soil unless amended to meet soils report recommendations before being used as planting soil.
- C. Obstructions: Notify Owner if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
- D. Drainage: Notify Owner if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE AND SHRUB PLANTING

- A. Stake locations for approval by Owner's representative.
- B. Before planting, verify that root flare is visible at top of root ball in accordance with ANSI Z60.1. If root flare is not visible, remove soil in a level manner from root ball to where the top-most root emerges from the trunk. After soil removal to expose root flare, verify that root ball still meets size requirements.
- C. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- D. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
 1. Backfill: Use Planting soil for backfill.
 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove Top and Sides 1/3 of burlap, and all twine, rope, and wire baskets from root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Distribute granular fertilizer around each planting pit when pit is approximately one-half filled. Do not place in bottom of the hole.
 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
 6. Construct a temporary 4 inch raised ring of soil at edge of root ball to contain water for deep watering. Contractor is responsible for deep watering until final acceptance. Remove or breach before winter.
 7. Construct a mulch ring with a minimum 36" diameter to a depth of 3" – 4"; leave 3" bare ground between mulch and tree trunk.
 8. Set stakes, if required, as outlined in Article "Installation of Tree-Stabilization Materials"

- E. Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades, or as indicated on the drawings.
 - 1. Backfill: Planting soil.
 - 2. Carefully remove root ball from container without damaging root ball or plant.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4. Distribute granular fertilizer around each planting pit when pit is approximately one-half filled. Do not place in bottom of the hole.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
 - 6. Construct a temporary 4 inch raised ring of soil at edge of root ball to contain water for deep watering. Contractor is responsible for deep watering until final acceptance.
 - 7. Construct a mulch ring with a minimum 36" diameter to a depth of 3" – 4"; leave 3" bare ground between mulch and tree trunk.
 - 8. Set stakes, if required, as outlined in Article "Installation of Tree-Stabilization Materials".
- F. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of root ball.
- G. Root Balls
 - 1. Root balls shall be properly located in relationship to adjacent soil as required by referenced standards.
 - 2. Balls set too deep or too shallow shall be carefully removed and replanted as required by the Owner's representative.

3.6 PERENNIAL PLANTING

- A. Prepare planting beds as indicated on drawings. Provide one foot of thoroughly mixed and prepared soil consisting of 50 percent sand loam topsoil; 25 percent coarse pumice, 3/8 inch size; and 25 percent peat moss. Thoroughly mix in 20 pounds of Scott, Ortho or Lilly-Miller nitrogen fertilizer per cubic yard with formulation of 10-20-10.
- B. Replace existing soil with planting mix.
- C. Space plants as indicated on drawings. Obtain approval of plant layout from Owner's representative before planting. Owner's representative reserves the right to change the location of plants prior to planting.

3.7 MECHANIZED TREE-SPADE PLANTING

- A. Plant trees with approved mechanized tree spade at designated locations. Do not use tree spade to move trees larger than maximum size allowed for similar field-grown, balled-and-burlapped, root-ball diameter in accordance with ANSI Z60.1, or trees larger than manufacturer's maximum size recommendation for tree spade being used, whichever is smaller.
- B. Use same tree spade to excavate the planting hole as will be used to extract and transport the tree.
- C. When extracting tree, center the trunk within the tree spade and move tree with solid ball of earth.
- D. Cut exposed roots cleanly during transplanting operations.
- E. Plant trees following procedures in "Tree, Shrub, and Vine Planting" Article.
- F. Where possible, orient the tree in same direction as in its original location.

3.8 TREE, SHRUB, AND VINE PRUNING

- A. Follow referenced standards and prune material as directed by Owner's representative.
- B. Prune, thin, and shape trees, shrubs, and vines in accordance with standard professional horticultural and arboricultural practices. Unless otherwise indicated by Owner, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character. Do not prune for shape.
- C. Do not apply pruning paint to wounds.

3.9 INSTALLATION OF TREE-STABILIZATION MATERIALS

- A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:
 - 1. Upright Staking and Tying:
 - a. Stake all proposed trees. Use a minimum of two stakes of length required to penetrate at least 24 inches below bottom of backfilled excavation and to extend to the dimension indicated on Drawings above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
 - b. Stake trees with two stakes for trees up to 12 ft. high and 2-1/2 inches or less in caliper; three stakes for trees less than 14 ft. high and up to 4 inches in caliper. Space stakes equally around trees.
 - 2. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

3. Support trees with 1" wide minimum, flexible belt-like fabric. Do not use rope or wire. Do not overtighten around tree. Allow enough slack to avoid rigid restraint of tree.
 4. Remove ties within one year after installation. Coordinate with Owner prior to removal on timeline for removal of stakes and tree guards.
- B. Trunk Stabilization by Staking and Guying: Stake and guy trees more than 14 ft. in height and more than 3 inches in caliper unless otherwise indicated.
1. Site-Fabricated, Staking-and-Guying Method: Install no fewer than three guys spaced equally around tree.
 - a. For trees more than 6 inches in caliper, anchor guys to wood deadmen buried at least 36 inches below grade. Provide turnbuckle for each guy wire and tighten securely.
 - b. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
 - c. Attach flags to each guy wire, 30 inches above finish grade.
 2. Proprietary Staking and Guying Device: Install staking and guying system sized and positioned as recommended by manufacturer unless otherwise indicated and in accordance with manufacturer's written instructions.

3.10 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in equidistance spacing in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to depth not less than two nodes.
- E. Work soil around roots to eliminate air pockets and leave slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.11 INSTALLATION OF MULCHES

- A. After planting has been completed and approved by the Owner's representative, install weed-control barriers before mulching in accordance with manufacturer's written instructions, in areas as indicated on Drawings. Completely cover area to be mulched, overlapping edges minimum of **12 inches**.

1. At the bed margins, fabric should be installed under the bottom of the edging. Fabric lapping outside the edging should be trimmed to below grade and buried when the edging is backfilled. Fabric should be well anchored with 6 inch staples pounded flush with the grade. Plant openings must be large enough to allow for future growth.
- B. Mulch backfilled surfaces of planting areas and other areas indicated.
1. Trees and Treelike Shrubs in Turf Areas: Apply organic mulch ring of 3-inch average thickness, with 36-inch radius around trunks or stems. Do not create a mulch cone or place mulch within 3 inches of trunks or stems.
 2. Mineral Mulch in Planting Areas: Apply 3-inch average thickness of mineral mulch extending 12 inches beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

3.12 INSTALLATION OF LANDSCAPE EDGINGS

- A. Aluminum Edging: Install aluminum edging where indicated in accordance with manufacturer's written instructions. Set edging as indicated in true lines as designed with top of edging one inch above finish grade.

3.13 INSTALLATION OF BOULDERS

- A. Boulders shall be installed as indicated on the drawings, firmly anchored in planting beds, level, with approximately 1/3 bottom of boulder buried. Place mulch up to base of boulder.
- B. Final boulder placement locations may be adjusted in the field by the Owner.

3.14 APPLICATION OF HERBICIDES AND PESTICIDES

- A. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written instructions. Do not apply to seeded areas.
- B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written instructions.
- C. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and in accordance with manufacturer's written instructions. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

3.15 PLANT MAINTENANCE & ESTABLISHMENT PERIOD

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
- B. Water will be available on site. Provide necessary hoses and other watering equipment required to complete work.
 - 1. Coordinate watering schedules with irrigation contractor or Owner's representative during installation and until final acceptance. Provide deep root watering to newly installed trees.
- C. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- D. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.
- E. Weeding: Remove weeds and foreign grasses in planted areas at least once per week. Herbicides may be used only when approved by the Owner's Representative.
- F. PLANT MAINTENANCE AND ESTABLISHMENT shall be the period of time required to meet conditions of Final Acceptance. See Article "Conditions & Inspection for Final Acceptance."

3.16 REPAIR AND REPLACEMENT

- A. Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Owner.
 - 1. Trees removed during demolition or construction are to be replaced following consultation with Owner's Arborist or Owner's Representative. Appraised values of existing trees have been determined according to industry standards and will be provided by the Owner if applicable.
 - 2. Submit details of proposed pruning and repairs.
 - 3. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
 - 4. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Owner.
 - 5. Remove and replace trees that are more than 25 percent dead or in unhealthy condition or are damaged during construction operations that Owner determines are incapable of restoring to normal growth pattern.

3.17 CLEANING AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.
- C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

PART 4 - MEASUREMENT AND PAYMENT

- A. The engineer will measure actual quantities of work completed as described in subsections for individual pay items.
- B. The engineer will measure the completed work as follows:
 - 1. Trees, shrubs, and perennials will be measured by each and will include all associated soil testing and preparation, mulches, tree stabilization, installation, warranty, and required maintenance through Final Acceptance.
 - 2. Boulders will be measured by each.
 - 3. Mineral mulch will be measured by cubic yard and include landscape weed barrier fabric.
 - 4. Edging will be measured by linear feet and include all associated stakes.

END OF SECTION

SECTION 03310
STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Furnish structural concrete meeting all specified requirements that is composed of Portland cement, supplementary cementitious materials, aggregates, chemical admixtures and water. Furnish Ready-mixed concrete meeting ASTM C94 unless otherwise specified. Furnish concrete reinforcement to concrete as specified in the construction documents.

1.2 REFERENCES

- A. References to ASTM, AASHTO, ANSI and ACI designations, means the latest revision at the time of the call for bids:

ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C150	Specification for Portland Cement
ASTM C618	Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C989	Specification for Slag Cement for Use in Concrete and Mortars ASTM C1240 Specification for Silica Fume Used in Cementitious Mixtures ASTM C595 Specification for Blended Hydraulic Cements
ASTM C1157	Performance Specification for Hydraulic Cement
ASTM C157	Length Change of Hardened Hydraulic-Cement Mortar and Concrete
ASTM C33	Specification for Concrete Aggregates
ASTM C260	Specification for Air-Entraining Admixtures for Concrete
ASTM C494	Specification for Chemical Admixtures for Concrete
ASTM C1017	Specification for Chemical Admixtures for Use in producing Flowing Concrete
ASTM C138	Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C173	Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C231	Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C31	Practice for Making and Curing Concrete Test Specimens in the Field

ASTM C39	Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C172	Practice for Sampling Freshly Mixed Concrete ACI 301 Standard Specification for Structural Concrete ACI 305 Hot Weather Concrete
ACI 306	Cold Weather Concrete
ACI 318	Building Code Requirements for Structural Concrete and Commentary

1.3 QUALITY ASSURANCE

- A. Codes and Standards: The codes and standards referred to in this section are declared to be part of this specification as if fully set forth herein. In addition, the following ACI Standards are incorporated in their entirety, unless specifically required otherwise:
1. ACI Standard 301, "Specifications for Structural Concrete," American Concrete Institute, current edition.
 2. ACI Standard 318, "Building Code Requirements for Structural Concrete", American Concrete Institute, current edition.
 3. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".
 4. International Building Code of I.C.B.O.
- B. Employ, at the Contractor's expense, a testing laboratory acceptable to the Engineer to perform material evaluation tests and/or perform the mix design prior to placing any concrete, and all acceptance testing during the onsite placement of the concrete. Retesting or additional testing of concrete or materials failing to meet the requirements of these specifications must be done by the Contractor at no additional cost to the Owner.

PART 2 - PRODUCT

2.1 CLASSIFICATION

- A. Concrete is classified as set forth by aggregates size referenced in ASTM C33, sizes 4 and 467 for Class C concrete and 56, 57, and 6 for Class M concrete. Place the specified class of concrete for each structure element as specified.
1. Use M-4500 ($f'_c = 4,500$ psi) concrete for curb and gutter, sidewalks, driveways, approaches, curb turn fillets and valley gutters and structural concrete. The maximum allowable water cement (w/c) for this concrete is 0.45.
 2. Use M-3000 ($f'_c = 3,000$ psi) concrete for manholes, storm drain inlets and miscellaneous or C-3000 Concrete Construction class. The maximum allowable w/c for this concrete is 0.50.
- B. If concrete strength or durability requirements established by design exceed the above strength classifications, the Engineer may specify additional concrete classifications to meet those requirements.

2.2 COMPOSITION OF CONCRETE

- A. Upon receipt of the notice of award of the contract, furnish the Engineer with names of suppliers and locations of sources of materials proposed for use.
1. Materials
 - a. Cementitious Material: Cementitious material consists of Portland Cement meeting ASTM C150 Type I, II, III, or V, with or without the addition of cementitious or pozzolanic mineral admixtures meeting, ASTM C618 or ASTM C989, and ASTM C1240, or blended hydraulic cement meeting ASTM C595 Type 1P, 1S, or 1L, or hydraulic cement meeting ASTM C1157 Type GU, MS, HS, or HE. Unless otherwise specified, assure cementitious material meets ASTM C 150 Type I or Type II. Assure cementitious material used in concrete is the same brand and type and from the same plant of manufacture as the cementitious material used in the concrete represented by the submitted field test data or used in the trial mixtures.
 - b. Aggregates: Assure aggregates meet ASTM C33. When a single size or a combination of two or more sizes of coarse aggregates are used, assure the final gradation meets the grading requirements of ASTM C33 or provide an optimized combined aggregate gradation plan. Obtain concrete aggregates from the same source and use the same size ranges as the aggregates used in the concrete represented by submitted historical data, or used in trial mixtures.
 - c. Water and Ice: Use concrete mixing water and water to make ice meeting requirements of ASTM C94.
 - d. Admixtures: Use admixtures meeting the following requirements:
 - i. Air entraining, admixtures - ASTM C260
 - ii. Chemical admixtures- ASTM C494
 - iii. Chemical admixtures for use in producing, flowing concrete- ASTM C1017
 - iv. Calcium Chloride - ASTM D98
 - v. Use admixtures in the concrete that are the same as those used in the concrete represented by submitted field test data or in trial mixtures.
 2. Change of materials
 - a. When brand, type, size, or source of cementitious materials, aggregates, water, ice or admixtures are requested to be changed, submit new field data or data from new trial mixtures or furnish evidence that indicates that the change will not adversely affect the relevant properties of the concrete for acceptance before using the concrete.
- B. Performance and Design Requirements
1. Assure the cementitious material content is adequate to meet the specified requirements for strength, water-cement ratio and finishing requirements. For

concrete exposed to freezing and thawing or concrete exposed to deicers, assure a maximum water-cement ratio of 0.45.

2. Furnish concrete at the point of delivery having a slump of 4 inches (max) determined by ASTM C143. Meet slump tolerances in ACI 117. When a plasticizing admixture is used meeting ASTM C1017 or when a Type F or G high range water reducing admixture meeting ASTM C494 is approved to increase the concrete slump, assure the concrete has a slump of 2 to 4 inches before the admixture is added and a maximum slump of 8 inches at the point of delivery after the admixture is added.
3. Assure the nominal maximum size of coarse aggregate does not exceed three fourths of the minimum clear spacing between reinforcing bars, one-fifth of the narrowest dimension between sides of forms or one-third of the thickness of slabs or toppings.
4. Concrete exposed to cycles of freezing and thawing or in the presence of deicers must be air entrained. Montana is considered a "severe" exposure state. Measure air content under ASTM C 138, C 173 or C231. Unless otherwise specified, ASTM C231 shall be used. Table 2.1 lists the required air contents for various nominal maximum size aggregates.

TABLE 2.1

TOTAL AIR CONTENT* OF CONCRETE FOR VARIOUS SIZES OF COARSE AGGREGATE

Nominal maximum Size of aggregate in.	Total air content, percent
	Severe exposure
Less than 3/8	9
3/8	7.5
1/2	7
3/4	6
1	6
1-1/2	5.5
2	5
3	4.5
6	4

* Measure in accordance with ASTM C 138, C 173, or C 231. Air content tolerance is plus 2 percent (+2%) to minus 1 percent (-1%).

- a. When admixtures are specified in the Contract documents for particular parts of the work, use types specified. Use of calcium chloride or other admixtures containing chloride ions is subject to the limitations in Table 2.2 Chloride Ion Concentration. When approved, use calcium chloride in solution form only, when introduced into the mixture.
 - i. Assure the maximum water-soluble chloride ion concentrations in hardened concrete at ages from 28 to 42 days attributed to the ingredients including water, aggregates, cementitious materials and

admixtures do not exceed the limits of Table 2.2. Use tests to determine water soluble chloride ion content meeting AASHTO T260. The type of member described in Table 2.2 applies to the work as indicated in the Contract Documents.

TABLE 2.2
MAXIMUM ALLOWABLE CHLORIDE ION CONTENT

Type of Member	Maximum water-soluble chloride (Cl) Content in concrete, percent by weight of cement
Prestressed concrete	0.06
Reinforced concrete exposed to chloride in service	0.15
Reinforced concrete that will be dry or protected from moisture in service	1.00
Other reinforced concrete construction	.30

- b. When the air temperature has fallen to or is expected to fall below 40oF (4oC) during the protection period, deliver concrete in accordance with minimum temperatures identified in ASTM C94. The protection period is defined as the time required to prevent concrete from being affected by exposure to cold weather.
- c. Furnish the compressive strength and the water-cement or water cementitious, material ratio of concrete for each portion of the work as specified in the Contract documents.
 - i. If cementitious or pozzolanic mineral admixtures meeting, ASTM C618 or ASTM C989, or ASTM C1240 are used, the cement portion of the water-cement ratio must be the total weight of cementitious material.
 - ii. The combined weight of fly ash and other pozzolans, slag cement, silica fume meeting applicable ASTM standards, cannot exceed limits in ACI 318-14, Table 26.4.2.2 (b). The fly ash and pozzolan present in an ASTM Type IP cement meeting ASTM C595 must be included in the calculated percentage.

ACI Table 26.4.2.2(b) – Limits on cementitious materials for concrete assigned to Exposure Class F3

Cementitious Materials	Maximum Percent of Total Cementitious Materials by Mass
Fly ash or other pozzolans conforming to ASTM C618	25
Slag cement conforming to ASTM	50
Silica fume conforming to ASTM C1240	10
Total of fly ash or other pozzolans	35
Total of fly ash or other pozzolans, slag cement, and	50

- iii. Strength requirements are based on the 28-day compressive strength determined on 6" x 12" (average of two specimens), or 4" x 8" (average of three specimens) cylindrical specimens made and tested under ASTM C31 and C39 respectively.

2.3 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to the Engineer for preparing and reporting proposed mix designs.
- B. Submit written reports of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until design mixes have been reviewed and approved.

PART 3 - EXECUTION

3.1 CONCRETE MIXES

- A. Job-Site Mixing: Mix materials for concrete in appropriate drum type batch match mixer. For mixers of 1 cu. yd., or small capacity, continue mixing at least 1-½ minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cu. yd., increase minimum 1-½ minutes of mixing time by 2.5 minutes for each additional cu. yd., or fraction thereof. Aggregates or bags of cement containing lumps or crusts shall not be used.
- B. Provide batch ticket in compliance with ASTM C94 for each batch discharged and used in work.
- C. When air temperature is between 85°F (30°C) and 90°F (32°C), reduce mixing and delivery time from 1-½ hours to 75 minutes, and when air temperature is above 90°F (32°C), reduce mixing and delivery time to 60 minutes, unless a hot weather concreting plan has been approved.
- D. The mix may be designed for delayed set time to allow for long haul or other project conditions. Information pertaining to the delayed set admixture needs to be included

on the Batch Ticket. Include with the mix design submittal information on the delayed set provisions of the design and specific time to final placement requirements.

3.2 MIXING

- A. Thoroughly mix concrete to assure a uniform distribution of the materials throughout the mass. Mix concrete only in quantities required for immediate use and place it within the time limits specified. Waste all concrete which initial set has begun. Retempering of concrete is prohibited. Mix concrete in an approved truck mixer meeting the requirements of ASTM C94 herein.
1. WATER
 - a. Do not exceed the approved w/c ratio
 - b. The addition of water is allowed only one time and a minimum of 30 revolutions at mixing speed are required before discharge of concrete
 - c. Do not add water if part of the batch has been discharged as a W/C ratio cannot be determined
 - d. Do not add water if the slump is within specified range
 2. ADMIXTURE
 - a. Do not exceed manufacturer's recommended dosage rates unless otherwise approved in the mix design stage
 - b. Only admixtures included in the approved mix design may be dosed on-site.
 - c. A minimum of 30 revolutions at mixing speed are required before discharging of concrete.
 - d. Do not add admixtures if any concrete has been discharged from the mixer other than the minimal amount for initial testing
 - e. When measured plastic air content or slump exceeds the upper test limit and there is time available within the discharge time limit specified, rotate the load at agitation speed and re-test the air content and/or slump.
 - f. Do not use additives to reduce the air content and/or slump
- B. The capacity of the plant and the transportation equipment must ensure delivery at a rate that will permit proper handling, placement and finishing at the point of delivery. Maintain the concrete delivery rate to provide for the continuous operation of placing, handling and finishing concrete as is practical. Maintain the interval between delivery of loads so that layers or lifts of concrete in place do not harden before succeeding layers or lifts are placed. In general, no lift or layer of concrete can remain exposed for more than 20 minutes before being covered by fresh concrete.
- C. The volume of mixed concrete in the mixing drum shall not exceed the manufacturer's rating, on the capacity plate.

- D. A recording water metering device is always required at the primary point of the batching operation.
- E. Do not add water to concrete in transit. Water may be introduced into the mixer at the job site, one time only, under direction of the Engineer, if the specified water-cement ratio is not exceeded. Water must be added in accordance with ASTM C94, Assure the drum revolves continuously after the introduction of the cement and water until the concrete is discharged.
- F. Begin mixing immediately after introduction of the cement and water and continue for at least 70 revolutions of the drum at mixing speed. This minimum revolution count will be waived when the concrete is produced at a central mixing plant. Not more than 100 drum revolutions can exceed 6 revolutions per minute. All other revolutions must be at agitating speed of not less than 2 or more than 6 revolutions per minute.
- G. Provide a revolution counter on each truck that registers the number of revolutions of the drum.
- H. Mount the counter so it can be easily read by both the operator and the Engineer.

3.3 PLACING CONCRETE

- A. Thoroughly consolidate concrete into its final position. Assure it is thoroughly consolidated around fittings and embedded items. Assure all reinforcement and embedded items are accurately placed as shown on the plans and are clean and free from coatings of dried mortar, detrimental rust, scale, oil or foreign matter. Place concrete meeting the applicable requirements of Sections 02528 and 02529.

3.4 CURING CONCRETE

- A. Protect freshly placed concrete from freezing, high temperature, large temperature differentials, premature drying, excessive moisture, and moisture loss for a period of time necessary to develop the desired concrete properties.
- B. Thoroughly cure concrete surfaces by covering as soon as possible with canvas, plastic sheets with sealed joints, burlap and sand or other satisfactory materials and keep concrete moist. If the concrete surfaces are not covered, keep them moist by flushing or sprinkling. Continue curing for at least 7 days after placing the concrete. Concrete surfaces placed against forms may be cured by leaving the forms in place for at least 7 days, when approved.
- C. Protect concrete against freezing or other conditions detrimental to strength development meeting the applicable requirements of this specification.
- D. To aid finishing, side forms on ornamental work, curbs and sidewalks, railing and parapets may be removed after 12 hours, not to exceed 48 hours, depending on weather conditions. Continue moist curing during the concrete finishing operation.
- E. Untreated forms and existing concrete must be kept continuously wet for at least 1 hour before any concrete is placed. Keep wet until covered with concrete except that

adequately treated forms must be thoroughly washed with a water spray immediately before placing the concrete.

F. The curing of concrete, by either water curing or membrane curing, must be as follows unless otherwise approved by the Engineer.

1. Water Curing

- a. Keep all concrete top surfaces continuously moist after finishing, with a fine water spray, until the concrete has set. Cover the moist concrete with water or an approved curing covering.
- b. Cure concrete deck slabs and concrete floors for at least 7 days. Cure by placing burlap, cotton mats or other absorptive material as close behind the finishing operation as possible without marring the finished surface. Keep the absorptive material continuously moist for the full time it is used. The absorptive material may be kept in place for the entire curing period or it may be removed as soon as practical and the entire surface covered with approximately 1-1/2 inches (38.1 mm) of sand, kept continuously moist for the entire curing period.
- c. Remove forms and repair surface irregularities without interfering with any of the curing requirements. As soon as the vertical forms have been removed and the surface irregularities repaired, cover the concrete with absorptive material, kept continuously wet for the balance of the curing period.

2. Impervious Membrane Curing

- a. Assure membrane curing compounds are delivered to the job in the manufacturer's original container, clearly labeled to show the name of the manufacturer and the contents. The clear curing compound must be sufficiently transparent and free from permanent color that would change the color of the natural concrete. Use clear compound containing a fugitive dye having color sufficient to render the film visible on the concrete for at least 4 hours after application. The concrete surface must maintain its natural color after curing.
- b. Use a compound ready for use as shipped by the manufacturer. Dilute following the manufacturer's recommendations. Use curing compound only with written approval. Sampling will not be required if manufacturer's certification is available. Apply the curing compound under pressure with a spray nozzle to cover the entire exposed surface thoroughly and completely with a uniform film not exceeding manufacturer's specifications. Maintain the required pressure in the spray machine to force the material to leave the nozzle in a fine mist. Keep all concrete surfaces moist with a fine water spray or with wetted burlap until the sealing compound is applied. Keep the curing compound application close to the finishers of the top surface of concrete at all times. Seal the concrete immediately after the

finishing operations have been completed, to the satisfaction of the Engineer.

- c. If it is necessary to allow workers or equipment on the surface before the 7 day curing period is completed, protect the concrete from damage and maintain the curing environment.
- d. Keep concrete, which has not completed its curing period, continuously moist during the stripping and surface repair operations. Remove all surface irregularities, repair all depressions, voids or holes, including those formed by trapped air, to the satisfaction of the Engineer. Immediately apply the curing compound before the surface has had an opportunity to dry out. Keep concrete, from which forms have been stripped, continuously moist until surface repair and finishing are completed, and the impervious membrane curing has been applied.

3.5 WEATHER & NIGHT LIMITATIONS

A. General

- 1. Stop concreting operations when darkness prevents obtaining the specified placing and finishing work. Night operations may be conducted with written approval and when approved artificial lighting is provided.
- 2. Cold weather concreting is governed by ACI 306.1 unless otherwise specified herein. Cold weather exists when the ambient air temperature has fallen or is expected to fall below 40oF during the protections and curing period. The protection and curing period is defined as the time required to prevent concrete from being affected by exposure to cold weather.
- 3. When cold weather conditions are expected, all concreting operations will be suspended unless authorized by the Engineer. Contractor may receive authorization from concrete placement in cold weather by submitting a cold weather concreting plan for review and approval. The plan shall include detailed procedures to protect the fresh concrete from freezing during placement and maintaining the concrete surface temperature at a minimum of 55oF during the curing period.
- 4. Assume all risk of placing concrete in cold weather. Placing concrete during cold weather does not relieve the Contractor of the responsibility for obtaining the specified results. Remove and replace all concrete injured by frost at Contractor expense.
- 5. Before any concrete is placed, remove all ice, snow and frost completely from the formwork receiving the concrete. The subgrade must be frost free and above freezing before any concrete can be placed. Increase the temperature of formwork, reinforcement, subgrade, and base gravel to a minimum of 35°F (2°C).
- 6. Concrete shall be mixed, placed, and maintained according to Table (306-R10 5.1) 3.1.
- 7. Protection of Concrete

- a. Unless otherwise approved, Maintain the surface temperature of the concrete in place between 55° F and 75° F for a minimum of 7 days using approved heating devices or enclosures during the protection and cure period. The minimum 7 day protection and cure period is intended only to protect the concrete from the effects of cold. A longer protection period may be needed for the concrete to gain additional strength to support the loads it will experience when in service. Contractor may, bearing all expenses, field cure concrete test cylinders with the in-place concrete and discontinue protection and curing when the field test cylinders reach 3500 psi. Contractor shall monitor the concrete temperature daily throughout the protection and cure period and make adjustments as needed to maintain the temperature between 55° F and 75° F. Forms shall be kept in place for the duration of the protection and cure period. When the protection and cure period has ended reduce the heat gradually so the concrete surface temperature does not decrease faster than 15° per hour until the concrete temperature is the same as the outside temperature. Modifications may be allowed if approved by Engineer and in conformance with ACI 306.1.
- b. A Contractor may, at their expense, determine the in-place strength of the concrete using appropriate test methods and discontinue protection when those test methods indicate the concrete has reached 3500 psi.

3.6 TESTING

- A. All concrete quality assurance testing must be performed by an ACI Grade I certified testing technician. Unless otherwise specified, the Engineer shall be responsible for all quality assurance testing during the on-site placement of the concrete.
 1. Materials
 - a. The Engineer or their representative must have access to the ready mix production facility for sampling constituent materials during production to assure the materials meet these specifications and represent those stated on the approved mix design.
 2. Standard Slump Tests
 - a. The Engineer shall, during each day's placement, check the consistency of the concrete by slump test. A slump test will also be made each time that strength specimens are made. Slump tests are performed meeting ASTM C143 "Method of Test for the Slump of Portland Cement Concrete".
 3. Air Content Tests
 - a. The Engineer shall during each strength test, check the air content by either the "Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method" (ASTM C231), "Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method" (ASTM C173) or "Method of Test for Unit Weight, Yield and Air Content (Gravimetric) of Concrete" (ASTM C138).

4. Compressive Strength Tests.
 - a. A minimum of three specimens, 6 inch diameter or four 4 inch diameter, shall be made and tested for every concrete placement. Mold and test 1 set of test cylinders for every 50 cubic yards of concrete or fraction thereof placed each day or once per class of concrete supplied per day. On a given project, if the total volume of concrete is such that frequency of testing required above would generate less than 5 strength tests for a given class of concrete, make tests from at least 5 randomly selected batches or from each batch if fewer than 5 batches are used. Cure these cylinders under laboratory conditions except that additional test cylinders cured entirely under field conditions may be required by the Engineer to check the adequacy of curing and protection of the concrete.
 - b. Take samples for strength tests in accordance with ASTM C172, entitled "Standard Practice for Sampling Freshly Mixed Concrete".
 - c. Mold test cylinders and laboratory-cure in accordance with ASTM C31. Test cylinders in accordance with ASTM C39, entitled "Method of Test for Compressive Strength of Cylindrical Concrete Specimens", ASTM C39, using an independent testing laboratory, as approved by the Engineer.
 - d. Each set of cylinders cast per placement, test 1 for information strength at 7 days and test the remaining cylinders for acceptance strength at 28 days. To meet this specification, average strength of 28-day cylinders from the same sample is classified at the compressive strength test result. Strength level of an individual class of concrete is considered satisfactory if both of the following requirements are met:
 - i. The average of all sets of 3 consecutive tests equal or exceed the specified strength.
 - ii. No individual strength test (average of 28-day cylinders) falls below specified strength by more than 500 psi (3400 kPa).
 - e. Cure field cylinders under field conditions meeting the provisions of "Field Curing" of the Standard Practice for "Making and Curing Concrete Test Specimens in the Field" (ASTM C31).
 - f. Mold field cured test cylinders at the same time and from the same samples as laboratory cured test cylinders. Improve procedures for protecting and curing concrete when strength of field cured cylinders at the test age designated for measuring specified strength is less than 85% of that of companion laboratory cured cylinders. When laboratory cured cylinder strengths are appreciably higher than the specified strength, field cured cylinder strengths need not exceed the specified strength by more than 500 psi (3400 kPa) even though the 85% criterion is met.
 - g. The strengths of any specimens cured on the job are to indicate the adequacy of protection and curing of the concrete and may be used to determine when the forms may be stripped, shoring removed or the

structure placed in service. When the strengths of the job cured specimens are below those specified above, the Contractor must improve the procedures for protecting and curing the concrete. The strengths of any field cured specimens should never be used solely for concrete acceptance purposes.

- h. When concrete fails to meet the requirements above or when tests of field cured cylinders indicate deficiencies in protection and curing, the Owner's representative may order tests on the hardened concrete in accordance with ACI-301 for that portion of the structure where the questionable concrete has been placed. In the event the core tests also indicate that the structure is unsatisfactory, make all modifications as directed by the Engineer to make the structure sound. If the core tests indicate the concrete is satisfactory, all cost of testing shall be paid by Owner.

5. Temperature

- a. Performed each time a set of compressive strength test specimens is made.

6. Testing Reports

- a. In addition to the reports provided to the Owner and Engineer, the Contractor shall ensure that the concrete producer is provided copies of all reports of tests performed on concrete samples taken to determine compliance with the specification requirements. Reports shall be provided on a timely basis.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. The method of measurement and basis of payment is as outlined in the specifications for the various items of concrete work.

4.2 REQUIRED SUBMITTALS

- A. The submittals required to become an approved source of supply for Portland Cement concrete:

- 1. Complete concrete mix design meeting all specification requirements. Meet the mix proportions specified in ACI 301. Submittals will include the following:

MIX PROPORTIONS

-cement in lbs	Type and source of supply
-coarse aggregate	Size and source of supply
-fine, aggregate	Source of supply
-water, gallons	City of well
-admixtures, oz/yd ³	Brand and description*

*description as retarder, accelerator, air entraining, etc.

2. Items directly affecting a facility's ability to properly proportion, transport, and deliver concrete may be reason for disqualifying that facility as a source of supply until such deficiencies are corrected. Examples would include cement and aggregate scales that will not accurately weigh materials or mixer units which will not thoroughly mix concrete materials.

B. MATERIALS INFORMATION

1. Specific gravity (bulk s.s.d. Basis) of coarse and fine aggregate and 1% absorption-coarse aggregate unit weight (dry-rodded)-ASTM C33 quality tests including the following:
 - a. Fine aggregate
 - i. gradation AASHTO, T27 and T11 deleterious substances soundness (AASHTO T104) organic impurities (AASHTO T21) mortar-making properties (AASHTO T71)
 - b. Coarse aggregate
 - i. Deleterious substances gradation (AASHTO T27 and T11) soundness (AASHTO T104) percentage of wear (AASHTO T96)
 - c. Current chemical analysis of mixing water (if well)
 - d. Current cement and fly ash mill analyses
2. CONCRETE MIX DATA
 - a. slump
 - b. % air content
 - c. unit weight
 - d. 7 day and 28 day compressive strength
3. VARIATIONS
 - a. The following variations will be cause for submittal of a new mix design.
 - i. Change of aggregate source
 - ii. Change of cement content
 - iii. Addition or exclusion of certain admixtures including, but not limited to, pozzolans, accelerators, retarders and water reducers
 - iv. Change in aggregate size
 - v. Change in type of cement
 - vi. Failure to attain strength requirements as outlined in ACI 301 or ASTM C94

- b. A variation in any of the following will require informing the Engineer and Owner.
 - i. Change of cement supplier
 - ii. Change of admixture brands or dosages (not types)
 - iii. Minor adjustments of aggregate proportions accompanying materials changes or to accommodate placement conditions (same w/c ratio).
- C. Certification of Ready Mixed Concrete Production Facilities
 - 1. Concrete producers are to allow access to their facilities by Engineer or the Owner representatives for inspecting their facilities and/or sampling materials. All facilities should meet the requirements of the "National Ready-Mix Concrete Association" check list for concrete production facilities.
 - 2. Items directly affecting a facility's ability to properly proportion, transport and deliver concrete may be reason for disqualifying that facility as a source of supply until such deficiencies are corrected. Examples would include cement and aggregate scales that will not accurately weigh materials or mixer units that will not thoroughly mix concrete materials.
- D. The following chart indicates the submittal frequency for each item required for approval as a source of supply.

END OF SECTION

**SECTION 260500
COMMON WORK RESULTS FOR ELECTRICAL**

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. The following specification details the work and related criteria for a complete electrical system.
 - 2. Subcontractor shall furnish services, materials, labor, and equipment for the complete installation of lighting & control systems in accordance with these Specifications and the accompanying Drawings.

1.02 REFERENCES

- A. General
 - 1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
 - 2. Unless otherwise noted, the edition of the referenced code or standard that is current at the time of the "date of record" for the Work shall be considered the effective code or standard for the duration of the project.
 - 3. Refer to specific Division 26 Sections for additional referenced codes and standards.
- B. Execute and inspect all work in full accordance with the latest applicable rules, regulations, requirements, and specifications of the following.
 - 1. ANSI/NFPA 70 – National Electric Code (NEC), most recent addition adopted by Authority Having Jurisdiction, including all applicable amendments and supplements.
 - 2. NFPA – National Fire Protection Association: Standard for Electrical Safety in the Workplace (NFPA 70E).
 - 3. NECA 1 – National Electrical Contractors Association (NECA) Standard of Installation.
 - 4. National Electrical Manufacturers Association (NEMA)
 - 5. American National Standards Institute (ANSI).
 - 6. National Electrical Safety Code (NESC).
 - 7. Underwriters Laboratories (UL)
 - 8. Illuminating Engineering Society of North America (IES).

1.03 SUBMITTALS

- A. Provide complete manufacturer's data sheets, product literature and shop drawings for all equipment, material and devices furnished under Division 26 – Electrical, demonstrating compliance with these Specifications and accompanying Drawings.
- B. Manufacturer's standardized elementary diagrams will not be acceptable unless applicable portions of the diagram have been clearly identified and nonapplicable portions deleted or crossed out.

1.04 QUALITY ASSURANCE

- A. If the Drawings or Specifications do not appear clear or definite, the Subcontractor shall request from the Project Manager through the 'Request for Information' (RFI) process an interpretation and decision of same, and shall have such questions decided before proceeding with the Work.
- B. Manufacturer's Directions: Follow manufacturer's directions covering points not shown on the drawings or specified herein. Manufacturer's directions do not take precedence over Drawings and Specifications. Where these conflict with the Drawings and Specifications, notify the Project Manager for clarification before installing the work.
- C. Protection of Equipment:
 - 1. Care shall be exercised during construction to avoid damage or disfigurement. Equipment shall be protected from dust and moisture prior to and during construction. The Subcontractor is cautioned that concrete finishing, painting, etc., in electrical rooms shall not proceed if unprotected equipment is installed.

2. Where required or directed, construct temporary protection for equipment and installations to protect same from dust and debris caused by construction.
- D. Materials and Equipment:
1. Materials and equipment shall be new. Materials and equipment for which tests have been established by Underwriter's Laboratories, Inc. shall be approved by that body and shall bear its label of approval or the label of an OSHA approved nationally recognized testing laboratory (NRTL).
 2. Unless otherwise approved by the Project Manager, the materials to be furnished under this Specification shall be the standard products of manufacturers regularly engaged in the production of such equipment equal to or superior to material specified, and shall be the manufacturer's latest standard design that complies with the Specification requirements.
- E. Approval of Materials:
1. A complete list of materials and equipment proposed shall be submitted to the Project Manager for approval. The list shall include for each item: the manufacturer, the manufacturer's catalog number, type or class, the rating, capacity, size, NRTL label/listing, etc.
 2. The Subcontractor shall submit a brochure containing catalog cuts or drawings and data for, but not limited to, the following items:
 - a. Before installation of the equipment, the Subcontractor shall submit for approval detailed construction drawings for each item of fabricated equipment required for the electrical installation. Drawings shall be to scale and fully dimensioned and shall provide sufficient detail to clearly indicate the arrangement of equipment, including its components, and conduit/raceway system routing and configuration.
 - b. Installation of approved substituted equipment is the Subcontractor's responsibility, and changes required to work included under other divisions for installations of approved substituted equipment must be made to the satisfaction of the Architect/Engineer and without change in Subcontract price.

1.05 COORDINATION

- A. Coordinate schedules, access to MSU facilities, material supply, and all construction related processes through McKinstry.

1.06 RECORD DRAWINGS

- A. As-built Drawings shall be prepared by the Contractor to show departures from original Drawings and to indicate installed conditions for:
 1. Major raceway systems, size, and location, for both exterior and interior; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
 2. Electrical, Lighting & Lighting Control Equipment locations (exposed and concealed).
 3. All hidden equipment requiring future maintenance or replacement, such as power packs, mini-inverters, etc, must be documented within Record Drawings by Installer, per Montana State University Engineering Guidelines.
 4. Approved substitutions and actual equipment and materials installed.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to project identified with names, model numbers, types, compliance labels and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.
- B. Store equipment and materials in an environmentally controlled area that meets ambient and storage temperatures per manufacturer product literature.
 1. Major raceway systems, size, and location, for both exterior and interior; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
 2. Equipment locations (exposed and concealed), dimensioned from established building lines.
 3. Approved substitutions and actual equipment and materials installed.

1.08 WARRANTY

- A. Provide complete warranty information for each item, including start date of warranty and duration of warranty.
- B. See individual specification sections within this document.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT REQUIREMENTS

- A. General
 - 1. All materials provided shall be new and free of defects, and suitable for the space provided.
 - 2. Equipment of the same type shall be of the same manufacturer.
 - 3. Provide materials and equipment listed for the intended purpose by Underwriters (UL) or an equivalent testing firm and bearing its label of approval.
 - 4. Unless otherwise indicated, provide materials and equipment which are the standard products of manufacturers regularly engaged in the production of such materials and equipment.
- B. Hazardous Areas
 - 1. Provide materials and equipment acceptable to the regulatory AHJ for the Class, Division and Group of hazardous area indicated.

PART 3 – EXECUTION

3.01 ELECTRICAL INSTALLATIONS

- A. General
 - 1. General work practices for electrical construction shall be in accordance with NECA 1 Standard of Installation for good workmanship.
 - 2. Coordinate electrical systems, equipment and materials installation with General Contractor and work of other trades to mitigate conflicts, errors, and delays during construction.
 - 3. Drawings are diagrammatic and indicate general arrangement. Check the approximate locations electrical system components shown on Drawings for conflicts with components of other systems and equipment. Headroom and space condition to be maintained.
 - 4. Drawings and accompanying specifications are intended to describe and illustrate systems which will not interfere with the structure of the building and which will fit into the available spaces. Install electrical equipment to conform to NEC clearances and to avoid obstructions with architectural, structural, mechanical and site conditions.
- B. Layout and Coordination
 - 1. Layout of the various equipment is specific with the relative location shown on the drawings. Call attention to any error, conflict, or discrepancy in the drawings or specifications. Do not proceed with any questionable items of work until clarification has been received.
 - 2. Verify the physical dimensions of each item of electrical equipment and required clearances to fit the available space and provide prompt notification prior to roughing-in if conflicts appear. Coordinate equipment to fit into the available spaces and coordinate access routes through the construction site.

3.02 PROTECTION

- A. Electrical work, wire and cable, materials, and other equipment specified in this division shall be protected against damage by other construction activities, weather conditions, or any other causes as a part of this work. Equipment found damaged or in other than new condition shall be rejected as defective.
- B. Conduit and raceways shall be kept closed during construction to prevent entrance of dirt, moisture, concrete, or foreign objects. Raceways shall be clean and dry before installation of wire and shall be so at the time of acceptance.

3.03 ELECTRICAL TESTS

- A. Upon completion of the work, the entire electrical system shall be tested and shall be shown to be in proper working condition in accordance with the intent of these Specifications and accompanying Drawings.
- B. After the electrical system installation is completed, conduct an operating test for approval. Demonstrate that the equipment operates in accordance with the requirements of these Specifications and accompanying Drawings. Demonstrate that functions are operating correctly and are properly incorporated in control system.
- C. Tests shall be made in the presence of the Owner's designated representative.

END OF SECTION

**SECTION 260505
SELECTIVE DEMOLITION FOR ELECTRICAL**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.

PART 3 EXECUTION

2.01 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as indicated.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation and existing record documents.
- D. Report discrepancies to Engineer before disturbing existing installation.
- E. Beginning of demolition means installer accepts existing conditions.

2.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
 - 2. Make temporary connections to maintain service in areas adjacent to work area.

2.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
 - 1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
 - 2. PCB- and DEHP-containing lighting ballasts.
 - 3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories, unless hangers are suitable for re-use.
- H. Repair adjacent construction and finishes damaged during demolition and extension work.

- I. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- J. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

2.04 CLEANING AND REPAIR

- A. See Section 017419 - Construction Waste Management and Disposal for additional requirements.
- B. Clean and repair existing materials and equipment that remain or that are to be reused.
- C. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

END OF SECTION

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Underground feeder and branch-circuit cable.
- C. Metal-clad cable.
- D. Wiring connectors.
- E. Electrical tape.
- F. Heat shrink tubing.
- G. Wire pulling lubricant.
- H. Cable ties.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 260505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.
- C. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- H. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.
- I. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
- J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- L. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- M. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.
- N. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- O. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- P. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

- Q. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- R. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
 - 3. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- B. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductor Material:
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 - 3. Tinned Copper Conductors: Comply with ASTM B33.
- H. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
 - 3) 20 A, 277 V circuits longer than 150 feet (46 m): 10 AWG, for voltage drop.
- I. Conductor Color Coding:
 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 2. Color Coding Method: Integrally colored insulation.
 3. Color Code:
 - a. 480Y/277 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Neutral/Grounded: Gray.
 - b. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - c. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
 - a. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

2.04 METAL-CLAD CABLE

- A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- B. Conductor Stranding:
 1. Size 10 AWG and Smaller: Solid.
 2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- E. Grounding: Full-size integral equipment grounding conductor.
- F. Armor: Steel, interlocked tape.

2.05 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 260526.

2.06 ACCESSORIES

- A. Electrical Tape:
 - 1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 - 2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 - 3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
 - 4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
 - 5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
- C. Wire Pulling Lubricant:
 - 1. Listed and labeled as complying with UL 267.
 - 2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
 - 3. Suitable for use at installation temperature.
- D. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

- A. Circuiting Requirements:
 - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 - 2. When circuit destination is indicated without specific routing, determine exact routing required.
 - 3. Arrange circuiting to minimize splices.
 - 4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
 - 5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 - 6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 - 7. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is

not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install metal-clad cable (Type MC) in accordance with NECA 120.
- E. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
 - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
- G. Terminate cables using suitable fittings.
 - 1. Metal-Clad Cable (Type MC):
 - a. Use listed fittings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- H. Install conductors with a minimum of 12 inches (300 mm) of slack at each device.
- I. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- J. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- K. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
- L. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
 - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 - 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
 - 3. Wet Locations: Use heat shrink tubing.

- M. Insulate ends of spare conductors using vinyl insulating electrical tape.
- N. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- O. Identify conductors and cables in accordance with Section 260553.
- P. Install firestopping to preserve fire resistance rating of partitions and other elements, using listed materials and methods..
- Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

- A. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.

1.02 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D. Bonding and Equipment Grounding:
 - 1. Provide bonding for equipment grounding conductors, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 - 2. Provide insulated equipment grounding conductor in each branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 - 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 - 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 - 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 - 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
 - 1. Use insulated copper conductors unless otherwise indicated.

- C. Connectors for Grounding and Bonding:
 - 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 - 2. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Make grounding and bonding connections using specified connectors.
 - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 - 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- D. Identify grounding and bonding system components in accordance with Section 260553.

END OF SECTION

**SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

- A. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- B. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- C. Section 260548 - Vibration and Seismic Controls for Electrical Systems.
- D. Section 265100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.
- E. Section 265600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
 - 2. Coordinate work to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
 - 4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
 - 5. Notify Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Comply with the following. Where requirements differ, comply with most stringent.
 - a. NFPA 70.
 - b. Requirements of authorities having jurisdiction.
 - 2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.

3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Components for Vibration Isolation and/or Seismic Controls: See Section 260548.
- C. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 2. Conduit Clamps: Bolted type unless otherwise indicated.
- D. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
- E. Metal Channel/Strut Framing Systems:
 1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
 2. Comply with MFMA-4.
- F. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Outlet Boxes: 1/4-inch (6 mm) diameter.
 - b. Luminaires: 1/4-inch (6 mm) diameter.
- G. Anchors and Fasteners:
 1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install hangers and supports in accordance with NECA 1.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Engineer, do not provide support from suspended ceiling support system or ceiling grid.
- E. Do not penetrate or otherwise notch or cut structural members.
- F. Equipment Support and Attachment:
 1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
 2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
- G. Box Support and Attachment: See Section 260533.16 for additional requirements.
- H. Interior Luminaire Support and Attachment: See Section 265100 for additional requirements.
- I. Exterior Luminaire Support and Attachment: See Section 265600 for additional requirements.
- J. Secure fasteners in accordance with manufacturer's recommended torque settings.
- K. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

- A. Inspect support and attachment components for damage and defects.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

**SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.

1.02 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 - 2. Do not install identification products until final surface finishes and painting are complete.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- B. Identification for Conductors and Cables:
 - 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
 - 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
- C. Identification for Raceways:
 - 1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet (6.1 m).
 - 2. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
- D. Identification for Boxes:
 - 1. Use voltage markers to identify highest voltage present.
 - 2. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
- E. Identification for Devices:
 - 1. Use identification label or engraved wallplate to identify serving branch circuit for all lighting control devices.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Labels:
 - 1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

2.03 VOLTAGE MARKERS

- A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- C. Minimum Size:
 - 1. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
 - 2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).
 - 3. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).
- D. Legend:
 - 1. Markers for Voltage Identification: Highest voltage present.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 - 1. Surface-Mounted Equipment: Enclosure front.
 - 2. Flush-Mounted Equipment: Inside of equipment door.
 - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 - 4. Elevated Equipment: Legible from the floor or working platform.
 - 5. Interior Components: Legible from the point of access.
 - 6. Conduits: Legible from the floor.
 - 7. Boxes: Outside face of cover.
 - 8. Conductors and Cables: Legible from the point of access.
 - 9. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- E. Mark all handwritten text, where permitted, to be neat and legible.

END OF SECTION

**SECTION 260533.13
CONDUIT FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Stainless steel rigid metal conduit (RMC).
- C. Galvanized steel intermediate metal conduit (IMC).
- D. Stainless steel intermediate metal conduit (IMC).
- E. Flexible metal conduit (FMC).
- F. Galvanized steel electrical metallic tubing (EMT).
- G. Stainless steel electrical metallic tubing (EMT).
- H. Aluminum electrical metallic tubing (EMT).

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Cable assemblies consisting of conductors protected by integral metal armor.
- C. Section 260526 - Grounding and Bonding for Electrical Systems.
 - 1. Includes additional requirements for fittings for grounding and bonding.
- D. Section 260529 - Hangers and Supports for Electrical Systems.
- E. Section 260533.16 - Boxes for Electrical Systems.
- F. Section 260548 - Vibration and Seismic Controls for Electrical Systems.
- G. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
- F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- I. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- J. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.
- K. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- L. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- M. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.
- N. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
- O. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
 - 4. Notify Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.
- C. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- D. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- E. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- F. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).
 - 1. Maximum Length: 6 feet (1.8 m).

2.02 CONDUIT - GENERAL REQUIREMENTS

- A. Comply with NFPA 70.
- B. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.
 - 1. Where permitted, existing conduits to be reused may be used as sole equipment grounding conductor only when continuity of conduit pathway, including associated boxes and fittings, is verified; see Section 260526.
- C. Fittings for Grounding and Bonding: See Section 260526 for additional requirements.
- D. Provide conduit, fittings, supports, and accessories required for complete raceway system.
- E. Provide products listed, classified, and labeled as suitable for purpose intended.

- F. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 3/4-inch (21 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4-inch (21 mm) trade size.
 - 3. Control Circuits: 1/2-inch (16 mm) trade size.
 - 4. Flexible Connections to Luminaires: 3/8-inch (12 mm) trade size.
- G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
 - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 STAINLESS STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC stainless steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6A.
- B. Fittings:
 - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
 - 2. Material: Use stainless steel with corrosion resistance equivalent to conduit.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.05 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
 - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.06 STAINLESS STEEL INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
 - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.

2.07 FLEXIBLE METAL CONDUIT (FMC)

- A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.08 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use compression/gland or set-screw type.
 - a. Do not use indenter type connectors and couplings.

2.09 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Connectors and Couplings: Use compression/gland or set-screw type.

2.10 ALUMINUM ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT aluminum electrical metallic tubing listed and labeled as complying with UL 797A.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; listed for use with aluminum EMT.
 - 2. Material: Use aluminum.
 - 3. Connectors and Couplings: Use compression/gland or set-screw type.
 - a. Do not use indenter type connectors and couplings.

2.11 ACCESSORIES

- A. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.
- B. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).
- C. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in accordance with NECA 1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated without specific routing, determine exact routing required.
 - 3. Conceal conduits unless specifically indicated to be exposed.
 - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
 - 5. Arrange conduit to maintain adequate headroom, clearances, and access.

6. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
 7. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
- F. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.
 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 4. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 7. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
 8. Use of wire for support of conduits is not permitted.
- G. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 3. Use suitable adapters where required to transition from one type of conduit to another.
 4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 5. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
 6. Secure joints and connections to provide mechanical strength and electrical continuity.
- H. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 4. Conceal bends for conduit risers emerging above ground.
 5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
 7. Install firestopping to preserve fire resistance rating of partitions and other elements.
- I. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where conduits are subject to earth movement by settlement or frost.
- J. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
 - a. Where conduits enter building from outside.
 - b. Where service conduits enter building from underground distribution system.

- c. Where conduits enter building from underground.
- d. Where conduits may transport moisture to contact live parts.
- 2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
 - a. Where conduits pass from outdoors into conditioned interior spaces.
 - b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- K. Provide grounding and bonding; see Section 260526.
- L. Identify conduits; see Section 260553.

3.02 FIELD QUALITY CONTROL

- A. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- B. Correct deficiencies and replace damaged or defective conduits.

3.03 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

3.04 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

**SECTION 260533.16
BOXES FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

1.02 RELATED REQUIREMENTS

- A. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260533.13 - Conduit for Electrical Systems:
 - 1. Conduit bodies and other fittings.
- E. Section 260548 - Vibration and Seismic Controls for Electrical Systems.
- F. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 2. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
 - 3. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
 - 4. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
 - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
 - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 - 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 - 3. Use suitable concrete type boxes where flush-mounted in concrete.
 - 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
 - 5. Use raised covers suitable for the type of wall construction and device configuration where required.
 - 6. Use shallow boxes where required by the type of wall construction.
 - 7. Do not use "through-wall" boxes designed for access from both sides of wall.
 - 8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 - 9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 - 10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 - 11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
 - 12. Wall Plates: Refer to Lighting Control Equipment Schedule.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - 1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 - 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 - 3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.

- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Box Locations:
 - 1. Locate boxes to be accessible.
 - 2. Unless dimensioned, box locations indicated are approximate.
 - 3. Locate boxes so that wall plates do not span different building finishes.
 - 4. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 - 5. Locate junction and pull boxes in the following areas:
 - a. Concealed above accessible suspended ceilings.
 - b. Within joists in areas with no ceiling.
 - c. Electrical rooms.
 - d. Mechanical equipment rooms.
- E. Box Supports:
 - 1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
 - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
- F. Install boxes plumb and level.
- G. Flush-Mounted Boxes:
 - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
 - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- H. Install boxes as required to preserve insulation integrity.
- I. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- J. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- K. Close unused box openings.
- L. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- M. Provide grounding and bonding in accordance with Section 260526.
- N. Identify boxes in accordance with Section 260553.

3.03 CLEANING

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 260548
VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Seismic control requirements.
- B. Seismic restraint systems.

1.02 RELATED REQUIREMENTS

- A. Section 260529 - Hangers and Supports for Electrical Systems.

1.03 DEFINITIONS

- A. Electrical Component: Where referenced in this section in regards to seismic controls, applies to any portion of the electrical system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., conduit, cable tray).
- B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.04 REFERENCE STANDARDS

- A. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.
- B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.
- C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2022.
- D. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.
- E. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.
- F. MFMA-4 - Metal Framing Standards Publication; 2004.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
 - 2. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 3. Seismic Controls:
 - a. Coordinate the arrangement of seismic restraints with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
 - 4. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.06 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.

PART 2 PRODUCTS

2.01 SEISMIC CONTROL REQUIREMENTS

- A. Component Importance Factor (Ip): Electrical components to be assigned a component importance factor (Ip) of 1.5 unless otherwise indicated.
- B. Component Importance Factor (Ip): Electrical components essential to life safety to be assigned a component importance factor (Ip) of 1.5 as indicated or as required. This includes but is not limited to:
 - 1. Electrical components required to function for life safety purposes after an earthquake.
- C. Seismic Restraints:
 - 1. Provide seismic restraints for electrical components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
 - 2. Seismic Restraint Exemptions:
 - a. Conduit, Cable Tray, and Raceway Exemptions, All Seismic Design Categories:
 - 1) Raceways with component importance factor (Ip) of 1.0 where flexible connections are provided between cable tray or raceway and associated components, where cable tray or raceway is positively attached to the structure, and where one of the following apply:
 - (a) Trapeze supported conduits, cable trays, or raceways with trapeze assemblies using 3/8 inch (10 mm) diameter rod hangers not exceeding 12 inches (305 mm) in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds (445 N) or less.
 - (b) Trapeze supported conduits, cable trays, or raceways with trapeze assemblies using 1/2 inch (13 mm) diameter rod hangers not exceeding 12 inches (305 mm) in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 200 pounds (890 N) or less.
 - (c) Trapeze supported conduits, cable trays, or raceways with trapeze assemblies using 1/2 inch (13 mm) diameter rod hangers not exceeding 24 inches (610 mm) in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds (445 N) or less.
 - (d) Hanger supported conduits, cable trays, or raceways with individual rod hangers 3/8 inch (10 mm) or 1/2 inch (13 mm) in diameter not exceeding 12 inches (305 mm) in length from support point connection to the supporting structure, and the total weight supported by any single rod is 50 pounds (220 N) or less.
 - 2) Conduits less than 2-1/2 inch (64 mm) trade size.
 - b. Lighting Exemptions, All Seismic Design Categories:
 - 1) Suspended luminaires where attachments are designed to accommodate 1.4 times the operating weight acting in both the vertical and horizontal directions and connections to structure allow for 360 degree range of motion in the horizontal plane; arrange to prevent impact between luminaires and the structure or other nonstructural components.
 - 2) Lay-in luminaires weighing less than 56 pounds (25 kg) secured to ceiling grid and provided with safety wires in accordance with ASTM E580/E580M.
 - 3. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
 - a. ASHRAE (HVACA).
 - b. FEMA 413.
 - c. FEMA E-74.
 - d. SMACNA (SRM).

4. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
5. Seismic Restraint Systems:
 - a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
 - b. Use only cable restraints to restrain vibration-isolated electrical components, including distributed systems.
 - c. Use only one restraint system type for a given electrical component or distributed system (e.g., conduit, cable tray) run; mixing of cable and rigid restraints on a given component/run is not permitted.
 - d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain electrical component in all lateral directions; consider bracket geometry in anchor load calculations.
 - e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported electrical component weight.
 - f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported electrical component weight.
 - g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
 - h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
 - i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.
- D. Seismic Attachments:
 1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
 2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
 3. Do not use power-actuated fasteners.
 4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
 5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.

2.02 SEISMIC RESTRAINT SYSTEMS

- A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.
- B. Cable Restraints:
 1. Comply with ASCE 19.
 2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
 3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
 4. Use protective thimbles for cable loops where potential for cable damage exists.
- C. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install products in accordance with applicable requirements of NECA 1 (general workmanship).
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Secure fasteners according to manufacturer's recommended torque settings.
- E. Install flexible conduit and cable connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.
- F. Seismic Controls:
 - 1. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
 - 2. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch (3 mm), use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch (3 mm) or less.
 - 3. Equipment with Sheet Metal Housings:
 - a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
 - b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
 - c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
 - 4. Seismic Restraint Systems:
 - a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
 - b. Install restraints within permissible angles in accordance with seismic design.
 - c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
 - d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
 - e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

3.03 FIELD QUALITY CONTROL

- A. Inspect vibration isolation and/or seismic control components for damage and defects.
- B. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION

**SECTION 260924
LIGHTING CONTROLS - LUTRON VIVE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single space wireless lighting control systems and associated components:
 - 1. Wired load control modules with wireless communication inputs.
- B. Wireless hub(s) for centralized control, monitoring, and system integration.
- C. Software data and analytics dashboard, including server requirements.

1.02 RELATED REQUIREMENTS

- A. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. 47 CFR 15 - Radio Frequency Devices; current edition.
- B. ASTM D4674 - Standard Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments; 2019.
- C. IEC 60929 - AC and/or DC-Supplied Electronic Control Gear for Tubular Fluorescent Lamps - Performance Requirements; 2011, with Amendment (2015).
- D. IEC 61000-4-2 - Electromagnetic Compatibility (EMC) - Part 4-2: Testing and Measurement Techniques - Electrostatic Discharge Immunity Test; 2008.
- E. ISO 9001 - Quality Management Systems — Requirements; 2015.
- F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- G. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- H. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2020.
- I. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).
- J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Notify Engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
 - 1. Occupancy/Vacancy Sensors: Include detailed basic motion detection coverage range diagrams.
- B. Project Record Documents: Record actual installed locations and settings for lighting control system components.
- C. Operation and Maintenance Data: Include detailed information on lighting control system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
- D. Warranty: Submit sample of manufacturer's Warranty or Enhanced Warranty as specified in Part 1 under "WARRANTY". Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications:
 - 1. Company with not less than ten years of experience manufacturing lighting control products using wireless communication between devices.
 - 2. Registered to ISO 9001, including in-house engineering for product design activities.
 - 3. Provides factory direct technical support hotline available 24 hours per day, 7 days per week.
 - 4. Qualified to supply specified products and to honor claims against product presented in accordance with warranty.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.
 - 1. Basis of Design System Requirements - Lutron, Unless Otherwise Indicated:
 - a. Ambient Temperature:
 - 1) Lighting Control System Components, Except Fluorescent Electronic Dimming Ballasts: Between 32 and 104 degrees F (0 and 40 degrees C).
 - b. Relative Humidity: Less than 90 percent, non-condensing.
 - c. Protect lighting controls from dust.

1.09 WARRANTY

- A. Manufacturer's Standard Warranty, With Manufacturer Full-Scope Start-Up; Lutron Standard 2-Year Warranty; Lutron LSC-B2:
 - 1. Manufacturer Lighting Control System Components, Except Lighting Management System Computer, Ballasts/Drivers and Ballast Modules:
 - a. First Two Years:
 - 1) 100 percent replacement parts coverage, 100 percent manufacturer labor coverage to troubleshoot and diagnose a lighting issue.
 - 2) First-available on-site or remote response time.
 - 3) Remote diagnostics for applicable systems.
 - b. Telephone Technical Support: Available 24 hours per day, 7 days per week, excluding manufacturer holidays.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design Manufacturer: Lutron Electronics Company, Inc; Vive; www.lutron.com/#sle.

2.02 LIGHTING CONTROLS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) as suitable for the purpose indicated.
- B. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, programming, etc. as necessary for a complete operating system that provides the control intent indicated.
- C. Design lighting control equipment for 10 year operational life while operating continually at any temperature in an ambient temperature range of 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C) and 90 percent non-condensing relative humidity.
- D. Electrostatic Discharge Tolerance: Design and test equipment to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.

- E. Power Failure Recovery: When power is interrupted for periods up to 10 years and subsequently restored, lights to automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.
- F. Wireless Devices:
 - 1. Wireless device family includes area or fixture level sensors, area or fixture level load controls for dimming or switching, and load controls that can be mounted in a wallbox, on a junction box, or at the fixture.
 - 2. Wireless devices including sensors, load controls, and wireless remotes or wall stations, can be set up using simple button press programming without needing any other equipment (e.g. central hub, processor, computer, or other smart device).
 - 3. Wireless hub adds the ability to set up the system using any smart device with a web browser (e.g. smartphone, tablet, PC, or laptop).
 - 4. System does not require a factory technician to set up or program the system.
 - 5. Capable of diagnosing system communications.
 - 6. Capable of having addresses automatically assigned to them.
 - 7. Receives signals from other wireless devices and provides feedback to user.
 - 8. Capable of determining which devices have been addressed.
 - 9. RF Range: 60 feet (18 m) line-of-sight or 30 feet (9 m) through typical construction materials between RF transmitting devices and compatible RF receiving devices.
 - 10. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
- G. Wireless Network:
 - 1. RF Frequency: 434 MHz; operate in FCC governed frequency spectrum for periodic operation; continuous transmission spectrum is not permitted.
 - a. Wireless sensors, wireless wall stations and wireless load control devices do not operate in the noisy 2.4 GHz frequency band where high potential for RF interference exists.
 - b. Wireless devices operate in an uncongested frequency band providing reliable operation.
 - c. Fixed network architecture ensures all associated lights and load controls respond in a simultaneous and coordinated fashion from a button press, sensor signal, or command from the wireless hub (i.e. no popcorning).
 - 2. Distributed Architecture: Local room devices communicate directly with each other. If the wireless hub is removed or damaged, local control, sensing, and operation continues to function without interruption.
 - 3. Local room devices communicate directly with each other (and not through a central hub or processor) to ensure:
 - a. Reliability of system performance.
 - b. Fast response time to events in the space (e.g. button presses or sensor signals).
 - c. Independent operation in the event of the wireless hub being removed or damaged.
- H. Device Finishes:
 - 1. Standard Colors: Comply with NEMA WD 1 where applicable.
 - 2. Color Variation in Same Product Family: Maximum delta E of 1, CIE L*a*b color units.
 - 3. Visible Parts: Exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D4674. Provide proof of testing upon request.

2.03 LOAD CONTROL MODULES

- A. Provide wireless load control modules as indicated or as required to control the loads as indicated.
- B. Junction Box-Mounted Modules:
 - 1. Plenum rated.
 - 2. 0-10 V Dimming Modules:
 - a. Product(s):

- 1) 8 A dimming module with 0-10V control, without emergency mode; Lutron PowPak Dimming Module Model RMJS-8T-DV-B.
 - b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
 - c. Single low voltage dimming module with Class 1 or Class 2 isolated 0-10V output signal conforming to IEC 60929 Annex E.2; source or sink automatically configures.
 - d. Selectable minimum light level.
 - e. Configurable high- and low-end trim.
 - f. Relay: Rated for 0-10 V ballasts, LED drivers, or fixtures that conform with NEMA 410.
3. Relay Modules:
- a. Product(s):
 - 1) 16 A relay module, without emergency mode, without contact closure output; Lutron PowPak Relay Module Model RMJS-16R-DV-B.
 - b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
 - c. Relay:
 - 1) Rated Life of Relay: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.
 - 2) Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
 - 3) Fully rated output continuous duty for inductive, capacitive, and resistive loads.

2.04 WIRELESS HUBS

- A. Product(s):
 1. Wireless hub without BACnet; Lutron Vive Hub.
 - a. Surface-mount wireless hub; Model HJS-1-SM; as indicated on drawings, supports up to 700 total paired devices.
- B. Integrated multicolor LED provides feedback on what mode the hub is in for simple identification and diagnosis.
- C. Integrated processor and web server allows hub to set up and operate the system without any external connections to outside processors, servers, or the internet.
- D. Utilizes Ethernet connection for:
 1. Networking up to 64 hubs together to create a larger system.
 2. Remote connectivity capabilities, including maintaining system date/time and receiving periodic firmware updates (requires internet connection).
- E. A single hub or network of hubs can operate on either a dedicated lighting control only network or can be integrated with an existing building network as a VLAN.
- F. Communicates directly to compatible Lutron Vive RF devices through use of Lutron Clear Connect radio frequency communications link; does not require communication wiring; RF range of 71 feet (23 m) through walls to cover an area of 15836 square feet (1471 sq m) (device and hub must be on the same floor).
- G. Communicates directly to mobile device (smartphone or tablet) or computer using built-in Wi-Fi. 2.4 GHz 802.11b/g; wireless range of 71 feet (23 m) through walls (device and hub must be on the same floor).
 1. Does not require Wi-Fi router for connecting to the hub.
- H. Allows for system setup, control, and monitoring from mobile device or computer using Vive web-based software:
 1. Supports paired devices up to maximum number indicated including compatible wireless sensors, wireless control stations, and wireless load devices.
 2. Allows for timeclock scheduling of events, both time of day and astronomic (sunrise and sunset).
 - a. Timeclock is integrated into the unit and does not require a constant internet connection.

- b. Retains time and programming information after a power loss.
- c. 365-day schedulable timeclock allows for:
 - 1) Scheduling of events years in advance.
 - 2) Setting of recurring events with exceptions on holidays.
- d. Timeclock events can be scheduled to:
 - 1) Send lights to a desired level and select the fade rate desired to reach that level.
 - 2) Adjust level lights go to when occupied.
 - 3) Adjust level lights go to when unoccupied.
 - 4) Enable/disable occupancy.
- 3. Allows for control, monitoring, and adjustment from anywhere in the world (Lutron Vive wireless hub internet connection required).
- 4. Uses RF signal strength detection to find nearby devices for quick association and programming without having to climb ladders.
 - a. Association and setup does not require a factory technician to perform.
- 5. System using Lutron Vive wireless hub(s) can operate with or without connection to the internet.
- 6. Supports energy reporting.
 - a. Reports measured energy data for PowPak fixture control modules at accuracy of plus/minus 2 percent or 0.5 W (whichever is higher).
 - b. Reports calculated energy data for PowPak junction box mounted modules at accuracy of 10 percent.
- 7. Supports automatic demand response for load shedding via:
 - a. Local contact closure without need for separate interface.
 - b. OpenADR® 2.0b compliant utility command.
- 8. Support automatic generation of alerts in Lutron Vive web-based application for designated events/triggers, including:
 - a. Low-battery condition in battery-operated sensors and controls; alert cleared when battery is replaced.
 - b. Missing device (e.g., control or sensor); alert cleared when device is detected.
- 9. Wireless hub can be firmware upgraded to provide new software features and system updates.
 - a. Firmware update can be done either locally using a wired Ethernet connection or Wi-Fi connection, or remotely if the wireless hub is connected to the internet.
- I. Lutron Vive Web-Based Application:
 - 1. Accessibility and Platform Support:
 - a. Web-based; runs on most HTML5 compatible browsers (including Safari and Chrome).
 - b. Supports multiple platforms and devices; runs from a tablet, desktop, laptop, or smartphone.
 - c. User interface supports multi-touch gestures such as pinch to zoom, drag to pan, etc.
 - d. Utilizes HTTPS (industry-standard certificate-based encryption and authentication for security).
 - e. Multi-level Password Protected Access: Individual password protection on both the integrated Wi-Fi network and web-based software.
 - f. WPA2 security for Wi-Fi communication with wireless hub.
 - 2. System Navigation and Status Reporting:
 - a. Area Tree View: Easy navigation by area name to view status and make programming adjustments through the software.
 - b. Area and device names can be changed in real time.
 - 3. Setup app available for iOS and Android that allows for:
 - a. Job registration to extend product warranty.
 - b. Management of setup for multiple projects in different locations.
 - c. Creation of handoff documents that are sent directly to a facility manager via email once setup is complete.
 - d. Backup of Vive wireless hub database to Lutron cloud for hub replacement.

- e. Access to native help and instructions to assist user with Vive system setup.
- J. Scenes:
 - 1. Support programmable scenes to control individual devices, areas, or groups of areas on demand.
 - 2. Scenes may be activated via:
 - a. Contact closure input.
 - b. API integration.
 - c. Manual activation in app.
- K. Contact Closure Interface: Provide two contact closure inputs; accepts both momentary and maintained contact closures that can be used for automatic demand response.
- L. Rated for use in air-handling spaces as defined in UL 2043.
- M. Provide Ethernet switch(es) as required for inter-hub network wiring per manufacturer's instructions; do not exceed manufacturer's required maximum wiring segment lengths.

2.05 SOURCE QUALITY CONTROL

- A. Factory Testing; Lutron Standard Factory Testing:
 - 1. Perform full-function factory testing on all completed assemblies. Statistical sampling is not acceptable.
 - 2. Perform factory burn-in of 100 percent of all ballasts at 104 degrees F (40 degrees C).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that ratings and configurations of system components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive system components.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, except for mounting heights specified in those standards.
- B. Install products in accordance with manufacturer's instructions.
- C. Identify system components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Manufacturer's Full-Scope Start-Up Service: Provide manufacturer's On-Site Full-Scope Start-Up Service.
 - 1. On-Site Full-Scope Start-Up Service; Lutron LSC-OS-SU-VIVE: Manufacturer's authorized Service Representative to conduct site visit upon completion of lighting control system installation to perform system start-up and verify proper operation:
 - a. Verify connection of power wiring and load circuits.
 - b. Verify connection and location of controls.
 - c. Energize wireless hubs.
 - d. Associate occupancy/vacancy sensors, daylight sensors, wireless remotes, and wall stations to load control devices.
 - e. Provide initial rough calibration of sensors; fine-tuning of sensors is responsibility of Contractor unless provided by Lighting Control Manufacturer as part of Sensor Layout and Tuning service where specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS".
 - f. Program timeclock schedules per approved sequence of operations.
 - g. Configure load shed parameters per approved sequence of operations.
 - h. Verify system operation control by control.

- i. Obtain sign-off on system functions.
 - j. Train Owner's representative on system capabilities, operation, and maintenance, as specified in Part 3 under "Closeout Activities".
- C. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

3.04 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

- A. Demonstration:
 - 1. Demonstrate proper operation of lighting control devices to Engineer, and correct deficiencies or make adjustments as directed.
- B. Training:
 - 1. Include services of manufacturer's certified service representative to perform on-site training of Owner's personnel on operation, adjustment, and maintenance of lighting control system as part of on-site system start-up services.

END OF SECTION

**SECTION 265600
EXTERIOR LIGHTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior luminaires.
- B. Poles and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260923 - Lighting Control Devices.

1.03 REFERENCE STANDARDS

- A. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
 - 2. Notify Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. Shop Drawings:
 - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 - 2. Luminaires & poles are MSU
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- D. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- E. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 WARRANTY

- A. Provide 5-year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

2.03 POLES

- A. Manufacturers:
 - 1. Ameron, as
- B. All Poles:
 - 1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
 - 2. Unless otherwise indicated, provide with the following features/accessories:
 - a. Pole-top tenon, sized to match luminaire slip fitter.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Clean dirt, debris, plaster, and other foreign materials from existing pole tops.

3.03 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires in accordance with NECA/IESNA 501.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Pole-Mounted Luminaires:
 - 1. Foundation-Mounted Poles:
 - a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 033000.
 - 1) Install anchor bolts plumb per template furnished by pole manufacturer.
 - 2) Position conduits to enter pole shaft.
 - b. Install foundations plumb.
 - c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
 - d. Tighten anchor bolt nuts to manufacturer's recommended torque.
 - e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
 - f. Install anchor base covers or anchor bolt covers as indicated.
 - 2. Embedded Poles: Install poles plumb as indicated.
 - 3. Grounding:
 - a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
- G. Install accessories furnished with each luminaire.
- H. Bond products and metal accessories to branch circuit equipment grounding conductor.

3.04 FIELD QUALITY CONTROL

- A. Inspect each product for damage and defects.
- B. Operate each luminaire after installation and connection to verify proper operation.
- C. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Engineer.

3.05 CLEANING

- A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.06 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION