STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

Division of Facilities Construction and Management

DFCM

STANDARD LOW BID PROJECT

August 8, 2006

RTI CLASSROOMS 9 - 12
CAMP WILLIAMS

UTAH NATIONAL GUARD
RIVERTON, UTAH

DFCM Project Number 05236480

AJC Architects
703 East 1700 South
Salt Lake City, Utah 84105

TABLE OF CONTENTS

Current copies of the following documents are hereby made part of these contract documents by reference. These documents are available on the DFCM web site at http://dfcm.utah.gov or are available upon request from DFCM.

DFCM General Conditions dated May 25, 2005.
DFCM Application and Certification for Payment dated May 25, 2005.

Technical Specifications :
Drawings:

The Agreement and General Conditions dated May 25, 2005 have been updated from versions that were formally adopted and in use prior to this date. The changes made to the General Conditions are identified in a document entitled Revisions to General Conditions that is available on DFCM's web site at http://dfcm.utah.gov

NOTICE TO CONTRACTORS

Sealed bids will be received by the Division of Facilities Construction and Management (DFCM) for:

RTI CLASSROOMS 9-12 – CAMP WILLIAMS
UTAH NATIONAL GUARD – RIVERTON, UTAH
DFCM PROJECT NO: 05236480

Bids will be in accordance with the Contract Documents that will be available at 12:00 NOON on Tuesday, August 8, 2006, and distributed in electronic format only on CDs from DFCM, 4110 State Office Building, SLC, Utah and on the DFCM web page at http://dfcm.utah.gov. For questions regarding this project, please contact Wayne Smith, DFCM, at 801-550-6536. No others are to be contacted regarding this bidding process. The construction budget for this project is $782,500.

A **mandatory** pre-bid meeting will be held at 9:00 AM on Tuesday, August 15, 2006 at Building 119 Camp Williams, 17800 South Redwood Road, Riverton, Utah. All bidders wishing to bid on this project are required to attend this meeting.

Bids will be received until the hour of 3:00 PM on Thursday, August 24, 2006 at DFCM, 4ll0 State Office Building, Salt Lake City, Utah 84114. Bids will be opened and read aloud in the DFCM Conference Room, 4110 State Office Building, Salt Lake City, Utah. NOTE: Bids must be received at 4110 State Office Building by the specified time.

Bid security, in the amount of five percent (5%) of the bid, must be submitted as stated in the Instruction to Bidders.

The Division of Facilities Construction and Management reserves the right to reject any or all bids or to waive any formality or technicality in any bid in the interest of DFCM.

DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT
Marla Workman, Contract Coordinator
4110 State Office Building, Salt Lake City, Utah 84114

DESCRIPTION

The scope of work for this project includes the prefabrication construction of four (4) modular building units delivered to the jobsite and placed on the foundation sites as per plans and specifications. The scope of work also includes all utility hookups to the modular units including impact fees for the sewer.

Only qualified contactors who have had proven experience in this type of construction and who have demonstrated successful completion of State government construction projects will be allowed to submit bids for this project.

A statement of qualifications will be required to be submitted to DFCM prior to the mandatory pre-bid meeting by all contractors who have not previously contracted with the State to include:

A five-year history of completed similar work projects to the scope of work for this particular project including specific project results and references.

A management plan for the project to detail the construction process from start to finish with tentative schedules and plans to ensure that the quality and timeliness of the work will satisfy the Owner and the Stage agency and be in accordance with all drawings and specifications.

PROJECT SCHEDULE

PROJECT NAME:	**RTI CLASSROOMS 9-12 – CAMP WILLIAMS UTAH NATIONAL GUARD – RIVERTON, UTAH**
DFCM PROJECT NO.	**05236480**

Event	Day	Date	Time	Place
Bidding Documents Available	Tuesday	August 8, 2006	12:00 NOON	DFCM 4110 State Office Bldg SLC, UT or DFCM web site *
Mandatory Pre-bid Site Meeting	Tuesday	August 15, 2006	9:00 AM	Building 119 Camp Williams Utah National Guard 17800 S Redwood Rd Riverton, UT
Last Day to Submit Questions	Monday	August 21, 2006	4:00 PM	DFCM 4110 State Office Bldg SLC, UT
Final Addendum Issued	Tuesday	August 22, 2006	4:00 PM	DFCM 4110 State Office Bldg SLC, UT or DFCM web site *
Prime Contractors Turn In Bid and Bid Bond / Bid Opening in DFCM Conference Room	Thursday	August 24, 2006	3:00 PM	DFCM 4110 State Office Bldg SLC, UT
Sub-contractor List Due	Friday	August 25, 2006	3:00 PM	DFCM 4110 State Office Bldg SLC, UT

*** DFCM's web site address is http://dfcm.utah.gov**

BID FORM

NAME OF BIDDER _____ DATE _____

To the Division of Facilities Construction and Management
4110 State Office Building
Salt Lake City, Utah 84114

The undersigned, responsive to the "Notice to Contractors" and in accordance with the "Instructions to Bidders", in compliance with your invitation for bids for the **RTI CLASSROOMS 9-12 – CAMP WILLIAMS - UTAH NATIONAL GUARD – RIVERTON, UTAH – DFCM PROJECT NO. 05236480** and having examined the Contract Documents and the site of the proposed Work and being familiar with all of the conditions surrounding the construction of the proposed Project, including the availability of labor, hereby proposes to furnish all labor, materials and supplies as required for the Work in accordance with the Contract Documents as specified and within the time set forth and at the price stated below. This price is to cover all expenses incurred in performing the Work required under the Contract Documents of which this bid is a part:

I/We acknowledge receipt of the following Addenda: _____

For all work shown on the Drawings and described in the Specifications and Contract Documents, I/we agree to perform for the sum of:

_____ DOLLARS ($_____)
(In case of discrepancy, written amount shall govern)

I/We guarantee that the Work will be Substantially Complete by **March 31, 2007**, should I/we be the successful bidder, and agree to pay liquidated damages in the amount of **$500.00** per day for each day after expiration of the Contract Time as stated in Article 3 of the Contractor's Agreement.

This bid shall be good for 45 days after bid opening.

Enclosed is a 5% bid bond, as required, in the sum of _____

The undersigned Contractor's License Number for Utah is _____.

Upon receipt of notice of award of this bid, the undersigned agrees to execute the contract within ten (10) days, unless a shorter time is specified in the Contract Documents, and deliver acceptable Performance and Payment bonds in the prescribed form in the amount of 100% of the Contract Sum for faithful performance of the contract.

The Bid Bond attached, in the amount not less than five percent (5%) of the above bid sum, shall become the property of the Division of Facilities Construction and Management as liquidated damages for delay and additional expense caused thereby in the event that the contract is not executed and/or acceptable l00% Performance and Payment bonds are not delivered within the time set forth.

Type of Organization:

_____
(Corporation, Partnership, Individual, etc.)

Any request and information related to Utah Preference Laws:

_____

Respectfully submitted,

_____
Name of Bidder

ADDRESS:

_____

_____

_____
Authorized Signature

INSTRUCTIONS TO BIDDERS

1. Drawings and Specifications, Other Contract Documents

Drawings and Specifications, as well as other available Contract Documents, may be obtained as stated in the Invitation to Bid.

2. Bids

Before submitting a bid, each contractor shall carefully examine the Contract Documents, shall visit the site of the Work; shall fully inform themselves as to all existing conditions and limitations; and shall include in the bid the cost of all items required by the Contract Documents. If the bidder observes that portions of the Contract Documents are at variance with applicable laws, building codes, rules, regulations or contain obvious erroneous or uncoordinated information, the bidder shall promptly notify the DFCM Representative and the necessary changes shall be accomplished by Addendum.

The bid, bearing original signatures, must be typed or handwritten in ink on the Bid Form provided in the procurement documents and submitted in a sealed envelope at the location specified by the Invitation to Bid prior to the deadline for submission of bids.

Bid bond security, in the amount of five percent (5%) of the bid, made payable to the Division of Facilities Construction and Management, shall accompany bid. THE BID BOND MUST BE ON THE BID BOND FORM PROVIDED IN THE PROCUREMENT DOCUMENTS IN ORDER TO BE CONSIDERED AN ACCEPTABLE BID.

If the bid bond security is submitted on a bid bond form other than DFCM's required bid bond form, and the bid security meets all other legal requirements, the bidder will be allowed to provide an acceptable bid bond by the close of business on the next business day following notification by DFCM of submission of a defective bid bond security. NOTE: A cashier's check cannot be used as a substitute for a bid bond.

3. Contract and Bond

The Contractor's Agreement will be in the form bound in the specifications. The Contract Time will be as indicated in the bid. The successful bidder, simultaneously with the execution of the Contract Agreement, will be required to furnish a performance bond and a payment bond, both bearing original signatures, upon the forms provided in the procurement documents. The performance and payment bonds shall be for an amount equal to one hundred percent (100%) of the contract sum and secured from a company that meets the requirements specified in the requisite forms. Any bonding requirements for subcontractors will be specified in the Supplementary General Conditions.

4. Listing of Subcontractors

Listing of Subcontractors shall be as summarized in the "Instructions and Subcontractor's List Form", which are included as part of these Contract Documents. The Subcontractors List shall be delivered to DFCM or faxed to DFCM at (801)538-3677 within 24 hours of the bid opening. Requirements for listing additional subcontractors will be listed in the Contract Documents.

DFCM retains the right to audit or take other steps necessary to confirm compliance with requirements for the listing and changing of subcontractors. Any contractor who is found to not be in compliance with these requirements is subject to a debarment hearing and may be debarred from consideration for award of contracts for a period of up to three years.

5. Interpretation of Drawings and Specifications

If any person or entity contemplating submitting a bid is in doubt as to the meaning of any part of the drawings, specifications or other Contract Documents, such person shall submit to the DFCM Project Manager a request for an interpretation thereof. The person or entity submitting the request will be responsible for its prompt delivery. Any interpretation of the proposed documents will be made only by addenda posted on DFCM's web site at http://dfcm.utah.gov. Neither the DFCM nor A/E will be responsible for any other explanations or interpretations of the proposed documents. A/E shall be deemed to refer to the architect or engineer hired by DFCM as the A/E or Consultant for the Project.

6. Addenda

Addenda will be posted on DFCM's web site at http://dfcm.utah.gov. Contractors are responsible for obtaining information contained in each addendum from the web site. Addenda issued prior to the submittal deadline shall become part of the bidding process and must be acknowledged on the bid form. Failure to acknowledge addenda may result in disqualification from bidding.

7. Award of Contract

The Contract will be awarded as soon as possible to the lowest, responsive and responsible bidder, based on the lowest combination of base bid and acceptable prioritized alternates, provided the bid is reasonable, is in the interests of the State of Utah to accept and after applying the Utah Preference Laws in U.C.A. Title 63, Chapter 56. DFCM reserves the right to waive any technicalities or formalities in any bid or in the bidding. Alternates will be accepted on a prioritized basis with Alternate 1 being highest priority, Alternate 2 having second priority, etc.

8. DFCM Contractor Performance Rating

As a contractor completes each DFCM project, DFCM, the architect/engineer and the using agency will evaluate project performance based on the enclosed "DFCM Contractor Performance Rating" form. The ratings issued on this project will not affect this project but may affect the award on future projects.

9. Licensure

The Contractor shall comply with and require all of its subcontractors to comply with the license laws as required by the State of Utah.

10. Right to Reject Bids

DFCM reserves the right to reject any or all Bids.

11. Time is of the Essence

Time is of the essence in regard to all the requirements of the Contract Documents.

12. Withdrawal of Bids

Bids may be withdrawn on written request received from bidder prior to the time fixed for opening. Negligence on the part of the bidder in preparing the bid confers no right for the withdrawal of the bid after it has been opened.

13. Product Approvals

Where reference is made to one or more proprietary products in the Contract Documents, but restrictive descriptive materials of one or more manufacturer(s) is referred to in the Contract Documents, the products of other manufacturers will be accepted, provided they equal or exceed the standards set forth in the drawings and specifications and are compatible with the intent and purpose of the design, subject to the written approval of the A/E. Such written approval must occur prior to the deadline established for the last scheduled addenda to be issued. The A/E's written approval will be in an issued addendum. If the descriptive material is not restrictive, the products of other manufacturers specified will be accepted without prior approval provided they are compatible with the intent and purpose of the design as determined by the A/E.

14. Financial Responsibility of Contractors, Subcontractors and Sub-subcontractors

Contractors shall respond promptly to any inquiry in writing by DFCM to any concern of financial responsibility of the contractor, subcontractor or sub-subcontractor.

15. Debarment

By submitting a bid, the Contractor certifies that neither it nor its principals, including project and site managers, have been, or are under consideration for, debarment or suspension, or any action that would exclude such from participation in a construction contract by any governmental department or agency. If the Contractor cannot certify this statement, attach to the bid a detailed written explanation which must be reviewed and approved by DFCM as part of the requirements for award of the Project.

BID BOND

(Title 63, Chapter 56, U. C. A. l953, as Amended)

KNOW ALL PERSONS BY THESE PRESENTS:

That _____ hereinafter referred to as the "Principal," and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ and authorized to transact business in this State and U. S. Department of the Treasury Listed, (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the STATE OF UTAH, hereinafter referred to as the "Obligee," in the amount of $_____ (5% of the accompanying bid), being the sum of this Bond to which payment the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal has submitted to Obligee the accompanying bid incorporated by reference herein, dated as shown, to enter into a contract in writing for the _____ _____ Project.

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that if the said principal does not execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the principal, then the sum of the amount stated above will be forfeited to the State of Utah as liquidated damages and not as a penalty; if the said principal shall execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the Principal, then this obligation shall be null and void. It is expressly understood and agreed that the liability of the Surety for any and all defaults of the Principal hereunder shall be the full penal sum of this Bond. The Surety, for value received, hereby stipulates and agrees that obligations of the Surety under this Bond shall be for a term of sixty (60) days from actual date of the bid opening.

PROVIDED, HOWEVER, that this Bond is executed pursuant to provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals on the date indicated below, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

DATED this _____ day of _____, 20_____ .

Principal's name and address (if other than a corporation):

_____

_____

By: _____

Title: _____

Principal's name and address (if a corporation):

_____

_____

By: _____

Title: _____

(Affix Corporate Seal)

Surety's name and address:

_____

_____

By: _____

Attorney-in-Fact (Affix Corporate Seal)

STATE OF _____)
) ss.
COUNTY OF _____)

On this ____ day of _____, 20____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20_____.
My Commission Expires: _____
Resides at: _____

_____
NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

INSTRUCTIONS AND SUBCONTRACTORS LIST FORM

The three low bidders, as well as all other bidders that desire to be considered, are required by law to submit to DFCM within 24 hours of bid opening a list of **ALL** first-tier subcontractors, including the subcontractor's name, bid amount and other information required by Building Board Rule and as stated in these Contract Documents, on the following basis:

PROJECTS UNDER $500,000 - ALL SUBS $20,000 OR OVER MUST BE LISTED
PROJECTS $500,000 OR MORE - ALL SUBS $35,000 OR OVER MUST BE LISTED

- Any additional subcontractors identified in the bid documents shall also be listed.
- The DFCM Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law.
- List subcontractors for base bid as well as the impact on the list that the selection of any alternate may have.
- Bidder may not list more than one subcontractor to perform the same work.
- Bidder must list "Self" if performing work itself.

LICENSURE:

The subcontractor's name, the type of work, the subcontractor's bid amount, and the subcontractor's license number as issued by DOPL, if such license is required under Utah Law, shall be listed. Bidder shall certify that all subcontractors, required to be licensed, are licensed as required by State law. A subcontractor includes a trade contractor or specialty contractor and does not include suppliers who provide only materials, equipment, or supplies to a contractor or subcontractor.

BIDDER LISTING 'SELF' AS PERFORMING THE WORK:

Any bidder that is properly licensed for the particular work and intends to perform that work itself in lieu of a subcontractor that would otherwise be required to be on the subcontractor list, must insert the term 'Self' for that category on the subcontractor list form. Any listing of 'Self' on the sublist form shall also include the amount allocated for that work.

'SPECIAL EXCEPTION':

A bidder may list 'Special Exception' in place of a subcontractor when the bidder intends to obtain a subcontractor to perform the work at a later date because the bidder was unable to obtain a qualified or reasonable bid under the provisions of U.C.A.Section 63A-5-208(4). The bidder shall insert the term 'Special Exception' for that category of work, and shall provide documentation with the subcontractor list describing the bidder's efforts to obtain a bid of a qualified subcontractor at a reasonable cost and why the bidder was unable to obtain a qualified subcontractor bid. The Director must find that the bidder complied in good faith with State law requirements for any 'Special Exception' designation, in order for the bid to be considered. If awarded the contract, the Director shall supervise the bidder's efforts to obtain a qualified subcontractor bid. The amount of the awarded contract may not be adjusted to reflect the actual amount of the subcontractor's bid. Any listing of 'Special Exception' on the sublist form shall also include amount allocated for that work.

GROUNDS FOR DISQUALIFICATION:

The Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law. Director may withhold awarding the contract to a particular bidder if one or more of the proposed subcontractors are considered by the Director to be unqualified to do the Work or for such other reason in the best interest of the State of Utah. Notwithstanding any other provision in these instructions, if there is a good faith error on the sublist form, at the sole discretion of the Director, the Director may provide notice to the contractor and the contractor shall have 24 hours to submit the correction to the Director. If such correction is submitted timely, then the sublist requirements shall be considered met.

CHANGES OF SUBCONTRACTORS SPECIFICALLY IDENTIFIED ON SUBLIST FORM:

Subsequent to twenty-four hours after the bid opening, the contractor may change its listed subcontractors only after receiving written permission from the Director based on complying with all of the following criteria.

(1) The contractor has established in writing that the change is in the best interest of the State and that the contractor establishes an appropriate reason for the change, which may include, but not is not limited to, the following reasons: the original subcontractor has failed to perform, or is not qualified or capable of performing, and/or the subcontractor has requested in writing to be released.
(2) The circumstances related to the request for the change do not indicate any bad faith in the original listing of the subcontractors.
(3) Any requirement set forth by the Director to ensure that the process used to select a new subcontractor does not give rise to bid shopping.
(4) Any increase in the cost of the subject subcontractor work is borne by the contractor.
(5) Any decrease in the cost of the subject subcontractor work shall result in a deductive change order being issued for the contract for such decreased amount.
(6) The Director will give substantial weight to whether the subcontractor has consented in writing to being removed unless the Contractor establishes that the subcontractor is not qualified for the work.

EXAMPLE:

Example of a list where there are only four subcontractors:

TYPE OF WORK	SUBCONTRACTOR, "SELF" OR "SPECIAL EXCEPTION"	SUBCONTRACTOR BID AMOUNT	CONT. LICENSE #
ELECTRICAL	ABCD Electric Inc.	$350,000.00	123456789000
LANDSCAPING	"Self"	300,000.00	123456789000
CONCRETE (ALTERNATE #1)	XYZ Concrete Inc	298,000.00	987654321000
MECHANICAL	"Special Exception" (attach documentation)	Fixed at: 350,000.00	(TO BE PROVIDED AFTER OBTAINING SUBCONTRACTOR)

PURSUANT TO STATE LAW - SUBCONTRACTOR BID AMOUNTS CONTAINED IN THIS SUBCONTRACTOR LIST SHALL NOT BE DISCLOSED UNTIL THE CONTRACT HAS BEEN AWARDED.

SUBCONTRACTORS LIST

FAX TO 801-538-3677

PROJECT TITLE: _____

Caution: You must read and comply fully with instructions.

TYPE OF WORK	SUBCONTRACTOR, "SELF" OR "SPECIAL EXCEPTION"	SUBCONTRACTOR BID AMOUNT	CONT. LICENSE #

We certify that:

1. This list includes all subcontractors as required by the instructions, including those related to the base bid as well as any alternates.
2. We have listed "Self" or "Special Exception" in accordance with the instructions.
3. All subcontractors are appropriately licensed as required by State law.

FIRM: _____

DATE: _____ SIGNED BY: _____

NOTICE: FAILURE TO SUBMIT THIS FORM, PROPERLY COMPLETED AND SIGNED, AS REQUIRED IN THESE CONTRACT DOCUMENTS, SHALL BE GROUNDS FOR DFCMS REFUSAL TO ENTER INTO A WRITTEN CONTRACT WITH BIDDER. ACTION MAY BE TAKEN AGAINST BIDDERS BID BOND AS DEEMED APPROPRIATE BY DFCM. ATTACH A SECOND PAGE IF NECESSARY.

FUGITIVE DUST PLAN

The Contractor will fill out the form and file the original with the Division of Air Quality and a copy of the form with the Division of Facilities Construction & Management, prior to the issuance of any notice to proceed.

The Contractor will be fully responsible for compliance with the Fugitive Dust Control Plan, including the adequacy of the plan, any damages, fines, liability, and penalty or other action that results from noncompliance.

Utah Division of Air Quality
April 20, 1999

GUIDANCE THAT MUST BE CONSIDERED IN DEVELOPING AND SUBMITTING A DUST CONTROL PLAN FOR COMPLIANCE WITH R307-309-3, 4, 5, 6, 7

Source Information:

1. Name of your operation (source): provide a name if the source is a construction site.

2. Address or location of your operation or construction site.

3. UTM coordinates or Longitude/Latitude of stationary emission points at your operation.

4. Lengths of the project, if temporary (time period).

5. Description of process (include all sources of dust and fugitive dust). Please, if necessary, use additional sheets of paper for this description. Be sure to mark it as an attachment.

6. Type of material processed or disturbed.

7. Amount of material processed (tons per year, tons per month, lbs./hr., and applicable units).

8. Destination of product (where will the material produced be used or transported, be specific, provide address or specific location), information needed for temporary relocation applicants.

9. Identify the individual who is responsible for the implementation and maintenance of fugitive dust control measures. List name(s), position(s) and telephone number(s).

10. List, and attach copies of any contract lease, liability agreement with other companies that may, or will, be responsible for dust control on site or on the project.

Description of Fugitive Dust Emission Activities
(Things to consider in addressing fugitive dust control strategies.)

1. Type of activities (drilling and blasting, road construction, development construction, earth moving and excavation, handling and hauling materials, cleaning and leveling, etc).

2. List type of equipment generating the fugitive dust.

3. Diagram the location of each activity or piece of equipment on site. Please attach the diagram.

4. Provide pictures or drawings of each activity. Include a drawing of the unpaved/paved road network used to move loads "on" and "off" property.

5. Vehicle miles travels on unpaved roads associated with the activity (average speed).

6. Type of dust emitted at each source (coal, cement, sand, soil, clay, dust, etc.)

7. Estimate the size of the release area at which the activity occurs (square miles). For haul or dirt roads include total miles of road in use during the activity.

Description of Fugitive Dust Emission Controls on Site

Control strategies must be designed to meet 20% opacity or less on site (a lesser opacity may be defined by Approval Order conditions or federal requirements such as NSPS), and control strategies must prevent exceeding 10% opacity from fugitive dust at the property boundary (site boundary) for compliance with R307-309-3.

1. Types of ongoing emission controls proposed for each activity, each piece of equipment, and haul roads.

2. Types of additional dust controls proposed for bare, exposed surfaces (chemical stabilization, synthetic cover, wind breaks, vegetative cover, etc).

3. Method of application of dust suppressant.

4. Frequency of application of dust suppressant.

5. Explain what triggers the use of a special control measure other than routine measures already in place, such as covered loads or measures covered by a permit condition (increase in opacity, high winds, citizen complaints, dry conditions, etc).

6. Explain in detail what control strategies/measures will be implemented off-hours, i.e., Saturdays/Sundays/Holidays, as well as 6 PM to 6 AM each day.

Description of Fugitive Dust Control Off-site

Prevent, to the maximum extent possible, deposition of materials, which may create fugitive dust on public and private paved roads in compliance with R307-309-5, 6, 7.

1. Types of emission controls initiated by your operation that are in place "off" property (application of water, covered loads, sweeping roads, vehicle cleaning, etc.).

2. Proposed remedial controls that will be initiated promptly if materials, which may create fugitive dust, are deposited on public and private paved roads.

Submit the Dust Control Plan to:

Executive Secretary
Utah Air Quality Board
POB 144820
15 North 1950 West
Salt Lake City, Utah 84114-4820

Phone: (801) 536-4000
FAX: (801) 536-4099

Fugitive Dust Control Plan Violation Report

When a source is found in violation of R307-309-3 or in violation of the Fugitive Dust Control Plan, the course must submit a report to the Executive Secretary within 15 days after receiving a Notice of Violation. The report must include the following information:

1. Name and address of dust source.

2. Time and duration of dust episode.

3. Meteorological conditions during the dust episode.

4. Total number and type of fugitive dust activities and dust producing equipment within each operation boundary. If no change has occurred from the existing dust control plan, the source should state that the activity/equipment is the same.

5. Fugitive dust activities or dust producing equipment that caused a violation of R-307-309-3 or the sources dust control plan.

6. Reasons for failing to control dust from the dust generating activity or equipment.

7. New and/or additional fugitive dust control strategies necessary to achieve compliance with R307-309-3, 4, 5, 6, or 7.

8. If it can not be demonstrated that the current approved Dust Control Plan can result in compliance with R307-309-3 through 7, the Dust Control Plan must be revised so as to demonstrate compliance with 307-309-3 through 7. Within 30 days of receiving a fugitive dust Notice of Violation, the source must submit the revised Plan to the Executive Secretary for review and approval.

Submit the Dust Control Plan to:

Executive Secretary
Utah Air Quality Board
POB 144820
15 North 1950 West
Salt Lake City, Utah 84114-4820

Phone: (801) 536-4000
FAX: (801) 536-4099

Attachments: DFCM Form FDR R-307-309, Rule 307-309

CONTRACTOR'S AGREEMENT

FOR:

_____
_____
_____

THIS CONTRACTOR'S AGREEMENT, made and entered into this ____ day of _____, 20__, by and between the DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT, hereinafter referred to as "DFCM", and _____, incorporated in the State of _____ and authorized to do business in the State of Utah, hereinafter referred to as "Contractor", whose address is _____.

WITNESSETH: WHEREAS, DFCM intends to have Work performed at _____ _____.

WHEREAS, Contractor agrees to perform the Work for the sum stated herein.

NOW, THEREFORE, DFCM and Contractor for the consideration provided in this Contractor's Agreement, agree as follows:

ARTICLE 1. SCOPE OF WORK. The Work to be performed shall be in accordance with the Contract Documents prepared by _____ and entitled "_____."

The DFCM General Conditions ("General Conditions") dated May 25, 2005 on file at the office of DFCM and available on the DFCM website, are hereby incorporated by reference as part of this Agreement and are included in the specifications for this Project. All terms used in this Contractor's Agreement shall be as defined in the Contract Documents, and in particular, the General Conditions.

The Contractor Agrees to furnish labor, materials and equipment to complete the Work as required in the Contract Documents which are hereby incorporated by reference. It is understood and agreed by the parties hereto that all Work shall be performed as required in the Contract Documents and shall be subject to inspection and approval of DFCM or its authorized representative. The relationship of the Contractor to the DFCM hereunder is that of an independent Contractor.

ARTICLE 2. CONTRACT SUM. The DFCM agrees to pay and the Contractor agrees to accept in full performance of this Contractor's Agreement, the sum of _____ _____ DOLLARS AND NO CENTS ($_____.00), which is the base bid, and which sum also includes the cost of a 100% Performance Bond and a 100%

Payment Bond as well as all insurance requirements of the Contractor. Said bonds have already been posted by the Contractor pursuant to State law. The required proof of insurance certificates have been delivered to DFCM in accordance with the General Conditions before the execution of this Contractor's Agreement.

ARTICLE 3. TIME OF COMPLETION AND DELAY REMEDY. The Work shall be Substantially Complete within _____ (___) calendar days after the date of the Notice to Proceed. Contractor agrees to pay liquidated damages in the amount of $_____ per day for each day after expiration of the Contract Time until the Contractor achieves Substantial Completion in accordance with the Contract Documents, if Contractor's delay makes the damages applicable. The provision for liquidated damages is: (a) to compensate the DFCM for delay only; (b) is provided for herein because actual damages can not be readily ascertained at the time of execution of this Contractor's Agreement; (c) is not a penalty; and (d) shall not prevent the DFCM from maintaining Claims for other non-delay damages, such as costs to complete or remedy defective Work.

No action shall be maintained by the Contractor, including its or Subcontractor or suppliers at any tier, against the DFCM or State of Utah for damages or other claims due to losses attributable to hindrances or delays from any cause whatsoever, including acts and omissions of the DFCM or its officers, employees or agents, except as expressly provided in the General Conditions. The Contractor may receive a written extension of time, signed by the DFCM, in which to complete the Work under this Contractor's Agreement in accordance with the General Conditions.

ARTICLE 4. CONTRACT DOCUMENTS. The Contract Documents consist of this Contractor's Agreement, the Conditions of the Contract (DFCM General Conditions, Supplementary and other Conditions), the Drawings, Specifications, Addenda and Modifications. The Contract Documents shall also include the bidding documents, including the Invitation to Bid, Instructions to Bidders/ Proposers and the Bid/Proposal, to the extent not in conflict therewith and other documents and oral presentations that are documented as an attachment to the contract.

All such documents are hereby incorporated by reference herein. Any reference in this Contractor's Agreement to certain provisions of the Contract Documents shall in no way be construed as to lessen the importance or applicability of any other provisions of the Contract Documents.

ARTICLE 5. PAYMENT. The DFCM agrees to pay the Contractor from time to time as the Work progresses, but not more than once each month after the date of Notice to Proceed, and only upon Certificate of the A/E for Work performed during the preceding calendar month, ninety-five percent (95%) of the value of the labor performed and ninety-five percent (95%) of the value of materials furnished in place or on the site. The Contractor agrees to furnish to the DFCM invoices for materials purchased and on the site but not installed, for which the Contractor requests payment and agrees to

safeguard and protect such equipment or materials and is responsible for safekeeping thereof and if such be stolen, lost or destroyed, to replace same.

Such evidence of labor performed and materials furnished as the DFCM may reasonably require shall be supplied by the Contractor at the time of request for Certificate of Payment on account. Materials for which payment has been made cannot be removed from the job site without DFCM's written approval. Five percent (5%) of the earned amount shall be retained from each monthly payment. The retainage, including any additional retainage imposed and the release of any retainage, shall be in accordance with UCA 13-8-5 as amended. Contractor shall also comply with the requirements of UCA 13-8-5, including restrictions of retainage regarding subcontractors and the distribution of interest earned on the retention proceeds. The DFCM shall not be responsible for enforcing the Contractor's obligations under State law in fulfilling the retention law requirements with subcontractors at any tier.

ARTICLE 6. INDEBTEDNESS. Before final payment is made, the Contractor must submit evidence satisfactory to the DFCM that all payrolls, materials bills, subcontracts at any tier and outstanding indebtedness in connection with the Work have been properly paid. Final Payment will be made after receipt of said evidence, final acceptance of the Work by the DFCM as well as compliance with the applicable provisions of the General Conditions.

Contractor shall respond immediately to any inquiry in writing by DFCM as to any concern of financial responsibility and DFCM reserves the right to request any waivers, releases or bonds from Contractor in regard to any rights of Subcontractors (including suppliers) at any tier or any third parties prior to any payment by DFCM to Contractor.

ARTICLE 7. ADDITIONAL WORK. It is understood and agreed by the parties hereto that no money will be paid to the Contractor for additional labor or materials furnished unless a new contract in writing or a Modification hereof in accordance with the General Conditions and the Contract Documents for such additional labor or materials has been executed. The DFCM specifically reserves the right to modify or amend this Contractor's Agreement and the total sum due hereunder either by enlarging or restricting the scope of the Work.

ARTICLE 8. INSPECTIONS. The Work shall be inspected for acceptance in accordance with the General Conditions.

ARTICLE 9. DISPUTES. Any dispute, PRE or Claim between the parties shall be subject to the provisions of Article 7 of the General Conditions. DFCM reserves all rights to pursue its rights and remedies as provided in the General Conditions.

ARTICLE 10. TERMINATION, SUSPENSION OR ABANDONMENT. This Contractor's Agreement may be terminated, suspended or abandoned in accordance with the General Conditions.

ARTICLE 11. DFCM'S RIGHT TO WITHHOLD CERTAIN AMOUNT AND MAKE USE THEREOF. The DFCM may withhold from payment to the Contractor such amount as, in DFCM's judgment, may be necessary to pay just claims against the Contractor or Subcontractor at any tier for labor and services rendered and materials furnished in and about the Work. The DFCM may apply such withheld amounts for the payment of such claims in DFCM's discretion. In so doing, the DFCM shall be deemed the agent of Contractor and payment so made by the DFCM shall be considered as payment made under this Contractor's Agreement by the DFCM to the Contractor. DFCM shall not be liable to the Contractor for any such payment made in good faith. Such withholdings and payments may be made without prior approval of the Contractor and may be also be prior to any determination as a result of any dispute, PRE, Claim or litigation.

ARTICLE 12. INDEMNIFICATION. The Contractor shall comply with the indemnification provisions of the General Conditions.

ARTICLE 13. SUCCESSORS AND ASSIGNMENT OF CONTRACT. The DFCM and Contractor, respectively bind themselves, their partners, successors, assigns and legal representatives to the other party to this Agreement, and to partners, successors, assigns and legal representatives of such other party with respect to all covenants, provisions, rights and responsibilities of this Contractor's Agreement. The Contractor shall not assign this Contractor's Agreement without the prior written consent of the DFCM, nor shall the Contractor assign any moneys due or to become due as well as any rights under this Contractor's Agreement, without prior written consent of the DFCM.

ARTICLE 14. RELATIONSHIP OF THE PARTIES. The Contractor accepts the relationship of trust and confidence established by this Contractor's Agreement and covenants with the DFCM to cooperate with the DFCM and A/E and use the Contractor's best skill, efforts and judgment in furthering the interest of the DFCM; to furnish efficient business administration and supervision; to make best efforts to furnish at all times an adequate supply of workers and materials; and to perform the Work in the best and most expeditious and economic manner consistent with the interests of the DFCM.

ARTICLE 15. AUTHORITY TO EXECUTE AND PERFORM AGREEMENT. Contractor and DFCM each represent that the execution of this Contractor's Agreement and the performance thereunder is within their respective duly authorized powers.

ARTICLE 16. ATTORNEY FEES AND COSTS. Except as otherwise provided in the dispute resolution provisions of the General Conditions, the prevailing party shall be entitled to reasonable attorney fees and costs incurred in any action in the District Court and/or appellate body to enforce this Contractor's Agreement or recover damages or any other action as a result of a breach thereof.

IN WITNESS WHEREOF, the parties hereto have executed this Contractor's Agreement on the day and year stated hereinabove.

CONTRACTOR: _____

_____
Signature Date

Title: _____

State of _____)
)
County of _____) _____
Please type/print name clearly

On this ____ day of _____, 20____, personally appeared before me, _____, whose identity is personally known to me (or proved to me on the basis of satisfactory evidence) and who by me duly sworn (or affirmed), did say that he (she) is the _____ (title or office) of the firm and that said document was signed by him (her) in behalf of said firm.

_____
Notary Public

(SEAL)

My Commission Expires _____

APPROVED AS TO AVAILABILITY OF FUNDS:

_____
Financial Manager, Date
Division of Facilities Construction
and Management

DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT

_____
_____ Date
Manager -
Capital _____

APPROVED AS TO FORM:
ATTORNEY GENERAL
May 25, 2005
By: Alan S. Bachman
Asst Attorney General

APPROVED FOR EXPENDITURE:

_____
Division of Finance Date

PERFORMANCE BOND

(Title 63, Chapter 56, U. C. A. 1953, as Amended)

That _____ hereinafter referred to as the "Principal" and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ and authorized to transact business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah, hereinafter referred to as the "Obligee, " in the amount of _____ _____ DOLLARS ($_____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract with the Obligee, dated the _____ day of _____, 20____, to construct _____ in the County of _____, State of Utah, Project No. _____, for the approximate sum of _____ _____ Dollars ($_____), which Contract is hereby incorporated by reference herein.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal shall faithfully perform the Contract in accordance with the Contract Documents including, but not limited to, the Plans, Specifications and conditions thereof, the one year performance warranty, and the terms of the Contract as said Contract may be subject to Modifications or changes, then this obligation shall be void; otherwise it shall remain in full force and effect.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the state named herein or the heirs, executors, administrators or successors of the Owner.

The parties agree that the dispute provisions provided in the Contract Documents apply and shall constitute the sole dispute procedures of the parties.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the Provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20_____.

WITNESS OR ATTESTATION:

_____

PRINCIPAL:

_____

By: _____

(Seal)

Title: _____

WITNESS OR ATTESTATION:

_____

SURETY:

_____

By: _____

Attorney-in-Fact (Seal)

STATE OF _____)

) ss.

COUNTY OF _____)

On this _____ day of _____, 20____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney in-fact of the above-named Surety Company and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20_____.

My commission expires: _____

Resides at: _____

_____

NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

DFCM FORM 1a-2 060706

PAYMENT BOND

(Title 63, Chapter 56, U. C. A. l953, as Amended)

KNOW ALL PERSONS BY THESE PRESENTS:

That _____ hereinafter referred to as the "Principal," and _____ _____, a corporation organized and existing under the laws of the State of _____authorized to do business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); with its principal office in the City of _____, hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah hereinafter referred to as the "Obligee," in the amount of _____ Dollars ($_____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract with the Obligee, dated the _____ day of _____, 20____, to construct _____ in the County of _____, State of Utah, Project No. _____ for the approximate sum of _____ _____ Dollars ($_____), which contract is hereby incorporated by reference herein.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal shall pay all claimants supplying labor or materials to Principal or Principal's Subcontractors in compliance with the provisions of Title 63, Chapter 56, of Utah Code Annotated, l953, as amended, and in the prosecution of the Work provided for in said Contract, then, this obligation shall be void; otherwise it shall remain in full force and effect.

That said Surety to this Bond, for value received, hereby stipulates and agrees that no changes, extensions of time, alterations or additions to the terms of the Contract or to the Work to be performed thereunder, or the specifications or drawings accompanying same shall in any way affect its obligation on this Bond, and does hereby waive notice of any such changes, extensions of time, alterations or additions to the terms of the Contract or to the Work or to the specifications or drawings and agrees that they shall become part of the Contract Documents.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20____.

WITNESS OR ATTESTATION:

_____

PRINCIPAL:

_____

By: _____

(Seal)

Title: _____

WITNESS OR ATTESTATION:

_____

SURETY:

_____

By: _____

Attorney-in-Fact (Seal)

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of _____, 20____, personally appeared before me _____ _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20_____.

My commission expires: _____

Resides at: _____

_____

NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

DFCM FORM 1a-2 060706

CHANGE ORDER #_____

CONTRACTOR:

ARCHITECT:

AGENCY OR INSTITUTION:
PROJECT NAME:
PROJECT NUMBER:
CONTRACT NUMBER:
DATE:

CONSTRUCTION CHANGE DIRECTIVE NO.	PROPOSAL REQUEST NO.	AMOUNT		DAYS	
		INCREASE	DECREASE	INCREASE	DECREASE

	Amount	Days	Date
ORIGINAL CONTRACT			
TOTAL PREVIOUS CHANGE ORDERS			
TOTAL THIS CHANGE ORDER			
ADJUSTED CONTRACT			

DFCM and Contractor agree that the terms, contract sum, scope of the Work and time specified in this Change Order shall constitute the full accord and satisfaction, and complete adjustment to the Contract and includes all direct and indirect costs and effects related to, incidental to, and/or reasonably implied from such change in the contract terms, sum, scope of the Work and time.

Contractor:_____
Date

Architect/Engineer:_____
Date

Agency or Institution:_____
Date

DFCM: _____
Date

Funding Verification:_____
Date

CERTIFICATE OF SUBSTANTIAL COMPLETION

PROJECT _____ PROJECT NO: _____
AGENCY/INSTITUTION _____

AREA ACCEPTED _____

The Work performed under the subject Contract has been reviewed on this date and found to be Substantially Completed as defined in the General Conditions; including that the construction is sufficiently completed in accordance with the Contract Documents, as modified by any change orders agreed to by the parties, so that the State of Utah can occupy the Project or specified area of the Project for the use for which it is intended.

The DFCM - (Owner) accepts the Project or specified area of the Project as Substantially Complete and will assume full possession of the Project or specified area of the Project at _____ (time) on _____ (date).

The DFCM accepts the Project for occupancy and agrees to assume full responsibility for maintenance and operation, including utilities and insurance, of the Project subject to the itemized responsibilities and/or exceptions noted below:

_____

_____

The Owner acknowledges receipt of the following closeout and transition materials:

☐ As-built Drawings ☐ O & M Manuals ☐ Warranty Documents ☐ Completion of Training Requirements

A list of items to be completed or corrected (Punch List) is attached hereto. The failure to include an item on it does not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents, including authorized changes thereof. The amount of _____(Twice the value of the punch list work) shall be retained to assure the completion of the punch list work.

The Contractor shall complete or correct the Work on the list of (Punch List) items appended hereto within _____ _____calendar days from the above date of issuance of this Certificate. The amount withheld pending completion of the list of items noted and agreed to shall be: $_____. If the list of items is not completed within the time allotted the Owner has the right to be compensated for the delays and/or complete the work with the help of independent contractor at the expense of the retained project funds. If the retained project funds are insufficient to cover the delay/completion damages, the Owner shall be promptly reimbursed for the balance of the funds needed to compensate the Owner.

_____	by:	_____	
CONTRACTOR (include name of firm)		(Signature)	DATE
_____	by:	_____	
A/E (include name of firm)		(Signature)	DATE
_____	by:	_____	
USING INSTITUTION OR AGENCY		(Signature)	DATE
_____	by:	_____	
DFCM (Owner)		(Signature)	DATE

4110 State Office Building, Salt Lake City, Utah 84114 cc: Parties Noted
telephone 801-538-3018 • facsimile 801-538-3267 • http://dfcm.utah.gov DFCM, Director

project manual

Camp W. G. Williams
Riverton, Utah 84065-4999

utah national guard

new RTI classroom, phase 5, buildings #9, 10, 11, 12
dfcm project number: 05236480

prepared for:
utah national guard
state of utah
department of administrative services
division of facilities and construction management
4110 state office building
salt lake city, utah 84114

prepared by:
ajc architects
703 east 1700 south
salt lake city, ut 84105
(801) 466-8818

construction documents
date: august, 2005

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UTAH NATIONAL GUARD
DIVISION OF FACILITIES AND CONSTRUCTION MANAGEMENT

RTI CLASSROOM, PHASE 5, BUILDINGS #9, 10, 11, 12
AT CAMP WILLIAMS

DIVISION 8 - DOORS AND WINDOWS

NOT USED

DIVISION 9 - FINISHES

NOT USED

DIVISION 10 – SPECIALTIES

DIVISION 11 - EQUIPMENT

NOT USED

DIVISION 12 - FURNISHINGS

NOT USED

DIVISION 13 - SPECIAL CONSTRUCTION

NOT USED

DIVISION 14 - CONVEYING SYSTEMS

NOT USED

DIVISION 15- MECHANICAL

NOT USED

DIVISION 16 – ELECTRICAL

SECTION 01100 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: RTI Classroom, Phase 5, Building #9, 10, 11, and 12. DFCM Project No. 04XXXXXX. Project consists of installation of four new prefabricated modular classroom buildings, concrete foundations and footings, exterior ramps and stairs, site utility work, utility connection to the modular buildings and limited site work including grading, asphalt paving and concrete paving.

1. Project Location: Camp W. G. Williams, Riverton, Utah.
2. Owner: Utah National Guard

B. Architect Identification: The Contract Documents were prepared for the project by ajc architects, 703 East 1700 South, Salt Lake City, Utah 84105. (801) 466-8818.

C. Project Coordinator: Utah National Guard/ State of Utah DFCM.

1.3 CONTRACT

A. Project will be constructed under a general construction contract.

1.4 WORK SEQUENCE

A. The Work shall be conducted in one phase.

1.5 USE OF PREMISES

A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.6 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.

1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

    a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.7 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 The General Contractor shall be responsible to coordinate all aspects of the work with the modular classroom manufacturer, including additional electrical requirements for the project.

END OF SECTION 01100

SECTION 01140 - WORK RESTRICTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 USE OF PREMISES

A. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of site beyond areas in which the Work is indicated.

1. Limits: Confine constructions operations to areas indicated on Construction Documents.
2. Coordinate with the Project Manager for staging areas and construction vehicle parking.
3. Use designated truck routes for delivery of heavy and wide loads such as concrete, asphalt and the modular buildings.
4. Coordinate with the Project Manager for any limitations on construction activities or deliveries.
5. Coordinate with the project manager for security issues and access to the construction site, including construction personnel security clearances and back-ground checks.
6. Coordinate with the project manager for all required utility shut-downs. Provide utility shut-down requests a minimum of 72 hours prior to the required shut-down time.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01140

SECTION 01210 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

1.3 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: 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. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

   a. Description of the Work.
   b. List of detrimental conditions, including substrates.
   c. List of unacceptable installation tolerances.
   d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. 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.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests on CSI Form 13.2A, "Request for Interpretation."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Construction Manager promptly.

B. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

C. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

D. 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 Architect.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 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.

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. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.

G. 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.

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction forces.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. 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 materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. 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: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

I. 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.

J. 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.

K. 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.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.9 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.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01210

SECTION 01250 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include the following:
   1. Division 1 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

   1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
   2. Within 5 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

D. Proposal Request Form: For Change Order proposals, use forms provided by Owner. Sample copies are included at end of this Section.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714 Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01250

SECTION 01290 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:

1. Division 1 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
2. Division 1 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

   a. Application for Payment forms with Continuation Sheets.
   b. Submittals Schedule.

2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

   a. Project name and location.
   b. Name of Architect.
   c. Architect's project number.
   d. Contractor's name and address.
   e. Date of submittal.

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

   a. Related Specification Section or Division.
   b. Description of the Work.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that affect value.
   g. Dollar value.

      1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

   a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.

6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

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

9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Owner will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Delays: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.

a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Products list.
5. Schedule of unit prices.
6. Submittals Schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.
14. Performance and payment bonds.
15. Data needed to acquire Owner's insurance.
16. Initial settlement survey and damage report if required.

I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01290

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Conservation.
3. Coordination Drawings.
4. Administrative and supervisory personnel.
5. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

C. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 1 Section "Construction Progress Documentation" for preparing and submitting the Contractor's Construction Schedule.
2. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 COORDINATION

A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Indicate relationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Refer to Division 15 Section "Basic Mechanical Materials and Methods" and Division 16 Section "Basic Electrical Materials and Methods" for specific Coordination Drawing requirements for mechanical and electrical installations.

B. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1. Include special personnel required for coordination of operations with other contractors.

1.6 PROJECT MEETINGS

A. General: The Owner shall schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 days of the meeting.

B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner, and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule.
b. Phasing.
c. Critical work sequencing.
d. Designation of responsible personnel.
e. Procedures for processing field decisions and Change Orders.
f. Procedures for processing Applications for Payment.
g. Distribution of the Contract Documents.
h. Submittal procedures.
i. Preparation of Record Documents.
j. Use of the premises.
k. Responsibility for temporary facilities and controls.
l. Parking availability.
m. Office, work, and storage areas.
n. Equipment deliveries and priorities.
o. First aid.
p. Security.
q. Progress cleaning.
r. Working hours.

C. Progress Meetings: Conduct progress meetings at regular intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction 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 present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.
        8) Temporary facilities and controls.
        9) Work hours.
        10) Hazards and risks.
        11) Progress cleaning.
        12) Quality and work standards.
        13) Change Orders.
        14) Documentation of information for payment requests.

3. Reporting: Distribute minutes of the meeting to each party present and to 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 Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01310

SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Daily construction reports.
5. Material location reports.
6. Field condition reports.
7. Special reports.
8. Construction photographs.

B. Related Sections include the following:

1. Division 1 Section "Payment Procedures" for submitting the Schedule of Values.
2. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
3. Division 1 Section "Submittal Procedures" for submitting schedules and reports.
4. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.
5. Division 1 Section "Closeout Procedures" for submitting photographic negatives as Project Record Documents at Project closeout.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor activity is an activity that must be completed before a given activity can be started.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.4 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's final release or approval.

C. Preliminary Construction Schedule: Submit two printed copies; one a single sheet of reproducible media, and one a print.

D. Contractor's Construction Schedule: Submit two printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period.

1. Submit an electronic copy of schedule, using software indicated, on 3-1/2-inch (89-mm) diskettes, formatted to hold 1.44 MB of data, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.

E. CPM Reports: Concurrent with CPM schedule, submit three printed copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.

F. Construction Photographs: Submit two prints of each photographic view within seven days of taking photographs.

1. Format: Digitally

G. Daily Construction Reports: Submit two copies at monthly intervals.

H. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting.

B. Photographer Qualifications: An individual of established reputation who has been regularly engaged as a professional photographer for not less than three years.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

C. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
4. Startup and Testing Time: Include not less than 1 day for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

2. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 1 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 1 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
4. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.
    k. Curing.
    l. Startup and placement into final use and operation.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed Substantial Completion, and Final Completion.

F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

1. Refer to Division 1 Section "Payment Procedures" for cost reporting and payment procedures.

G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

H. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established the Notice to Proceed. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.5 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. High and low temperatures and general weather conditions.
5. Accidents.
6. Meetings and significant decisions.
7. Unusual events (refer to special reports).
8. Stoppages, delays, shortages, and losses.
9. Meter readings and similar recordings.
10. Emergency procedures.
11. Orders and requests of authorities having jurisdiction.
12. Change Orders received and implemented.
13. Construction Change Directives received.
14. Services connected and disconnected.
15. Equipment or system tests and startups.
16. Partial Completions and occupancies.
17. Substantial Completions authorized.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules 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 performance of construction activities.

3.2 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified commercial photographer to take construction photographs.

B. Periodic Construction Photographs: Take four to six digital photographs weekly, coinciding with cutoff date associated with each Application for Payment. Photographer shall select vantage points to best show status of construction and progress since last photographs were taken.

END OF SECTION 01320

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow 21 days for initial review of each submittal.

3. If intermediate submittal is necessary, process it in same manner as initial submittal.
4. Allow 15 days for processing each resubmittal.
5. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

E. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 4 by 5 inches label or beside title block to record Contractor's review and approval markings and action taken by Architect .
3. Include the following information on label for processing and recording action taken:

   a. Project name.
   b. Date.
   c. Name and address of Architect.
   d. Name and address of Contractor.
   e. Name and address of subcontractor.
   f. Name and address of supplier.
   g. Name of manufacturer.
   h. Unique identifier, including revision number.
   i. Number and title of appropriate Specification Section.
   j. Drawing number and detail references, as appropriate.
   k. Other necessary identification.

F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect .
2. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.

H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.

1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.

2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
3. Transmittal Form: Provide locations on form for the following information:

    a. Project name.
    b. Date.
    c. Destination (To:).
    d. Source (From:).
    e. Names of subcontractor, manufacturer, and supplier.
    f. Category and type of submittal.
    g. Submittal purpose and description.
    h. Submittal and transmittal distribution record.
    i. Remarks.
    j. Signature of transmitter.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

1. Number of Copies: Submit four copies of each submittal, unless otherwise indicated. Architect, will return two copies. Mark up and retain one returned copy as a Project Record Document.
2. Number of Copies: Submit copies of each submittal, as follows, unless otherwise indicated:

    a. Initial Submittal: Submit a preliminary single copy of each submittal where selection of options, color, pattern, texture, or similar characteristics is required. Architect will return submittal with options selected.
    b. Final Submittal: Submit three copies, unless copies are required for operation and maintenance manuals. Submit five copies where copies are required for operation and maintenance manuals. Architect will retain two copies; remainder will be returned. Mark up and retain one returned copy as a Project Record Document.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's written recommendations.
b. Manufacturer's product specifications.
c. Manufacturer's installation instructions.
d. Standard color charts.
e. Manufacturer's catalog cuts.
f. Wiring diagrams showing factory-installed wiring.
g. Printed performance curves.
h. Operational range diagrams.
i. Mill reports.
j. Standard product operating and maintenance manuals.
k. Compliance with recognized trade association standards.
l. Compliance with recognized testing agency standards.
m. Application of testing agency labels and seals.
n. Notation of coordination requirements.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Include the following information, as applicable:

a. Dimensions.
b. Identification of products.
c. Fabrication and installation drawings.
d. Roughing-in and setting diagrams.
e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
f. Shopwork manufacturing instructions.
g. Templates and patterns.
h. Schedules.
i. Design calculations.
j. Compliance with specified standards.
k. Notation of coordination requirements.
l. Notation of dimensions established by field measurement.

2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
4. Number of Copies: Submit one correctable, translucent, reproducible print and one blue- or black-line print of each submittal. Architect will return the reproducible print.
5. Number of Copies: Submit three blue- or black-line prints of each submittal, unless prints are required for operation and maintenance manuals. Submit five prints where prints are required for operation and maintenance manuals. Architect will retain two prints; remainder will be returned. Mark up and retain one returned print as a Project Record Drawing.
6. Number of Copies: Submit copies of each submittal, as follows:
   a. Final Submittal: Submit three blue- or black-line prints, unless prints are required for operation and maintenance manuals. Submit five prints where prints are required for operation and maintenance manuals. Architect will retain two prints; remainder will be returned. Mark up and retain one returned print as a Project Record Drawing.

D. Coordination Drawings: Comply with requirements in Division 1 Section "Project Management and Coordination."

E. Samples: Prepare physical units of materials or products, including the following:

1. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.
2. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
3. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:

    a. Generic description of Sample.
    b. Product name or name of manufacturer.
    c. Sample source.

4. Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, provide the following:

    a. Size limitations.
    b. Compliance with recognized standards.
    c. Availability.
    d. Delivery time.

5. 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 final submittal and actual component as delivered and installed.
6. Number of Samples for Verification: Submit three sets of Samples. Architect will retain two. Sample sets; remainder will be returned.

    a. Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

F. Product Schedule or List: Prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product.
2. Number and name of room or space.
3. Location within room or space.

G. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."

H. Application for Payment: Comply with requirements in Division 1 Section "Payment Procedures."

I. Schedule of Values: Comply with requirements in Division 1 Section "Payment Procedures."

J. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

B. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."

C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.

H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.

I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.

J. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.

K. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed

before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

L. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.

M. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

N. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

O. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment.

P. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

Q. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.

7. Other required items indicated in individual Specification Sections.

R. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

S. Material Safety Data Sheets: Submit information directly to Owner. If submitted to Architect, Architect will not review this information but will return it with no action taken.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION 01330

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

B. Support facilities include, but are not limited to, the following:

1. Waste disposal facilities.
2. Field offices.

C. Security and protection facilities include, but are not limited to, the following:

1. Site enclosure fence.
2. Security enclosure and lockup.
3. Barricades, warning signs, and lights.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 QUALITY ASSURANCE

A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.

1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.

B. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.76-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts[, with 1-5/8-inch- (42-mm-) OD top rails.

2.2 EQUIPMENT

A. General: Provide equipment suitable for use intended.
   1. Field Offices: Mobile units with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading.

B. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.

   1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

C. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

D. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

   1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
   2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.

E. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

F. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. 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.

3.2 TEMPORARY UTILITY INSTALLATION

A. Telephone Service: Provide temporary telephone service throughout construction period for common-use facilities used by all personnel engaged in construction activities. Install separate telephone line for each field office and first-aid station.

1. At each telephone, post a list of important telephone numbers.

    a. Police and fire departments.
    b. Ambulance service.
    c. Contractor's home office.
    d. Architect's office.
    e. Engineers' offices.
    f. Owner's office.
    g. Principal subcontractors' field and home offices.
2. Provide a portable cellular telephone for superintendent's use in making and receiving telephone calls when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
2. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines. Comply with NFPA 241.
3. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads. Comply with requirements of authorities having jurisdiction.

C. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.

1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.
2. Develop a waste management plan for Work performed on Project. Indicate types of waste materials Project will produce and estimate quantities of each type. Provide detailed information for on-site waste storage and separation of recyclable materials. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.

D. Common-Use Field Office: Provide an insulated, weathertight, air-conditioned field office for use as a common facility by all personnel engaged in construction activities; of sufficient size to accommodate required office personnel and meetings of 10 persons at Project site. Keep office clean and orderly.

1. Furnish and equip offices as follows:

a. Desk and four chairs, four-drawer file cabinet, a plan table, a plan rack, and bookcase.
b. Water cooler and private toilet complete with water closet, lavatory, and medicine cabinet with mirror.
c. Provide a room of not less than 240 sq. ft. (22.5 sq. m) for Project meetings. Furnish room with conference table, 12 folding chairs, and 4-foot- (1.2-m-) square tack board.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.

B. Site Enclosure Fence: Before construction operations begin, install chain-link enclosure fence with lockable entrance gates. Locate where indicated, or enclose entire Project site or portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.

1. Set fence posts in compacted mixture of gravel and earth.
2. Provide gates in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.

C. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

D. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.

1. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch- (16-mm-) thick exterior plywood.

END OF SECTION 01500

SECTION 01731 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:

1. Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

a. Requirements in this Section apply to mechanical and electrical installations. Refer to Divisions 15 and 16 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.3 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.

6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. 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 that results in increased maintenance or decreased operational life or safety.

C. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.

B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing 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.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

A. 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 existing 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. Cutting: Cut existing 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 as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

C. 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 possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate 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 eliminate 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 existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION 01731

SECTION 01770 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Project Record Documents.
3. Operation and maintenance manuals.
4. Warranties.
5. Instruction of Owner's personnel.
6. Final cleaning.

B. Related Sections include the following:

1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
2. Division 1 Section "Construction Progress Documentation" for submitting Final Completion construction photographs and negatives.
3. Division 1 Section "Project Record Documents" for specific record document requirements.
4. Division 1 Section "Operation and Maintenance Data" for additional Project Closeout requirements.
5. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents. Refer to Section "Operation and Maintenance Data for submittal requirements.

4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs damage or settlement surveys, property surveys, and similar final record information. Refer to Section "Operation and Maintenance Data for submittal requirements.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled

requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect
    d. Name of Contractor.
    e. Page number.

1.6 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

B. Record Drawings: Maintain and submit one set of blue - or black-line white prints of Contract Drawings and Shop Drawings.

1. 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 prepare the marked-up Record Prints.

    a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
    b. Accurately record information in an understandable drawing technique.
    c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
    d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.

2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.

3. Mark important additional information that was either shown schematically or omitted from original Drawings.
4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.
6. Architect will provide corrected Record Drawings in electronic media format.

C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy 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. Note related Change Orders, Record Drawings, where applicable.
4. Architect will provide corrected Record Specifications in electronic media format.

D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

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 Drawings, and Record Specifications, where applicable.

E. Miscellaneous Record Submittals: 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.

1.7 OPERATION AND MAINTENANCE MANUALS

A. Assemble four complete sets of operation and maintenance data, and one set of electronic media in PDF format, indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

1. Operation Data:

a. Emergency instructions and procedures.
b. System, subsystem, and equipment descriptions, including operating standards.
c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
d. Description of controls and sequence of operations.
e. Piping diagrams.

2. Maintenance Data:

   a. Manufacturer's information, including list of spare parts.
   b. Name, address, and telephone number of Installer or supplier.
   c. Maintenance procedures.
   d. Maintenance and service schedules for preventive and routine maintenance.
   e. Maintenance record forms.
   f. Sources of spare parts and maintenance materials.
   g. Copies of maintenance service agreements.
   h. Copies of warranties and bonds.

B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.8 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark 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 Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    h. Sweep concrete floors broom clean in unoccupied spaces.
    i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    k. Remove labels that are not permanent.
    l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

        1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean ducts, blowers, and coils if units were operated without filters during construction.
r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
s. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01770

SECTION 01781 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Electronic media submittal in PDF format.

B. Related Sections include the following:

1. Division 1 Section "Closeout Procedures" for general closeout procedures.
2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Divisions 2 through 16 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up Record Prints.
2. Number of Copies: Submit copies of Record Drawings as follows:

a. Initial Submittal: Submit one set of corrected Record Transparencies and one set of marked-up Record Prints. Architect will initial and date each transparency and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return transparencies and prints for organizing into sets, printing, binding, and final submittal.
b. Final Submittal: Submit one set of marked-up Record transparencies, one set of marked-up Record Prints, one set of Architect's Record CAD Drawing files, one set of Architect's Record CAD Drawing original plots, and three copies printed from record plots. Plot and print each Drawing, whether or not changes and additional information were recorded.

1) Electronic Media: CD-R.

B. Record Specifications: Submit two copies of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one copy of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

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 prepare the 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. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders and clarifications.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.
o. Contractor's Coordination Drawings.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Transparencies: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected transparencies of the Contract Drawings and Shop Drawings.

1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.
2. Refer instances of uncertainty to Architect for resolution.
3. Owner will furnish Contractor one set of transparencies of the Contract Drawings for use in recording information.
4. Print the Contract Drawings and Shop Drawings for use as Record Transparencies. Architect will make the Contract Drawings available to Contractor's print shop.

C. Record CAD Drawings: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect for coordinating Architect's CAD Record Drawing preparation.

D. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

E. 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. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.
3. Record CAD Drawings: Organize CAD 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 CAD file.
4. Identification: As follows:

    a. Project name.
    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. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

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.

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.

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 modifications to Project Record Documents as they occur; do not wait until the 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 01781

SECTION 01782 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of products, materials, and finishes, systems and equipment.
5. Electronic media submittal in PDF format.

B. Related Sections include the following:

1. Division 1 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 1 Section "Closeout Procedures" for submitting operation and maintenance manuals.
3. Division 1 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
4. Divisions 2 through 16 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

A. Initial Submittal: Submit 2 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.

B. Final Submittal: Submit one copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.

1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

2. Final submittal to include 1 copy of electronic media in PDF format.

1.5 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

A. 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.

B. Title Page: Enclose title page in transparent plastic sleeve. 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, address, and telephone number of Contractor.
6. Name and address of Architect.
7. Cross-reference to related systems in other operation and maintenance manuals.

C. 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.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. 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.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

    a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. 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 diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
5. 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.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 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.
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. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
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.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUAL

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.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

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 printed 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 videotape, 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.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

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.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. 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.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. 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.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. 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.
2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."

G. Comply with Division 1 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

H. Final electronic media submittal of Operation and Maintenance in PDF format to be issued on CD-R discs.

END OF SECTION 01782

Utah National Guard
RTI Classroom, Phase 5, Building 9, 10, 11, 12
DFCM Project No. 05236480

SECTION 02222 - EXCAVATING, BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Obtain excavation permits from state and local authorities.

B. Excavate for utility systems and process piping systems, including manholes, catch basins, valves, and other appurtenances to the points of connection with the building utility or structure piping five (5) feet outside of the building or structure.

C. Locate and protect existing utilities, structures, landscaping, and other existing features.

D. Dewater excavations as required.

E. Support excavations as required.

F. Place and compact bedding, pipe zone, and backfill materials over pipes and appurtenances to rough grade elevation.

G. Stockpile and dispose of material

1.02 QUALITY ASSURANCE

A. Provide soil testing during excavation and placement of fill and backfill materials in accordance with Section 01400.

B. Perform soil testing during excavation and placement of fill, bedding, initial backfill, and backfill materials to show compliance with the requirements of the Contract Documents.

1.03 REFERENCES

A. ASTM D422 Particle Size Analysis of Soils.

B. ASTM D424 Calculating the Plasticity Index.

C. ASTM D698 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, using 5.5-lb (2.49-kg) Rammer and 12-in (304.8 mm) Drop.

D. ASTM D1556 Density of Soil In Place by the Sand-Cone Method.

E. ASTM D1557 Moisture-Density Relations of Soils and Soil Aggregate Mixtures using 10-pound rammer and 18-inch drop. (Modified Proctor).

F. ASTM D1663 Test Method for Compressive Strength of Molded Soil-Cement Cylinders.

G. ASTM D2419 Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

H. ASTM D2487 Classification of Soils for Engineering Purposes.

I. ASTM D2901 Test Method for Cement Content of Freshly-Mixed Soil-Cement.

J. ASTM D2922 Density of Soil and Soil Aggregate In Place by Nuclear Methods (Shallow Depth).

K. ASTM D3017 Test Methods for Moisture Content.

L. ASTM D4253 Test Methods for Maximum Index Density of Soils, using a Vibratory Table.

M. ASTM D4254 Test Methods for Minimum Index Density of Soils and Calculation of Relative Density.

N. Federal Occupational Safety and Health Administration, *Federal Register*, Volume 37, No. 243, Sub-part P, Section 1926-652.

1.05 DEFINITIONS

A. Suitable Material: Excavated material from the site or imported material from off-site meeting the requirements of structural fill or non-structural fill material.

B. Unsuitable Material: Excavated material from the site that does not meet the requirements of structural fill or non-structural fill. This material shall be removed from the site.

C. Structural Fill: Fill placed on prepared subgrade in areas which will ultimately be subjected to structural loadings due to footing, floor slabs, pavements, etc.

D. Non-structural Fill: Fill place on prepared subgrade outside of areas which will ultimately be subjected to structural loadings due to footing, floor slabs, pavements, etc.

E. Borrow Material: Material imported from off-site but made available at an Owner owned/designated site. It is anticipated that borrow material will meet the requirements for structural fill material. If the quantity of acceptable borrow material is not sufficient to complete the Work, the Contractor shall notify the Engineer in writing. The notification shall include an estimated quantity of material required to complete the Work and the Contractor's Geotechnical Engineer's explanation for non-complying material.

1.06 SUBMITTALS

Submit the following to the Engineer:

A. Certified sieve analysis of the following materials and samples of the materials when requested by the Engineer:

1. bedding and initial backfill
2. imported trench fill

3. foundation material (if required)

B. One optimum moisture-maximum density curve for each type of soil encountered or incorporated into the Work.

C. Compaction testing results.

D. For record purposes only and not for review or approval, submit shop drawings and data showing the intended plan for dewatering operations. Include locations and capacities of dewatering wells, well points, pumps, sumps, collection, and discharge lines, standby units, water disposal methods, monitoring and settlement measuring equipment, and data collection and dissemination. Submit, together with a copy of the approved UPDES permit, as applicable, not less than 15 days prior to start of dewatering operations.

PART 2 - PRODUCTS

2.01 FOUNDATION MATERIAL

Foundation material shall be granular well-graded material with a maximum aggregate size of 2 inches and not more than 5 percent passing the 200 sieve.

2.02 BEDDING, PIPE ZONE, AND INITIAL BACKFILL MATERIAL

A. Sanitary Sewer and Storm Drain: Bedding, pipe zone, and initial backfill material shall be clean free-draining well-graded crushed gravel with a maximum aggregate size of 1inch. Crushed rock meeting the gradation requirements shown below shall be submitted for approval by the Engineer.

1-Inch Crushed Gravel

Sieve Size	Percent Passing by Weight
1"	100
3/4"	90-100
1/2"	20-55
#4	0-1
#8	0-5

B. Water, Gas, Electric, Telephone, or Buried Cables: Bedding, pipe zone, and initial backfill material shall be clean granular natural sand material, free from organic matter, conforming to the gradation requirements shown below:

3/8"	100
#4	35-100
#30	20-100

2.03 FINAL BACKFILL UNDER STRUCTURES, PAVEMENT, AND WALKS

A. Fill and final backfill for utilities under and immediately adjacent to structures, pavement prisms, and walks shall be structural fill material consisting of clean, well-graded, non-expansive granular sand and gravel material imported from off-site with a maximum size of 3 inches, no greater than 35 percent passing the No. 200 sieve, and a liquid limit of no greater than 30 percent. The material shall be capable of attaining the required densities when compacted.

B. Native material will be acceptable for final backfill under walks, pavement, or structures if it meets the requirements for structural fill material.

2.04 FINAL BACKFILL OUTSIDE OF STRUCTURES, PAVEMENT, AND WALKS

A. Fill and final backfill for utilities not under or immediately adjacent to structures, pavement prisms, and walks, shall be suitable non-structural fill material consisting of excavated material from the site, free of topsoil, debris, trash, roots, and other organic matter, frozen material, and stones larger than 3 inches in any dimension. If an adequate quantity of non-structural material is not available at the site, provide imported fill or borrow material consisting of any cohesive or granular material free from topsoil, debris, trash, roots, and other organic matter, frozen material, and stones larger than 3 inches in any dimension. The material shall not contain excessive moisture and shall readily compact and support construction equipment.

B. Whenever the native excavated material is determined by the Engineer to be unsuitable, imported acceptable material, meeting the requirements for material within rights-of-way, and capable of attaining the required densities shall be used.

2.05 PLASTIC MARKING TAPE

Plastic marking tape shall be acid and alkali-resistant polyethylene film, 6 inches wide, with minimum thickness of 0.004 inch. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise. The tape shall be manufactured with integral wires, foil backing, or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in the table below and shall bear a continuous printed inscription describing the specific utility.

Tape Color	Utility
Red	Electric
Yellow	Natural Gas, Oil, Dangerous Material
Orange	Telephone, Telegraph, Television, Police and Fire Communications
Blue	Potable Water System

Green	Industrial and Sanitary Sewer
Green & White	Compressed Air

PART 3 - EXECUTION

3.01 PROTECTION

A. Protect trees, shrubs, and lawn areas to receive planting, rock outcropping, and other features remaining as part of final landscaping.

B. Protect bench marks and existing structures, roads, sidewalks, paving, and curbs against damage from vehicular or foot traffic.

C. Protect excavations and workmen by shoring, bracing, sheet piling, underpinning, or by other methods, as required to prevent cave-ins or lose dirt from falling into excavations.

D. Shore or otherwise support adjacent structure(s) which may be damaged by excavation work. This includes service lines, pipe chases, utilities, retaining walls, etc.

E. Notify Engineer of any unexpected subsurface conditions. Discontinue work in the area until Engineer provides notification to resume work.

3.02 EXISTING UTILITIES

A. The drawings show existing utilities and their locations insofar as they are known. Utility locations and sizes may vary from those shown. Underground utilities or improvements may exist which have not been shown on the plans. All reasonable precautions shall be taken to field locate, preserve, and protect any and all such improvements.

Any improvements damaged by the Contractor which are not indicated by the drawings shall be repaired by the Contractor. Compensation for such repairs shall be covered by a Field Change Order and will be negotiated with the Engineer before corrections are made. Any such improvements damaged by the Contractor which are on the drawings shall be repaired at the expense of the Contractor.

B. Request various agencies or utility companies concerned to field-mark substructures and utilities before excavating.

C. Where it is necessary to remove, replace, or relocate such improvements in order to execute the Work, coordinate with, and obtain approval from the utility company or agency concerned.

D. If the Contractor damages any existing utility lines that are not shown, or if the locations of suspected utilities are not known to the Contractor, report immediately to the Engineer and the Owner of the utilities.

3.03 TRENCH EXCAVATING

A. Obtain required permits from local or state agencies.

B. In areas requiring reseeding or sodding, strip topsoil to a minimum depth of 12 inches, or as directed by the Engineer, and stockpile away from trench and other excavated materials for reuse.

C. Vertically cut existing pavement, sidewalk, curb and gutter, driveways, etc., along the lines forming the trench in such a manner as not to damage the adjoining pavement. Break up the portion to be removed, and remove from the site of the work immediately without causing damage to the pavement outside the limits of the trench.

D. Perform trench excavation to the alignment and grade as shown on the drawings, or as required by the Engineer.

E. As directed by the Engineer, when unsuitable foundation material is encountered at subgrade, remove unsuitable material and replace with foundation material. Contact Engineer prior to excavation of unsuitable material and placement of foundation material to gain authorization to do so.

F. Place excavated material in a manner that will not endanger the work and will cause the least possible interference with public travel.

G. Provide for uninterrupted flow of irrigation ditches, streams, wastewater, and storm drainage. Provide free access to all fire hydrants, water valves, meters, and drives.

H. Keep excavation clear of water during the progress of the Work.

I. The Contractor shall backfill, to existing grades, and barricade all trenches within roadways and parking areas at the close of each day, unless approved by the Engineer. No trenches shall be backfilled except in these areas until pipelines are properly tested.

J. The use of a trench digging machine will be permitted except in places where machines may cause damage to existing structures, in which case, hand methods shall be employed.

K. Place barriers along each excavation, at each end of excavations, along soft shoulder areas within roadways, and at other locations along the excavation as may be necessary or as required by the Engineer. Trenches shall be delineated night and day as required by applicable codes until backfilling is complete.

L. Equipment with tracks which is to be used on pavement shall be equipped with suitable pads to prevent damage to the pavement. The Contractor shall be responsible for damage done to improved surfaces. Damaged surfaces shall be repaired or replaced by and at the expense of the Contractor in a manner satisfactory to the Engineer and at no additional cost to the Owner.

M. Trenches, at the top of the initial backfill, shall be of necessary width for the proper laying of the pipe, but in no case shall the trench be less than 12 inches wider than the outside diameter of the pipe or more than two 2 feet wider than the pipe outside diameter.

N. Trenches shall not be excavated until the pipe to be laid therein is on the site and is scheduled to be placed. The bottom of the trenches shall be accurately graded to a depth of 6 inches below the bottom of the pipe to allow for placing of granular pipe zone bedding material.

Care shall be taken not to excavate below the depths indicated. Where bell and spigot pipe is used, the minimum cover depth shall be maintained over the bell as well as under the straight portion of the pipe. Over-excavation shall be backfilled in 6-inch lifts to the proper grade with foundation or bedding material, as required by the Engineer, and shall be thoroughly consolidated and compacted as specified at no additional cost to the Owner.

O. Wasting of Material. Contractor shall remove and dispose of surplus, unsuitable and excess excavated material. Contractor shall secure waste sites for excess material. No additional payment shall be made for removal and disposal of material.

3.04 ROCK EXCAVATING

A. Rock shall be defined as follows:

1. Rock excavation shall consist of solid material and obstructions encountered with a volume in excess of 2 cubic yard. Sidewalks, pavement, and curb and gutter that cannot be excavated with a track-mounted power excavator (equivalent to Caterpillar Model No, 215C LC, rated at not less than 115 HP flywheel power and 32,000-pound drawbar pull, and equipped with a short stick and a 42-inch wide, short tip radius rock bucket rated at .81 cubic yard (heaped) capacity) without systematic drilling and blasting shall be excluded.

2. Hard and compact materials such as cemented gravels, glacial till, fractured quartzites, and relatively soft or disintegrated rock will not be considered as rock excavation. Rock excavation will not be considered as such because of intermittent drilling, blasting or ripping that is performed merely to increase production.

B. Excavation of the material claimed as rock shall not be performed until the material has been classified and cross-sectioned by the Engineer.

C. Rock payment lines are limited to the following:

Six (6) inches below invert elevation of pipe and two feet wider than inside diameter of the pipe, but not more than three (3) feet maximum trench width.

D. Excavate for and remove rock by the mechanical method.

1. Cut away rock at excavation bottom to form level bearing surface.
2. Remove shaled layers to provide sound and unshattered base for footings and foundations.
3. Remove excavated material.
4. For utility installations, cut away rock in bottom of trench to follow the proposed grade of

the utility line. Eliminate sharp steps or protrusions.

E. Provide for visual inspection of bearing surfaces and cavities formed by removed rock.

F. Correct unauthorized rock removal in accordance with backfilling and compaction requirements of Section 02222.

3.05 STABILITY OF EXCAVATIONS

A. Slope sides of excavations to comply with OSHA 29 CFR Part 1926 or latest revision. Provide and install trench support systems where sloping is not possible because of space restrictions or stability of material excavated.

B. Provide proper support for all excavations to protect life, property, utilities, pavement, and the Work and to provide safe working conditions in the trench in accordance with Occupational Safety and Health Administration (OSHA) regulations, *Federal Register* Vol. 37, No. 243, Subpart P., Sec. 1926.652 or latest edition.

C. Contractor shall be responsible to determine when and where the use of trench support is employed over the use of trench boxes or sloping the sides of the excavation to the angle of repose of the material being excavated. Contractor shall be responsible for the support system used. Support systems shall be in accordance with Section 02160 - Excavation Support Systems.

D. Remove all timber and sheeting from excavations or trenching before backfilling. Cut sheeting off 2-feet below final grade if allowed by Engineer.

E. Contractor shall prevent damage to the existing improvements. Where existing improvements are damaged or affected as a result of the Contractor's work, the Contractor shall replace or repair such damage at no additional cost to the Owner.

3.06 DEWATERING

A. Provide all equipment, labor, materials, tools, and incidentals necessary to design, construct, install, and operate dewatering facilities for construction of the Work.

B. Do not discharge drainage water into storm drains unless approval by the governing agency and the Engineer is given. No discharge into sanitary sewers is allowed.

C. Water shall not be allowed to flow through the pipe lines during construction.

3.07 BACKFILLING AND COMPACTING

A. Assure that trenches are free of debris, snow, ice, and water and that ground surfaces are not in frozen condition.

B. Backfill in a systematic manner and as soon as possible after pipeline installation and leak detection testing is complete.

C. Compact materials in accordance with paragraph 3.14 Field Quality Control.

D. Foundation. When unstable earth, muck, or other foundation material is encountered in the excavation, additional excavation shall be made as directed by the Engineer, and shall be replaced with foundation materials. A minimum of 12 inches below the pipe zone will be removed and backfilled with foundation material to give a stable subgrade.

No additional payment for foundation material will be made unless the Engineer is notified of the condition and approves the use of foundation materials.

In rock excavation where over-excavation occurs the excavation shall be backfilled with foundation material to 6 inches below the pipe zone.

E. Bedding and Pipe Zone. Place bedding material to required thickness and consolidate or compact. Shovel-slice or rod the bedding in the haunch area to assure that the pipe remains true to grade, voids are eliminated beneath the pipe, and the bedding is properly compacted or consolidated.

F. Initial Backfill. Place and compact initial backfill material simultaneously on each side of the pipe for the full width of the trench in layers of 6 inches or less, to a point 12 inches over the top of the pipe and in such a manner as not to injure, damage or disturb the pipe.

G. Final Backfill.

1. Under structures, pavement prisms, walks, and where specified by the Engineer, the backfill material shall be placed in continuous horizontal layers, not exceeding 6 inches in thickness or as required by Construction Manager. Adjust moisture content of fill or backfill material, as determined by ASTM D698, as necessary to $\pm$2 percent of optimum moisture as required to obtain specified degree of compaction. Utilize borrow material as available. Provide import structural fill material as required.

2. In all areas outside of structures, pavement prisms, and walks, place non-structural fill or backfill material in continuous horizontal layers not exceeding 12 inches in thickness degree of compaction. Moisten or aerate native materials as necessary to $\pm$1 to 3 percent of optimum moisture as determined by ASTM D698.

H. In areas where the pipe is placed near the existing ground surface, mound backfill material over pipe to a depth of 4 feet of cover, or as designated on the plans. Mounding shall be accomplished with consideration for drainage problems that may develop. Mounding shall only be used where shown on the plans.

I. Distribute the backfill material in such a manner as to avoid the formation of lenses or layers of material differing substantially in characteristics from surrounding material. Do not include any roots, sod, frozen material or other perishable or unsuitable material in backfill.

J. Whenever the excavated material is not suitable for backfill, furnish or transport from other areas within the project, suitable excavated material which meets the requirements for final backfill.

K. Remove from site and dispose of excess or undesirable excavated material not suitable or required for backfill in an appropriate acceptable manner.

L. Backfill for Appurtenances. After the manhole, catch basin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for seven (7) days, backfill shall be placed in such a manner that the structure will not be damaged by the shock of falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be placed in such a manner as to prevent eccentric loading and excessive stress on the structure.

3.08 SPECIAL REQUIREMENTS

A. Water Lines. Trenches shall be of a depth to provide a minimum cover of 4 feet from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe.

B. Electrical Distribution System. Direct burial cable and conduit or duct line shall have a minimum cover of 24 inches from the finished grade, unless otherwise indicated.

C. Gas Distribution. Trenches shall be excavated to the depth that will provide not less than 36 inches of cover. Trenches shall be graded as specified for pipe-laying requirements.

D. Plastic Marking Tape. Warning tapes shall be installed directly above the pipe at a depth of 18 inches below finished grade unless otherwise shown or required by the Engineer.

3.09 SOIL STORAGE (STOCKPILE) AREAS

A. Prepare areas to receive stockpile material. Clear and grub as necessary to prevent stockpiled material from contamination with unsuitable material.

B. Provide adequate drainage for stockpiles and surrounding areas by means of temporary ditches, dikes or other approved methods.

C. Stockpile suitable excavated material in an orderly manner, and at a distance from the bank of the excavation sufficient to avoid overloading or cave-ins.

D. Protect stockpiled material from contamination with unsuitable excavated material that may destroy the quality of the suitable stockpiled material. Replace stockpiled material, not adequately protected, that becomes unsuitable with suitable material at no cost to the Owner.

E. Do not place stockpile material in permanent fill material locations unless approved by the Engineer.

F. When stockpile areas are no longer needed, prior to completion of the work, grade the stockpile area to original contours and abandon/fill temporary ditches.

3.10 BORROW AREAS

A. Excavate borrow areas in such a manner as will afford adequate drainage.

B. Transport overburden and spoils material to the designated spoil area or otherwise dispose of as directed by the Engineer.

C. Operate borrow areas to minimize detrimental effects on natural environmental conditions.

D. Maintain access roads as required to permit access.

E. Slope sides of excavations or provide excavation support systems in accordance with Section 02160.

F. Trim and drain borrow areas to neat lines after the excavation is complete.

3.11 COLD WEATHER

A. Contractor shall remove and dispose of snow or ice from the construction area as necessary to perform the required work. The removal of additional deposits of snow shall not be cause for the Contractor to request an extension of contract time or additional payment.

B. The Contractor shall provide cold weather protection materials and equipment, such as heaters and blankets, as required.

C. Excavations, trenches, excavated material, and imported material shall be protected from frost or freezing, as necessary, until the excavation or trench has been backfilled.

D. The presence of frozen material or material containing frost shall not be cause for the Contractor to request an extension of contract time or additional payment.

E. The Contractor shall remove and dispose of frozen material that cannot be incorporated into the backfill.

3.12 FIELD QUALITY CONTROL

A. Densities of in-place materials shall equal or exceed the minimum densities as indicated below when compared to the maximum dry density as determined by ASTM D698:

COMPACTION REQUIREMENTS		
Location or Use of Fill	Percentage of Maximum Density	
Foundation, bedding, and initial trench backfill or fill material	96	
Final fill and backfill beneath structures, paved areas (including sidewalks and gravel roadways)	96	
Final fill and backfill, not beneath paved areas or structures	90	

COMPACTION REQUIREMENTS		
Location or Use of Fill	Percentage of Maximum Density	
Topsoil	80	
Overexcavation	95	

B. Passing overexcavation tests are required on the fills and backfills at the following frequencies:

Bedding	-	1 Test per 200 L.F. of Trench
Initial Backfil	-	1 Test per 200 L.F. of Trench
Final Backfill or Fill (outside pavement section)	-	1 Test per 200 L.F. of Trench per lift
Final Backfill or Fill (under pavement section)	-	1 Test per 50 L.F. of Trench per lift
Overexcavation	-	1 Test per 50 L.F. of Trench per lift

C. Densities of in-place material shall be as determined by ASTM D2922.

D. Compaction tests not meeting specification requirements shall be retested, after recompaction, at Contractor's expense. The Engineer shall select the depth that the test is to be taken. The Contractor shall be responsible to dig all density testing pits at the location and depth requested. No additional payment will be made for test pits dug for compaction tests or for replacing and recompacting the backfill material.

E. Fill or backfill not compacted to the required density will be removed, recompacted, and retested at the Contractor's expense until the requirements are met. The retesting shall be at the Contractor's expense.

F. Any trenches and excavation pits improperly backfilled, or where settlement occurs, shall be reopened to the depth required for proper compaction, then refilled and compacted with the surface restored to the required grade and compaction, rounded over, and smoothed off or pavement sections restored.

G. The Contractor shall be responsible for providing Proctor Density test results for backfill material, bedding material, and any special import backfill used. Prior to commencement of any construction the Contractor shall obtain samples of backfill material for Proctor tests. Where existing material is to be used as backfill material the Contractor shall be responsible for providing the machinery and labor to obtain soils samples of the backfill material for Proctor tests. On this project at least one sample per 1000 feet of pipe to be installed shall be required.

Additional Proctor tests may be required if backfill material changes in characteristics. Proctor tests shall be run by a Owner-approved testing laboratory. The cost of obtaining soil samples and conducting Proctor tests shall be paid by the Contractor.

No pipeline installation will begin until written results of the Proctor tests for that area have been submitted to the Engineer. The Contractor shall use the Proctor test results for testing compaction of backfill material.

3.13 LIMITS OF CONSTRUCTION

The Contractor shall complete all work within the easement lines and rights-of-way as shown on the drawings or as directed by the Engineer. All corrections for disturbance, damage, or irregularity shall be the responsibility of the Contractor and shall hold the Owner harmless of all suits, liability and damages. All ditches, canals, and roadways shall be placed back into their original or better condition.

3.14 CLEAN UP

A. Remove all excess material, debris, sheeting, etc. from the site upon completion of the Work and dispose of properly.

B. Keep cleanup operations to within 500 feet of excavation at all times.

C. Failure to keep the cleanup operations to within 500 feet of excavation shall be sufficient cause for the Engineer to stop forward progress of excavating equipment and hold progress payments until the cleanup is up to acceptable limits and standards.

D. Any pavement, trees, shrubbery, fences, poles, or other property or structures damaged, removed, or disturbed by the Contractor, whether deliberately or through failure to carry out the requirements of the contract documents, state laws, municipal ordinances or the specific direction of the Engineer or through failure to employ usual and reasonable safeguards shall be replaced or repaired at the expense of the Contractor.

END OF SECTION 02222

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SECTION 02510 - WATER LINE PIPING AND FITTINGS

PART 1 - GENERAL

1.01 DESCRIPTION

This section covers installation of all pipe, fittings, and appurtenances for the water distribution system, complete. All work shall conform to these specifications and plans.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Trench Excavation and Backfill. Section 02222

B. Cast-in-Place Concrete. Section 03300

PART 2 - MATERIALS

2.01 PIPING

A. General. Distribution system piping shall be polyvinyl chloride pipe (PVC) except as otherwise shown on the drawings. All piping, fittings and joints shall be "lead free" as required by the Safe Drinking Water Act Amendment of 1986. No pipes or fittings shall contain more than 8% lead, solder and flux shall not contain more that 0.2% lead.

B. Polyvinyl Chloride Pipe. PVC pipe shall be Schedule 80 and conform to the latest revision of ASTM D 1785.

C. Fittings. Fittings shall be PVC, Schedule 80 Socket Fittings and conform to the latest revision of ASTM D 2466. Joints shall be solvent-cemented.

D. Metallic "Detectatape" shall be installed above all non metal pipe and conduit except for sewer or sump drains. The tape shall be a minimum of 2-inches wide color-coded metallic warning ribbon. All warning tape shall be furnished by the Contractor and installed as recommended by the manufacturer.

PART 3 - EXECUTION

3.01 HANDLING

All pipe and materials shall be delivered and distributed at the site by the Contractor. Pipe, fittings, valves, special and accessories shall be loaded and unloaded by lifting with hoists or skidding to avoid shock or damage. In no case shall material be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.

Pipe and accessories shall be handled so that coatings and linings will not be damaged. If, however, any part of the coating or lining is damaged, it shall be repaired or replaced by the Contractor, at his expense, to the satisfaction of the Engineer.

3.02 INSTALLATION

A. Excavation and Backfill. Excavation and backfill for pipe lines shall conform to Section 02222, "Trench Excavation and Backfill."

B. Laying Pipe. Before installation, the pipe and fittings shall be inspected for defects.

All pipe shall be laid and maintained to the required lines and grades with fittings and specials at the required locations. A minimum of five (4) feet of cover will be maintained over the pipe line below 7300 feet in elevation.

Proper implements, tools and facilities satisfactory to the Engineer and any applicable regulatory agencies shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe, fittings and specials shall be carefully lowered into place piece by piece by means of a derrick, ropes or other suitable tools or equipment, to prevent damage to pipe materials and protective coatings and linings. Under no circumstances shall materials be dropped or dumped.

Every precaution shall be taken to prevent foreign materials from entering the pipe while it is being placed in the line.

During laying operations, no debris, tools, clothing or other materials shall be placed in the pipe. At times when pipe laying is not in progress and at the end of each day, the open ends of the pipe shall be closed by a watertight plug or other means approved by the Engineer.

All water lines shall be installed with the required vertical and horizontal separation from all sewer lines. Standards for separation from all sewer lines as specified by the State of Utah's Bureau of Public Water Supplies is ten (10) feet horizontal distance and eighteen (18) inches vertical separation between the bottom of the water line and the top of the sewer line, with the water line above the sewer line. Where common trench installation is required the Contractor shall maintain the minimum vertical separation between the water and sewer line. Special care shall be made to maintain the required separation and insure the integrity of the trench shelves.

All valves, hydrants and buried fittings shall be wrapped with 8 mil thick polyethylene film tube or sheet. The film shall be held in place by an approved adhesive tape, equal to Scotchrap No. 50. Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions or where long-radius curves are permitted, the amount of deflection allowed shall not exceed that required for satisfactory jointing as recommended by pipe manufacturer and shall be approved by the Engineer.

3.03 PIPE JOINTING

A. PVC Socket Fittings Jointing of pipe with PVC socket fittings shall be in accordance with the recommendations of the manufacturer of the pipe and/or couplings. Joints shall be solvent-cemented. Care shall be taken that the inside of the pipe and fittings are kept clean, that the pipe is seated in the joint, and that the joint is fully made up.

3.04 CONNECTION TO EXISTING WATER LINES

Connection to existing pipelines shall be made where shown on the plans or as directed by the Engineer. Connection to the existing water lines shall be done only in the presence of the Owner's Representative, and with previous notification, scheduling and approval of the owner. Prior to the actual connection, the Contractor shall have all necessary fittings and appurtenances present and ready for the connection.

3.05 DISINFECTION AND TESTING

All water lines shall be disinfected in accordance with the American Water Works Association (AWWA) Standard C651. Supply bacteriological test to show compliance with the standard. All water lines shall be tested in accordance with AWWA Standard C600. Supply test results to show compliance with the standard.

END OF SECTION 02713

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SECTION 02513 - ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Work in this section includes the construction of new asphaltic concrete pavement sections.

B. Prepare sub-grade to receive base course.

C. Place untreated base courses, work and compact.

1.02 REFERENCE STANDARDS

ASTM D1557 - Tests for Moisture - Density Relationship of Soils using 10 lb. (4.5 kg) Rammer in 18 inch (457 mm) Drop.

1.03 INSPECTION AND TESTING

A. Testing and inspection will be performed so as to minimize disruption to Work.

B. Allow testing laboratory access to the mixing plant for verification of weights or proportions, character of materials used and determination of temperatures used in the preparation of asphaltic concrete mix.

C. When and if required, the testing laboratory will perform laboratory tests on proposed asphaltic pavement mix(es) to determine conformity with requirements.

D. The testing laboratory will perform one (1) series of compaction tests per 100 square yards for untreated base course and one (1) series of compaction tests per 100 square yards for each lift of asphalt surface course.

E. When untreated base course or portion thereof has been placed and compacted in accordance with requirements, notify the testing laboratory to perform density tests. Do not place asphalt surface courses until results have been verified and base course installation approved.

F. If compaction tests indicate that untreated base course or asphalt surface course do not meet specified requirements, remove defective work, replace and retest at own expense. core testing may be required by the Engineer to evaluate defective work.

1.04 SUBMITTALS

A. Certified sieve analysis of untreated base course material and samples of this material for determination of Proctor values.

B. Certified sieve analysis of aggregate materials for asphalt pavement.

C. Proposed asphalt pavement mix with Marshall Test results for the proposed mix.

D. Seven (7) days prior to delivery of any bituminous paving to the job site, the Contractor shall submit the proposed job mix to the Engineer for approval. The job mix shall be submitted by the Contractor, and no bituminous mixture shall be manufactured until it has been approved. Data shall be provided that show the proposed mix will produce a mixture which meets the requirements of these specifications and the specific Marshall Test results, including density voids analysis and stability flow tests. Previously established test results will be accepted provided the tests were performed within the last six months.

PART 2 - PRODUCTS

2.01 UNTREATED BASE COURSE MATERIALS

Granular Base. Angular crushed natural stone; free from shale, organic matter and debris; graded within following limits:

1" GRADATION

Sieve Size	Percent Passing
1 inch	100
1/2-inch	79 to 91
No. 4	49 to 61
No. 16	27 to 35
No. 50	17-21
No. 200	5 to 12

B. Primer. Homogeneous medium curing liquid asphalt; of type recommended for asphaltic paving; of grade to suit job conditions.

C. Tack Coat. Emulsified asphalt (AC-10) to be used as the tack coat shall meet the requirements of ASTM D977-80, Grade SS-1N or ASTM D2397-79 Grade CSS-1N.

2.02 ASPHALT PAVEMENT MATERIALS

A. Mineral Aggregate. Mineral aggregate shall consist of crushed stone, crushed gravel, or crushed slag conforming to the following requirements:

1. Coarse aggregate, retained on the No. 4 sieve, shall consist of clean, hard, tough, durable and sound fragments, and shall be free from organic matter or other deleterious substances.

2. That portion of the aggregate retained on the No. 4 sieve shall have not less than 50% of particles by weight with at least one mechanically fractured face or clean angular face.

3. Fine aggregate passing the No. 4 sieve may be either a natural or manufactured product. The aggregate shall be clean, hard grained and moderately sharp, and shall contain not more than 2% by weight of vegetable matter or other deleterious substances.

4. That portion of the fine aggregate passing the No. 40 sieve shall be non-plastic when tested in accordance with AASHTO Designation T-90.

5. The weight of minus 200 mesh material retained in the aggregate, as determined by the difference in percent passing a No. 200 sieve by washing and dry sieving without washing, shall not exceed 6% of the total sample weight. The portion of fine aggregate passing the No. 200 sieve shall be determined by washing with water in accordance with AASHTO Designation T-11.

6. The aggregate shall be of uniform density and quality and shall have a rodded weight of not less than 75 lbs/cu. ft. when tested in accordance with AASHTO Designation T-19.

7. The aggregate shall have a percentage of wear not exceeding 40 when tested in accordance with AASHTO Designation T-96.

B. Asphalt Cement. Homogeneous; free of water; will not foam when heated to 177 C; 85/100 penetration grade; shall meet requirements of ASTM D3381; viscosity AC 10 for moderate climates.

C. Seal Coat. Fog type as defined in Manual No. 4; The Asphalt Institute (MS-4).2.03 ASPHALT PAVEMENT MIX

D. Combine mineral constituents in proportions to produce a mixture conforming to following gradation requirements:

¾" GRADATION

Sieve Size	Percent Passing By Weight
¾"	100
½"	75-91
#4	46-62
#16	22-34
#50	11-23
#200	5-9

½" GRADATION

Sieve Size	%Passing By Weight
½"	100
#4	60-80

#16	28-42
#50	11-23
#200	5-9

E. Percentage by weight of asphalt cement in mixture. 5.0% to 7.0% for surface course.

F. Maintain thorough and uniform mixture.

G. Bring asphalt cement and mineral constituents to required temperatures before mixing. Ensure aggregates are sufficiently dry so as not to cause foaming in mixture.

PART 3 - EXECUTION

3.01 PREPARATION

A. Ensure grading of sub-grade to required elevation.

B. Scarify sub-grade, where asphalt pavement is to be placed, to a depth of minimum 8 inches. Windrow loosened soil to one side.

C. Where existing gravel has been windrowed and retained for sub-grade, incorporate such into the top 8 inches by mixing and blading. Compact as specified in the preceding paragraph.

D. Water and thoroughly mix sub-grade until optimum moisture content is obtained when deficiency of moisture content exists. When excess of moisture exists, rework and aerate sub-grade until optimum moisture content is obtained.

E. Before final rolling, shape entire section, add additional sub-soil as required and compact sub-grade to provide grades, elevation and cross-section indicated. Points of finished sub-grade surface shall be within 1 inch of elevations indicated.

3.02 PLACEMENT OF UNTREATED BASE COURSE

A. Bring sub-base course to required depth(s) and profiles indicated. Extend sub-base course minimum 6 inches beyond asphalt pavement width. Place in layers not exceeding 4 inches in depth. Compact each layer to 95% maximum laboratory density. Properly compact areas adjacent to curbs, catch basins, manholes and other areas not accessible to rollers with mechanical or hand tamping devices. Ensure granular sub-base course materials are not contaminated with deleterious materials.

B. Add water during compaction to bring granular material to optimum moisture content.

C. Spread base course materials over prepared granular sub-base to a minimum compacted depth as indicated on the drawings. Compact to 96% maximum laboratory density. Ensure top surface of base course is true to lines and grades indicated, with all points within 1/2 inch of elevations indicated.

D. Add water during compaction to bring stabilizing base course materials to optimum moisture content. When an excess moisture exists, rework stabilizing base course materials

until optimum moisture content is obtained.

3.03 PLACEMENT OF ASPHALT PAVEMENT

A. Place asphalt pavement surface course within 12 hours of priming untreated base course.

B. Place asphalt pavement to compacted depth indicated on the drawings. The maximum compacted depth of each lift of asphalt surface course shall not exceed 3-inch thickness.

C. Do not place asphalt pavement when surface temperature is 4^0C or lower; or during rainy weather; or when the subgrade, sub-base, or base course is wet or frozen; or during other unfavorable weather conditions as determined by the Engineer. Ensure asphalt pavement is minimum 118^0C immediately after placing and prior to initial rolling.

D. Offset longitudinal joints in succeeding course at least six (6) inches traversely to avoid a vertical joint through more than one course.

E. Compact asphalt paving surface course to required density, with approved rolling equipment. Start compaction as soon as pavement will bear equipment without checking or undue displacement.

F. Carry out compaction in three operations in pass sequence. Ensure each pass of roller overlaps previous passes to ensure smooth surface free of roller marks. Keep roller wheels sufficiently moist so as not to pick up material.

G. Perform hand tamping in areas not accessible to rolling equipment.

H. Ensure joints made during paving operations are straight, clean, vertical and free of broken or loose material. Prime vertical surfaces of joints to ensure tight bond.

I. Ensure surface of completed asphalt pavement is true to lines, profiles and elevations indicated, and is free from depressions exceeding 1/2 inch when measured with a 10 ft. straightedge.

J. Do not allow vehicular traffic on newly paved areas until surface has cooled to atmospheric temperature, minimum of 6 hours after final installation.

3.04 ADJUSTING MANHOLE FRAMES AND VALVES

A. Adjust manholes, valves, and other appurtenances to required elevations.

B. Provide concrete collars when adjustments are required. Collars shall be installed in accordance with Section 02575 - Pavement Repair, and shall be placed to a minimum total pavement thickness of six (6) inches.

C. Adjustment of manholes, valves, and other appurtenances are considered incidental to the Work and no additional payment will be made for adjustments or paving repairs.

END OF SECTION 02513

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SECTION 02520 – CONCRETE DRIVEWAY, WALK, CURB AND GUTTER

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Subgrade preparation for walkways, ramps, curbs and gutters, waterways.

B. Base course for walkways, ramps, curbs and gutters, waterways.

C. Concrete walkways, ramps, curbs and gutters, waterways and other concrete flat work, complete with reinforcement as required.

1.02 RELATED WORK

A. Section 02200: Earthwork

1.03 REFERENCE STANDARDS

A. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

B. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

C. ASTM C33 - Concrete Aggregates.

D. ASTM C94 - Ready-Mixed Concrete.

E. ASTM C150 - Portland Cement.

F. ASTM C260 - Air-Entraining Admixtures for Concrete.

G. ASTM C309 - Liquid Membrane - Forming Compounds for Curing Concrete.

H. ASTM C1116 - Fiber Reinforcement.

I. ASTM D1557 - Tests for Moisture - Density Relations of Soils using 10 lb (4.5 kg) Rammer and 18 inch (457 mm) Drop.

J. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.04 INSPECTION AND TESTING

A. Three (3) concrete test cylinders will be taken for every 100 cu. yds. of concrete placed.

B. One (1) additional test cylinder will be taken during cold weather concreting, and be cured on job site under same conditions as concrete it represents.

C. One (1) slump test will be taken for each set of test cylinders taken.

PART 2 - PRODUCTS

2.01 UNTREATED BASE COURSE MATERIAL

A. Angular crushed natural stone; free from shale, clay and friable materials and debris; graded within following limits per ASTM C 136:

GRADATION, 1" MAXIMUM SIZE

Sieve Size	% Passing
1 inch (25 mm)	100
¾ inch (19 mm)	90 to 100
½ inch	78 to 90
3/8 inch	65 to 70
No. 4	47 to 61
No. 16	23 to 35
No. 50	10 to 20
No. 200	5 to 11

B. Material passing the No. 40 sieve: Non-plastic and liquid limit less than twenty-five (25), when tested in accordance with AASHTO Test Methods T-89 and T-90.

C. Percentage of wear not to exceed fifty (50) when tested in accordance with AASHTO Test Method T-96.

D. Rodded Weight: Not less than 75 pounds per cubic foot when tested in accordance with AASHTO Test Method T-19.

E. California Bearing Ratio Value (CBR) of eighty (80) minimum when tested in accordance with ASTM Test Method D-1883.

F. Determine material passing the No. 200 sieve by washing in water in accordance with ASTM Test Method T-11.

2.02 CONCRETE MATERIALS

A. Portland Cement: ASTM C150; Type II

B. Fine Aggregate for Concrete.

1. Fine aggregate deleterious substance limits conform to the requirements of ASTM C 33 with the following exceptions:

Substance	Max. % by Weight
Clay Lumps	0.5
Coal and Lignite	0.3
Other Substances	2.0

2. Grading. Well-graded fine aggregate from coarse to fine conforming the following gradation requirements:

Sieve Size	% Passing
3/8 inch	l00
No. 4	90 to 100
No. 50	10 to 30
No. 100	2 to 10

C. Coarse Aggregates for Concrete.

1. Crushed stone, gravel, or other approved inert materials of similar characteristics, or combinations thereof, having strong and durable pieces.

2. The aggregates shall be free from vegetable matter, lumps or balls of clay, adherent films of clay, or other matter that would prevent thorough bonding. Coarse aggregate deleterious substance limits conform to the requirements of ASTM C 33 with the following exceptions:

Substance	Max. % by Weight
Coal and Lignite	0.3
Clay Lumps	0.3
Soft Fragments	2.0
Other deleterious substances (such as friable, thin, elongated, or laminated pieces)	2.0

3. Wear and Soundness. ASTM C88. Percentage of wear for coarse aggregates of not more than 40 when tested in accordance with AASHTO T-96 or show a sodium sulphate loss not to exceed 12 percent (12%) when tested in accordance with AASHTO T-104. The wear and soundness requirements may be waived, or modified, by the Engineer provided that the coarse aggregate has a proven service record for similar service and exposure.

4. Gradation. Per ASTM C33. Coarse aggregate for concrete shall meet the following gradation limits for the concrete class specified. Other sizes or combinations of sizes may be used when specified.

Sieve Designation	Percent Passing (by weight)
1 "	100
¾"	95-100
½"	-
3/8"	20-55
No. 4	*0-10

*Not more than five percent (5%) shall pass a No. 8 sieve.

D. Water: Clean and free from injurious amounts of oil, alkali, organic matter, or other deleterious material, complying with AASHTO T-26.

E. Air-Entraining Agent: Use in all weather-exposed concrete. Comply with ASTM C260, except the

dilative durability factor in the freezing and thawing test shall not be less than 95.

F. Fiber Reinforcement (include when specifically indicated): Synthetic fibers engineered and designed for secondary reinforcement of concrete slabs, complying with ASTM C116, Type III.

2.03 CONCRETE MIX

A. Mix and proportion to produce minimum 4000 psi compressive strength concrete at 28 days with maximum slump of 3 inches and 5 to 7 percent air-entrainment.

B. Provide Ready-Mixed concrete. Comply with ASTM C 94.

C. Use accelerating admixtures in cold weather only when acceptable to Engineer. Use of admixtures shall not relax cold weather placement requirements. Do not use calcium chloride.

D. Use set-retarding admixtures during hot weather only when acceptable to Engineer.

2.04 REINFORCING MATERIALS

A. Reinforcing Bars: 60 ksi yield strength; plain deformed billet steel bars; ASTM A615; plain finish.

B. Epoxy-Coated Reinforcing Bars (use where indicated): ASTM A775 with ASTM A 615, Grade 60 deformed billet steel bars.

C. Welded Steel Wire Fabric: Plain type, ASTM A185; plain finish.

D. Tie Wire: Minimum 16 gage annealed type, or patented system acceptable to Engineer.

E. Joint Dowel Bars: Plain steel bars, ASTM A615, Grade 60 plain steel bars.

F. Supports for Reinforcement: Chairs, spacers, dowel bar supports and other devices for spacing, supporting and fastening reinforcing bars, welded wire fabric and dowels in place. Use wire bar-type complying with CRSI specifications.

2.05 FORMS

A. Plywood, metal, metal-framed plywood or other acceptable panel type materials to provide full-depth, continuous, straight, smooth exposed surfaces. Use flexible or curved forms for curves of a 100-foot or less radius. Provide forms with matched, tight-fitting joints and adequate stiffeners to support weight of concrete without deflection detrimental to tolerances and appearance of concrete.

B. Slip form construction may be used subject to approval of the Engineer. Provide slip-forming equipment with traveling side forms of sufficient dimensions, shape, and strength to support concrete laterally for a sufficient period of time during placement to produce pavement of the required cross-section. The equipment shall spread, consolidate, screed, and float finish the freshly placed concrete in such a manner as to provide a dense homogeneous pavement.

C. Form Release Agent: Provide commercial formulation form-release agent that will not stain or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces. Comply with VOC limitation regulations.

2.06 JOINT MATERIAL

A. Provide joint material of type, thickness, and widths indicated on the drawings.

B. Joint Filler: Bituminous mastic complying with ASTM D 994, formed and encased between 2 layers of bituminous saturated felt or 2 layers of glass-fiber felt. Minimum ½ inch thick.

C. Joint Sealant: Provide one of the following:

1. Concrete Joint Sealer, Cold-Applied: Elastomeric type complying with ASTM C 920, Type S or M, Grade P or NS, Class 25, Use T, NT, M and O, chemically curing suitable for vehicular or pedestrian use, types of construction and substrates indicated, as recommended by Manufacturer.

   a. Self-leveling
   b. Shore Hardness: 40 plus or minus, 5 ASTM D 2240.
   c. Final cure: 4 days maximum.
   d. Service range: -10 to 150 degrees F.

2. Concrete Joint Sealer, Hot-Applied: Resilient and adhesive compound type complying with ASTM D 340, Type and Grade suitable for specific application as recommended by Manufacturer.

D. Obtain joint sealing materials from a single manufacturer for each different product required.

E. Provide materials that are compatible with one another and with joint substrates under the conditions of service and application.

2.07 CURING MATERIALS

A. Insulating Coverings: One of the following.

1. Straw.

2. Insulating blankets.

B. Moisture-Retaining cover: One of the following, complying with ASTM C 171.

1. Waterproof paper.

2. Polyethylene film.

3. White burlap-polyethylene sheet.

C. Curing Compound: White-pigmented waterborne membrane-forming curing compound free from permanent color, complying with ASTM C 309, Type I, Class B.

D. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.

2.08 PAINTED TRAFFIC LINES AND MARKINGS

A. Alkyd-resin ready-mixed paint, complying with AASHTO M 248, Type F. Provide approved substitute as required to comply with applicable VOC limitations.

B. Color.

1. Pavement and Parking Striping, Stop Bars - White.

2. Crosswalks and Zebra Striping - White.

3. Fire Lane Curbs - Red.

4. Accessible Parking Markings - Blue.

C. Non-slip Aggregate Finish (where indicated): Fused aluminum oxide granules or crushed emery as the abrasive aggregate for a non-slip finish, with aggregate containing not less that 50 percent aluminum oxide and not less than 25 percent ferric oxide. Use material that is factory graded, packaged, rustproof, non-glazing, and unaffected by freezing, moisture and cleaning materials.

D. Bonding Agent: Acrylic or styrene butadiene

E. Epoxy Adhesive: ASTM C881, two-component material suitable for damp or dry surfaces. Material type, grade and class to suit requirements.

F. Apply pavement markings only with equipment manufactured specifically for that purpose. Use equipment capable of applying a stripe of the desired width with a tolerance of plus or minus 1/4 inch.

PART 3 - EXECUTION

3.01 PREPARATION

A. Check construction staking. Notify Engineer of conflicts or slope and drainage deficiencies. Failure to check and verify or notify Engineer will result in Contractor repairing and drainage deficiencies at no additional cost to the Owner.

B. Check form work with construction staking and drawing elevations prior to placing concrete. Adjust form work as necessary. Notify Engineer of conflicts or slope and drainage deficiencies.

3.02 PREPARATION OF SUBGRADE

A. Ensure rough grading has brought subgrade to required elevations.

B. Fill soft spots and hollows with additional structural fill.

C. Level and compact subgrade, to receive granular base course for concrete walkways, ramps, curbs and gutters, to 95% of maximum laboratory density, AASHTO T-99, Method D.

3.03 PLACEMENT OF BASE COURSE

A. Place and level untreated base course over prepared subgrade to a compacted depth indicated on drawings true to lines and levels. Compact to 95% of maximum modified proctor density, ASTM

D 1557.

B. Adjust moisture content of base course material, as determined by ASTM D 698, as necessary to plus or minus 2 percent of optimum moisture as required to obtain the specified degree of compaction.

C. Protect placed and compacted base course. Remove and replace "softened" base course areas occurring between base course placement and concrete placement.

D. During concrete placement, keep base sufficiently moist to prevent excessive absorption of water from freshly placed concrete.

3.04 FORM WORK

A. Provide sufficient forms to allow continuous progress of the work and so the forms can remain in place at least 24 hours after concrete placement.

B. Make forms sufficiently tight to prevent loss of concrete.

C. Form vertical surfaces to full depth and securely position to required lines, dimensions, and levels. Ensure form ties are not placed so as to pass through concrete.

D. Arrange and assemble form work to permit easy dismantling and stripping, and to prevent damage to concrete during form work removal.

E. At construction joints, overlap forms over hardened concrete at least 6 inches. Prevent offsets or loss of concrete at construction joint. Maintain a true surface.

F. Position expansion joint material and other embedded items accurately and support to prevent displacement.

G. Provide formed openings for elements embedded in or passing through concrete.

H. Apply form release agent on form work per manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.

I. Do not pry against face or visible edges of concrete to remove forms. Remove and replace sections of concrete work damaged during form removal at no additional cost to the Owner.

J. Thoroughly clean and properly coat forms before reuse.

3.05 REINFORCEMENT PLACEMENT

A. Reinforce concrete walks, curbs and gutters as required on the drawings.

B. Clean reinforcement of loose rust, mill scale, earth, ice, or other bond-reducing materials.

C. Comply with Concrete Reinforcing Steel Institute's recommended practice for placing and supporting reinforcing bars.

D. Maintain minimum cover over reinforcement. Allow for a minimum 1-1/2 inch concrete cover unless

otherwise noted.

E. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps to prevent continuous laps.

F. Do not extend reinforcing through expansion and contraction joints. Provide doweled joints through expansion and contraction joints, with one end of dowels fitted with capping sleeve to allow free movement.

3.06 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete form work installation, reinforcing steel, and items to be embedded.

B. Remove snow, ice or frost from base course surface and reinforcing before placing concrete. Don not place concrete on surfaces that are frozen.

C. Moisten base course if required to provide uniform dampened condition at the time of concrete placement.

D. Coordinate with the testing laboratory prior to delivery of concrete. Schedule to have a testing agent on site prior to the start of the pour.

E. Do not discharge concrete into forms if the slump or air-entrainment does not meet the specification requirements.

F. Do not discharge concrete if the time period from the batching at the plant to site discharge exceeds the following:

1. Air temperature less than 90 degrees F.: 1-1/2 hours

2. Air temperature over 90 degrees F. (without a retarder): 1 hour

3. Air temperature over 90 degrees F. (with a retarder): 1-1/2 hours

G. When concrete arrives at the site with a slump below specified, water may be added if the maximum approved water/cement ratio and maximum slump is not exceeded provided that:

1. Approved mix design allows for on-site addition of water.

2. Water addition can be accurately measured to within a gallon of the desired quantity.

3. Water addition is followed by 3 minutes of mixing at mixing speed prior to discharge.

H. Place concrete per ACI 301.

1. Hot Weather Placement: Place per ACI 305.

2. Cold Weather Placement: Place per ACI 306.1. Non-chloride accelerating admixture may be used in concrete work placed at temperatures below 50 degrees F.

I. Maintain mixed concrete temperature at time of placement between 60 degrees F. and 90 degrees F.

J. Do not disturb reinforcement, inserts, embedded parts and formed joints.

K. Do not break or interrupt successive pours such that cold joints occur at locations other than expansion type joints.

L. Honeycomb or embedded debris in concrete is not acceptable.

M. Consolidate per ACI 309.

N Placement of curb and gutter by slip-form paving equipment is acceptable. Comply with the following:

1. Provide adequate control for lines, grades and elevations.

2. Provide equipment that will produce required cross-section, lines, grades, finish and jointing as specified for formed concrete.

3. Prevent damage to adjacent curbs, gutters and pavement by equipment.

4. After placement, check fresh concrete with a straight-edge to ensure the concrete complies with tolerances specified.

5. Provide final finish on slip-formed curb and gutter in accordance with Section 3.07.

6. If results are not acceptable, remove and replace work with formed concrete.

3.07 CONTRACTION JOINTS

A. Construct at right angles to top surface of placement.

B. Construct straight unless otherwise indicated.

C. Construct traverse and longitudinal joints the same dimension.

D. Tooled Joints (Score Lines): Maximum depth 1 inch with a top radius of ½ inch, unless otherwise noted on the drawings.

E. Saw Cut Joints: Saw cuts before uncontrolled shrinkage cracking occurs. Do not tear or ravel concrete during sawing.

F. Templates: 1/8 to 3/16 inch wide.

G. Sidewalks: Construct contraction joints as follows.

1. At intervals equal to the width of the sidewalk and transverse to the line of the walk.

2. Radial at curbs and walks.

3. Place longitudinal joints in walks with width of walk in feet is greater that 2 times the walk

thickness in inches (e.g. Maximum width of a 4 inch thick walk before placement of a longitudinal joint is 8 feet).

4. At walk returns make joints radial.

5. Match longitudinal and traverse joints with adjacent walks.

H. Curb, Gutter, Waterway: Construction joints as follows:

1. Place joints at intervals not exceeding 10 feet.

2. At curb radius and walk returns make joints radial.

3. Where possible, make joints of curbs coincide with joints in walks.
4. Where integral curb and gutter is adjacent to concrete pavement, align joints with pavement joints where practical.

3.08 EXPANSION JOINTS

A. Place expansion joints where indicated on the drawings and at immovable structures, when sidewalks abut curb, at points of curve, and at back of curb returns.

B. Construct at right angles to top surface of placement.

C. Construct straight unless otherwise indicated.

D. Construct traverse and longitudinal joints the same dimension.

E. Place expansion joint material to full depth and width of joint. Fit joints with filler of required profiles, set perpendicular to longitudinal axis of walks, ramps, curbs and gutters.

F. Do not place longitudinal expansion joints in waterways

F. Do not place expansion joints in curb returns.

G. Do not extend reinforcement through an expansion joint. Place dowel mechanisms as required.

3.09 SEALED JOINTS

A. Provide sealed joints where required on the drawings. Install cold or hot-applied sealant as required.

B. Saw cut joints as necessary to provide the required sealant thickness and depth.

C. Remove oil, grease, wax, form-release agents, curing compounds and other materials by sand or water blasting as recommended by the manufacturer of the sealant. Remove frost and moisture prior to sealing.

D. Install sealants in uniform, continuous ribbons without gaps or air pockets with complete bonding of joint surfaces.

E. Fill surface rabbet flush with pavement surface.

F. Fill joints to a depth equal to 75 percent of the joint width, but not less than 3/8 inch deep or greater than 5/8 inch deep, unless otherwise indicated on the drawings.

G. Do not overfill joints. Clean overflow or spillage from adjoining surfaces.

3.10 FINISHING

A. Round all edges, including edges of expansion and contraction joints, with ½ radius edging tool, unless otherwise noted on the plans. Eliminate tool marks on concrete surfaces.

B. Ensure finished surfaces do not vary from true lines, levels or grade by more than 1/8 inch in 10 feet (3 mm in 3 m) when measured with straightedge.

C. Screed and float exposed surfaces to a smooth and uniform finish, free of open texturing and exposed aggregate. Avoid working mortar to surface. Remove and replace sections where the surface has been overworked at could result in spauling.

D. Finish exposed surfaces of walks with grades of less than or equal to 6 percent with a fine-hair broom applied transverse to the line of the walk.

E. Finish exposed surfaces of walks with grades of greater than 6 percent with a rough broom applied transverse to the centerline.

F. Finish exposed surfaces of curbs, gutters and waterways with a medium texture broom applied longitudinal to the line of the curb, gutter or waterway.

G. Provide detectable warnings in the concrete surface at curb ramps

H. Do not add water to concrete surface (sprinkle) without approval of the Engineer.

3.11 CURING

A. Apply curing compound on finished surfaces immediately after placement. Apply in accordance with manufacturer's recommendations.

B. Do not apply curing compound to areas to receive special finishes or paint.

C. Protect placed concrete from freezing or excessive moisture loss. Install covers or apply compounds as required. Apply compounds in accordance with manufacturer's recommendations.

3.12 PAINTING

A. Apply traffic paint for curbs and markings at all fire lanes and other locations as indicated on the drawings.

B. Apply with mechanical equipment to produce uniform straight edges.

C. Apply at manufacturer's recommended rates to provide a 15-mil minimum wet film thickness.

3.13 FIELD QUALITY CONTROL

A. Line: Less than ½ inch variance in 10 feet and not more than 1 inch from true line at any location.

B. Grade: Not more than 1/4 inch variance in 10 feet. Flood curb and gutter with water after final cure has been reached. Remove and replace any area where ponding is found to stand more than 3/8 inch deep.

C. Walk Cross Slope: Slope indicated on plans or 4 percent maximum, 1 percent minimum.

3.14 PROTECTION

A. Prevent damage to placed concrete.

B. Exclude traffic or equipment from placed concrete for a minimum of 14 days.

C. Maintain a clean surface and remove spill and surface stains until Substantial Completion.

D. Remove and replace damaged areas, discolored areas, or cracked sections at no additional cost to the Owner.

E. Do not backfill against placed concrete for a minimum of 7 days, unless otherwise approved by the Engineer.

F. Do not permit paving operations (base course or asphalt) against placed curbs, gutters and waterways for a minimum of 7 days, unless otherwise approved by the Engineer.

G. Do not permit paving operations against placed curbs and gutters without completed backfilling behind curbs.

END OF SECTION 02520

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SECTION 02530 - SANITARY SEWERAGE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Install sanitary sewer pipe, manholes, laterals, and other appurtenances.

B. Adjust manholes to finish grade.

C. Flush and clean all sewer lines.

D. Perform leakage tests and where required, deflection tests on all installed sewer lines.

E. Perform vacuum testing on all installed sewer manholes.

1.2 RELATED WORK

A. Section 01300 - SUBMITTALS

B. Section 02222 - EXCAVATING, BACKFILLING, AND COMPACTING FOR UTILITIES

1.3 QUALITY ASSURANCE

A. All products are subject, at the discretion of the Engineer, to inspection and approval at the plant of the manufacturer. Any material not meeting the requirements specified herein shall be rejected and shall be removed immediately from the vicinity of other material furnished for the project.

1.4 REFERENCES

A. ASTM A-48 Gray Iron Castings

B. ASTM A-746 Ductile Iron Gravity Sewer Pipe

C. ASTM C-76 Reinforced Concrete Culvert, Storm Drain and Sewer Pipe

D. ASTM C-150 Specification for Portland Cement

E. ASTM C-443 Joints for Concrete Sewer and Culvert Pipe, Using Rubber Gasket

F. ASTM C-478 Precast Reinforced Concrete Manhole Sections

G. ASTM C-990 Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

H. ASTM C-1244 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test

I. ASTM D-2321 Standard Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe

J. ASTM D-3034 Type PSM Polyvinyl Chloride Sewer Pipe and Fittings

K. ASTM F-679 PVC Large Diameter Plastic Gravity Sewer Pipe and Fittings

L. AWWA C-600 Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances

1.5 SUBMITTALS

A. "Air Test" results.

B. Manhole "vacuum test" results.

PART 2 - PRODUCTS

2.1 SEWER PIPE

A. PVC Pipe.

- 4" – 15" Diameter; ASTM D3034, SDR 35, bell and spigot with integral bell gasketed joints.

B. Ductile Iron Sewer Pipe. ASTM A-746, with mechanical joints, and cement mortar lining. The class of pipe shall be Pressure Class 150 or greater.

2.2 FITTINGS AND COUPLINGS

A. PVC Pipe Fittings.

- 4" – 15" Diameter; bell and spigot with integral bell gasketed joints.

B. Ductile Iron Sewer Pipe Fittings. ASTM A-746, mechanical joint and cement mortar lining. The class of pipe shall be Pressure Class 150 or greater.

C. Pipe Couplings. Ductile-iron fittings and specials conforming to AWWA C110, mechanical joint type with cement-mortar lining in accordance with AWWA C104.

2.2 MANHOLES

A. Precast Base Sections, Riser Sections, Cone Sections, and Appurtenances. ASTM C-478, of the diameter indicated.

1. Concrete used for manufacture of pre-cast sections shall contain air entrainment. Cement shall be Portland Cement, Type II, conforming to ASTM C-150.

2. Precast base sections shall be of the integral floor type with flexible rubber boots for connection to the sewer pipe. All manhole sections shall be specifically designed and constructed to accept and retain manhole joint gaskets.

3. Design of joints and joint gasket material for manholes shall meet ASTM C 990 and shall be a butyl rubber sealant. Use of bitumen sealants is not acceptable.

4. Flexible rubber boots for precast bases shall be manufactured for the specific type of pipe being installed and shall include flexible rubber pipe boots molded from a neoprene compound with a wall thickness of 3/8" throughout. Sets of ridges shall be molded into boot surfaces which contact pipe or port surfaces so that a watertight seal will be realized under clamping pressure. Clamping shall be done using approved stainless steel bands.

5. Cone sections shall be of the type indicated.

6. Flat slab tops (concrete traffic lids) shall be rated for HS20 loadings. Opening shall be concentric.

7. Steps shall be provided in the manholes indicated.

B. Cast-In-Place Bases. **Allowed only with prior approval of the Engineer**. Constructed of concrete with a minimum 28-day minimum compressive strength of 3000 psi and containing not less than 5-1/2 bags of Type V cement conforming to ASTM C-150.

1. A waterstop shall be placed around the outside of all pipe at the connection to the cast-in-place base to provide for a watertight connection.

C. Cast Iron Frames and Covers. ASTM A-48, Class 30, of uniform quality, free from blow holes, porosity, hard spots, and shrinkage defects, with non-rocking, machined bearing surfaces between frame and cover and a minimum combined frame and cover weight of 400 pounds. The frame and cover shall be cleaned and painted with an asphalt coating prior to delivery to the site.

1. Covers shall be 24-inch, heavy-duty type, non-vented with pick holes. cover shall have a low profile waffle pattern surface similar to D&L Supply A-1180 WP and shall be marked "SEWER."

2. Frames shall not have slots for dust pans.

D. Grout. Non-shrink.

E. Collars.

1. Concrete in accordance with *State of Utah Standard Specifications for Road and Bridge Construction*.

F. Manholes constructed from material other than Portland Cement Concrete or constructed using a different method than herein specified shall require prior approval of the Engineer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prior to excavating for sewer line, follow procedures outlined in Section 01050 - FIELD ENGINEERING for preparation of the work.

B. Line and Grade. Using the information supplied by the Engineer, establish the line and grade of the sewer line. A laser designed for such work shall be used to establish line and grade. The length of line between laser setups shall not exceed 500 feet unless approved by the Engineer. Other methods for maintaining line and grade must be approved by Engineer prior to construction.

C. Prior to installation, inspect all pipes, manholes, and appurtenances for cracks, defects, or imperfections, and verify compliance with the specifications. Remove all defective material from the site.

3.2 EXCAVATING, BACKFILLING, AND COMPACTING

A. Refer to Section 02222 - EXCAVATING, BACKFILLING AND COMPACTING FOR UTILITIES.

3.3 PIPE LAYING

A. Lay pipe to line and grade indicated.

B. After being cleaned and inspected for soundness, each piece of pipe shall be laid on the previously graded trench bottom or bedding material, as required, after the bell hole has been excavated.

C. Lay bell and spigot type pipe with the bell end upgrade. Pipe laying shall proceed upgrade.

D. Trenches shall be dewatered and under no circumstances shall pipe be laid in water, nor shall the pipe be laid under unsuitable weather or trench conditions.

E. Every precaution shall be taken to prevent foreign material from entering the pipe during installation. No debris, tools, clothing, or other materials shall be placed in the pipe.

F. At times when pipe laying is not in progress or at other times during construction as directed by the Engineer, the open end of the pipe shall be closed by a watertight plug or other means approved by the Engineer.

G. Pipe installation and jointing for the various types of pipe specified shall be according to these specifications and the manufacturer's recommendations.

1. Ductile Iron Sewer Pipe. AWWA C-600
2. PVC Sewer Pipe. ASTM D-2321

H. In the event the pipe "floats", remove and relay the entire pipe section.

3.4 MANHOLE INSTALLATION

A. Install manholes at locations and elevations indicated.

B. Pre-Cast Base. Place so as to be fully and uniformly supported in proper alignment. Place and compact bedding material under pre-cast base to provide uniform and stable support.

C. Cast-In-Place Base. Cast-In-Place Base shall consist of a continuous pour of concrete with at least 6 inches of concrete below the invert of the manhole and at least 6 inches radially outside of the outside diameter of the pre-cast riser section. The concrete shall also extend a minimum of 6 inches above the bottom of the riser section around the outside of the manhole.

1. The bottom pre-cast riser section shall be supported on concrete blocks and adjusted to proper alignment and grade prior to pouring of the cast-in-place base.

2. The pre-cast riser section shall not bear directly on any of the pipes.

3. All joints between cast-in-place concrete and pre-cast sections and pipe shall be grouted with non-shrink grout after concrete has cured.

D. Inverts: Manhole invert channels shall be smooth with a uniform grade, from inflow to outflow pipe invert.

1. Minimum drop through manholes shall be as indicated.
2. Changes in flow direction shall be smooth, uniform, and made with the longest radius possible.
3. The cross-sectional shape of the invert channels shall match the lower halves of the inflow and outflow pipes.
4. The pipes shall protrude into the manhole a maximum of 3 inches from the inside of the manhole wall.

E. Precast sections shall be placed and aligned to provide vertical sides.

F. Grade Rings. A maximum of 12 inches of grade rings will be allowed. If possible, grade rings should generally not be installed on manholes located off road.

G. Joints and Lift Holes.

1. All joints between pre-cast base, riser, and cone sections shall be sealed with a gasket designed specifically for concrete manholes.

2. All joints between grade rings and the cone section shall be sealed by placing a continuous bead of non-shrink grout sufficient to fill the void in the joint prior to joining the items, joining the items, and touching up the grout, adding additional non-shrink grout as required, to form a smooth, watertight joint both inside and outside with non-shrink grout.

3. The joint between the upper grade ring or the cone section and the manhole casting frame shall be sealed with a continuous bead of heated bitumen mastic.

4. In all cases, a watertight manhole is required.

H. Frame and Cover Installation

1. In roadways. Top of casting shall be set parallel to and ½ - to 1-inch below finished road surface. Castings shall be fully and uniformly supported. Wedges or shims used to elevate castings shall be brick or metal with concrete placed for uniform support. Unless otherwise indicated on the drawings.

2. Off road (outside rights-of-ways). Top of casting shall be set approximately 6 inches to 12 inches above surrounding ground elevations with grading away from the manhole at a minimum of 5H:1V, unless otherwise indicated or directed by the Engineer.

I. Manhole Collars.

1. Concrete Collars. Install concrete collars in accordance with *State of Utah Standard Specifications for Road and Bridge Construction*.

J. Stubs. Stubs shall be provided at the manholes indicated on the drawings. All stubs shall be plugged with watertight plugs at the end of the pipe outside of the manhole. All stubs require "Air Tests."

K. Manholes to be constructed over an existing sewer shall be constructed in such a manner as will not disrupt service of the existing sewer. A precast manhole is to be installed and wastewater flows diverted during installation in accordance with the approved Wastewater Bypass Pumping Plan. Any portion of the existing sewer damaged shall be repaired or replaced by the Contractor.

L. Place plywood bottoms in manholes during construction to prevent debris from entering sewer lines. Remove debris prior to activating sewer.

M. Remove and replace any manholes displaced or damaged prior to final acceptance at the Contractor's expense.

3.5 CONNECTION OF NEW SEWER PIPE TO EXISTING MANHOLES

A. Make connection to existing manhole at location and elevation indicated.

B. Core drill wall of existing manhole to accept new pipe. Cored hole shall be large enough in diameter to allow for proper placement of the pipe with adequate clearance for proper grouting.

C. Install flexible rubber boot connector. In the event a boot connector cannot be installed, and with prior approval of the Engineer, grout space between pipe and manhole wall to form a watertight joint. Connection made with pipe shall include a waterstop around the outside of the pipe at the connection to provide for a watertight connection.

D. Reform invert of existing manhole to provide for proper flow through the manhole.

E. A watertight plug shall be installed and maintained on the new sewer pipe to isolate the new construction from the existing system. Any debris entering the existing system shall be removed at the expense of the contractor. The plug shall be removed after final cleaning of the line and acceptance of the sewer line.

3.6 ABANDONING EXISTING MANHOLE

A. Abandon existing manholes where indicated on the drawings.

B. Abandon the existing manhole by plugging all incoming and outgoing pipes with an expansion plug to form: a watertight plug; cutting and removing asphalt or sod; excavating around manhole to allow for removal of casting and cone section; removing casting and cone section; backfilling inside and outside of manhole with acceptable backfill material and compacting such material to 95% of maximum Modified Proctor Density (AASHTO T-180); and replacing pavement and sod.

3.7 FIELD QUALITY CONTROL

A. Visual inspection and a leakage test shall be performed on all installed sewer lines prior to acceptance. Additional tests may be required by the Engineer as deemed necessary. Defects designated by the Engineer or from testing shall be repaired prior to acceptance of the sewer lines.

B. Visual Inspection. Perform a visual inspection of all installed sewer lines and manholes to assure conformance with the specifications. All sections of sewer line will be "lamped" to

assure that the line is straight, of uniform grade, and free of all dirt, debris, and obstructions. All broken, misaligned or displaced pipe and manholes or other defects revealed during this visual inspection shall be corrected at the Contractor's expense.

C. Leakage Test. Perform leakage tests on all installed sewer lines and manholes by means of an "Air Test" and a "Vacuum Test", respectively. All "Air Tests" and "Vacuum Tests" shall be reviewed by the Engineer unless the test is performed by a Testing Firm approved by the Engineer prior to testing.

Air Tests:

1. Notify Engineer 48 hours prior to any testing.
2. The results of the "Air Test" for each section shall be noted on an "Air Test form" and shall be submitted to the Engineer. Acceptance, failures, reasons for failure, and retests shall be shown on the form.
3. All sewer pipe shall be tested after the final backfill in placed.
4. To assure the acceptability of the work and that proper installation procedures are being followed, "Air Tests" shall be performed on the first 1000 feet of sewer line installed, and the results submitted to the Engineer prior to installation of the remaining sewer line.
5. All "Air Tests" are to include laterals when installed in conjunction with the sewer main.
6. All stubs are to be "Air Tested."
7. All defects indicated by an unsuccessful "Air Test" shall be repaired and the test repeated until the successful performance of all "Air Tests" is achieved.
8. Equipment of "Air Testing." Equipment for "Air Testing" shall meet the following minimum requirements:

    a. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be tested.
    b. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
    c. All air used shall pass through a single control panel.
    d. Three individual hoses shall be used for the following connections:

        1) From control panel to pneumatic plugs for inflation.
        2) From control panel to sealed line for introducing the low pressure air.
        3) From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

9. Method of Testing. The method of "Air Testing" gravity sewer lines shall be as follows:

    a. Clean test section.
    b. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
    c. All air used shall pass through a single control panel.

d. The average back pressure of groundwater above the pipe shall be determined by dividing the average vertical height in feet of groundwater above the invert of the sewer pipe to be tested by 2.31. The result gives the air pressure correction in pounds per square inch to be added. The maximum internal pressure in the test section shall in no case exceed the manufacturer's recommendations.
e. Maintain an internal pressure of 4.0 psig greater than the average groundwater back pressure for a period of 2 minutes.
f. Disconnect the air supply and allow the test pressure to decrease to 3.5 psig greater than the average groundwater back pressure.
g. Determine the time that is required for the internal air pressure to drop from 3.5 psig to 2.5 psig greater than the average groundwater back pressure.
h. If the time period is less than the Time Holding Chart, locate and repair problem.

TIME HOLDING CHART

Time in seconds required for
Pressure Drop from 3.5 to 2.5 psig

	Pipe Diameter (Inches)								
Length	4"	6"	8"	10"	12"	15"	18"	21"	24"
50	5	11	20	32	46	71	102	146	190
75	8	17	30	47	69	106	153	218	285
100	10	23	41	64	91	142	204	291	383
125	13	29	51	79	114	177	255	357	408
150	15	34	61	95	137	212	306	406	540
175	18	40	71	111	160	255	306	406	540
200	20	46	81	127	188	255	306	406	540
225	23	51	91	143	204	255	306	406	540
250	25	57	102	159	205	255	306	406	540
275	28	63	112	174	205	255	306	406	540
300	31	69	122	175	205	255	306	406	540
325	33	74	132	175	205	255	306	406	540
350	36	91	142	175	205	255	306	406	540
375	38	103	142	175	205	255	306	406	540
400	40	103	142	175	205	255	306	406	540
425	43	103	142	175	205	255	306	406	540
450	46	103	142	175	205	255	306	406	540
475	48	103	142	175	205	255	306	406	540
500	51	103	142	175	205	255	306	406	540

Vacuum Test:

1. Notify Engineer 48 hours prior to any testing.
2. The results of the "Vacuum Test" for each manhole shall be noted on a "Vacuum Test form" and shall be submitted to the Engineer. Acceptance, failures, reasons for failure, and retests shall be shown on the form.
3. All sewer manholes shall be tested after the final backfill in placed.
4. To assure the acceptability of the work and that proper installation procedures are being followed, "Vacuum Tests" shall be performed on the first 10 sewer manholes installed, and the results submitted to the Engineer prior to installation of the remaining sewer manholes.
5. Method of Testing. The method of "Vacuum Testing" sewer manholes shall be as follows:

   a. Clean manhole.

b. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
c. All air used shall pass through a single control panel.
d. Grade rings will not be required to be included in the test.
e. Inside conditions of the manhole, at the time of the test, shall be dry.
f. Testing shall be in accordance with ASTM C 1244.

6. All defects indicated by an unsuccessful "Vacuum Test" shall be corrected by restacking of the manhole with joint gasket or manhole section replacement as necessary to achieve a successful test. The test shall repeated until the successful performance of a "Vacuum Test" is achieved. Joint repairs are not acceptable.

D. Deflection Test. Perform deflection test on all flexible pipe installed by pulling a properly sized go-no-go mandrill, sewer ball, or deflectometer through the pipe after backfilling and after pipe has been cleaned and flushed. Maximum allowable pipe deflection shall be 5 percent.

E. Other tests on the installed sewer line may be required, as determined by the Engineer, to assure compliance with the specifications.

3.8 CLEANING

A. The interior of all sewer lines, manholes, and other appurtenances shall be cleaned of all dirt, debris, or other foreign material. Cleaning shall be by flushing, jetting, or other approved means as required to remove such foreign material.

B. Connections between new construction and the existing system shall be plugged to prevent any debris from the new construction or from cleaning operations from entering the existing system. Any debris entering the existing system shall be removed at the expense of the Contractor.

3.9 REPAIRS TO NEW WORK

A. Do not make repairs without approval of the Engineer.

END OF SECTION 02730

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SECTION 02575 - PAVEMENT REPAIR

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section provides for the furnishing of all labor, tools, materials, equipment and in performing all operations in connection with the restoration of all existing asphalt pavement surfaces which have been removed or damaged during the course of the work under this Contract.

B. Work shall include cutting, removal, and disposal of existing pavement, and the placement of a minimum eight (8)-inch thick untreated base course and a bituminous surface course of a thickness equal to the adjacent existing pavement plus one (1) inch, minimum of three (3) inches total thickness.

1.02 RELATED WORK

Section 01300	Contractor Submittals
Section 01400	Quality Control
Section 02222	Excavating, Backfilling, and Compacting for Utilities

1.03 REFERENCES

A. *State of Utah Standard Specifications for Road and Bridge Construction*

B. ASTM D422 Particle Size Analysis of Soils

C. ASTM D1556 Density of Soil In Place by the Sand-Cone Method

D. ASTM D1557 Moisture Density of Soils and Soil Aggregate Mixtures using 10-pound Rammer and 18-inch Drop (Modified Proctor)

E. ASTM D1559 Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus

F. ASTM D2922 Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)

G. ASTM D2950 Density of Bituminous Concrete In Place by Nuclear Methods

1.04 INSPECTION AND TESTING

A. Testing and inspection will be accomplished in accordance with *State of Utah Standard Specifications for Road and Bridge Construction*

PART 2 - PRODUCTS

2.01 UNTREATED BASE COURSE

A. Untreated base course materials shall be composed of angular crushed natural stone free of shale, organic matter, and debris.

B. The gradation when tested in accordance with ASTM D422 shall be as shown on the following page.

1" GRADATION

Sieve Size	Percent Passing By Weight
1"	100
½"	79-91
#4	49-61
#16	27-35
#50	17-21
#200	7-11

2.02 ASPHALT PAVEMENT

A. Asphalt pavement shall be a mixture of local aggregates and asphalt cement plant mixed and hot laid.

B. Bituminous material to be mixed with the mineral aggregates shall be asphalt cement conforming to the *State of Utah Standard Specifications for Road and Bridge Construction*, except that minimum flash point for all grades shall be 350^0F

C. Asphalt cement shall be grade AC-10 or AC-20.

D. The percent of asphalt cement in the asphalt job mix shall be 5% to 7% by weight of total mix.

E. The combined dry mineral aggregate shall be uniformly graded and of such size that it meets one of the following gradations when tested in accordance with ASTM D422.

¾" GRADATION

Sieve Size	Percent Passing By Weight
¾"	100
½"	75-91
#4	46-62
#16	22-34
#50	11-23
#200	5-9

½" GRADATION

Sieve Size	%Passing By Weight
½"	100
#4	60-80
#16	28-42
#50	11-23
#200	5-9

F. The maximum aggregate size shall not be more than one-half the thickness of the compacted course to be constructed.

2.03 BITUMINOUS TACK COAT

A. Bituminous tack coat. Emulsified asphalt (AC-10) to be used as the tack coat shall meet the requirements of ASTM D977-80, Grade SS-1N or ASTM D2397, Grade CSS-1N.

PART 3 - EXECUTION

3.01 PAVEMENT REMOVAL

A. Obtain approval from the Engineer prior to saw-cutting or removing pavement.

B. Saw-cut pavement vertically along the lines forming the trench. Do not damage pavement outside the limits of removal.

C. Remove pavement from site immediately and dispose of properly.

D. Pavement beyond the cut edge damaged during removal of the pavement or other construction operations shall be cut again to form a neat vertical edge for pavement repair at no additional cost to the Owner.

3.02 TEMPORARY PAVEMENT PLACEMENT

A. Provide temporary gravel surfaces with a minimum thickness of 6 inches in good condition immediately after final backfill is placed over pipe, and prior to opening to traffic.

B. Maintain temporary gravel surfaces in good condition by blading, sprinkling, rolling, adding gravel, etc., until final pavement is placed.

C. Complete final pavement replacement as soon as possible to provide maximum safety and convenience to traffic as directed by the Engineer or as specified in the road cut permit.

3.03 PREPARATION OF SUBGRADE

A. Ensure subgrade conforms to required grades and elevation. Remove any temporary gravel surfacing placed, to the depth of subgrade as indicated.

B. Ensure compaction of subgrade meets required density.

3.04 PLACEMENT OF UNTREATED BASE COURSE

A. Bring sub-base course to required depth(s) and profiles indicated. Extend sub-base course minimum 6 inches beyond asphalt pavement width. Place in layers not exceeding 4 inches in depth. Compact each layer to 96% maximum laboratory density. Properly compact areas adjacent to curbs, catch basins, manholes and other areas not accessible to rollers with mechanical or hand tamping devices. Ensure granular sub-base course materials are not contaminated with deleterious materials.

B. Add water during compaction to bring granular material to optimum moisture content.

C. Spread base course materials over prepared granular sub-base to a minimum compacted depth as indicated on the drawings. Compact to 96% maximum laboratory density. Ensure top surface of base course is true to lines and grades indicated, with all points within ½ inch of elevations indicated.

D. Add water during compaction to bring stabilizing base course materials to optimum moisture content. When an excess moisture exists, rework stabilizing base course materials until optimum moisture content is obtained.

3.05 APPLICATION OF BITUMINOUS TACK COAT

A. Ensure edges of existing pavement are clean and free of loose or foreign material to permit adhesion of bituminous materials.

B. Apply tack coat material to existing pavement edges and casting immediately prior to placement of asphalt pavement.

3.06 PLACEMENT OF ASPHALT PAVEMENT

A. Obtain permits from state and local authorities before augering/jacking operations begin.

B. Place asphalt pavement to compacted depth indicated on the drawings. The maximum compacted depth of each lift of asphalt surface course shall not exceed 3-inch thickness.

C. Do not place asphalt pavement when surface temperature is 4^0C or lower; or during rainy weather; or when the subgrade, sub-base, or base course is wet or frozen; or during other unfavorable weather conditions as determined by the Engineer. Ensure asphalt pavement is minimum 118^0C immediately after placing and prior to initial rolling.

D. Compact asphalt paving surface course to required density, with approved rolling equipment. Start compaction as soon as pavement will bear equipment without checking or undue displacement.

E. Do not allow vehicular traffic on newly paved areas until surface has cooled to atmospheric temperature, minimum of 6 hours after final installation.

F. Perform hand tamping in areas not accessible to rolling equipment.

G. Ensure surface of completed asphalt pavement is true to lines, profiles, and elevations of adjacent pavement surfaces.

3.07 ADJUSTING MANHOLE FRAMES AND VALVES

A. Adjust manholes, valves, and other appurtenances to required elevations.

B. Provide asphalt collars when adjustments are required. Collars shall be placed to a minimum total pavement thickness of six (6) inches.

C. Adjustment of manholes, valves, and other appurtenances are considered incidental to the Work and no additional payment will be made for adjustments or paving repairs.

END OF SECTION 02575

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

B. Cast-in-place concrete includes the following:

1. Foundations and footings.
2. Slabs-on-grade.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.

B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others if requested by Architect.

C. Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement. Include special reinforcing required for openings through concrete structures.

D. Shop drawings for formwork indicating fabrication and erection of forms for specific finished concrete surfaces. Show form construction including jointing, special form joints or reveals, location and pattern of form tie placement, and other items that affect exposed concrete visually.

1. Architect's review is for general architectural applications and features only. Designing formwork for structural stability and efficiency is Contractor's responsibility.

E. Concrete delivery tickets: A delivery ticket is required for each load of concrete and shall show the following information:

1. Number of cubic yards
2. The exact type and amount of cement, this can be indicated either by weight or volummetric quantity.
3. The amount of mixing water including free moisture in aggregates; this can be indicated either by weight or volummetric quantity.
4. If water is added at job site, (only when allowed by architect) note amount.
5. Amount of slump in inches (after addition of water, if any).

6. Type of cement.
7. Amount of air entrainment when delivered at job site.
8. Do aggregates meet ASTM specificied- yes or no. Indicate maximum size aggregate.
9. Amount and brand (or ASTM) of admixture other than air entraining agent (if any) previously approved in writing by architect.

PART 1 - Mix time.
PART 2 - Date, delivery time, temperature, driver name.

F. Maintain all delivery tickets on the job with a copy for the Architect. If the architect is not on the site, the superintendent or foreman shall obtain these tickets and see that they are held for him/her in a particular file so they are readily available. Note exact location of concrete placement at the project by indicating grid point identification.

G. Warranty: Submit sample of proposed warranty for approval as to form.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. ACI 318, "Building Code Requirements for Reinforced Concrete."
2. ACI 301 “Specificaitons for Structural Concrete Buildings.”

B. Materials and installed work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at Contractor's expense.

C. Appearance Criteria: Concrete exposed to view with defects which adversely affect appearance of specified finish may be repaired only by approved methods when repair work is approved by architect.

1. Concrete not exposed to view (either interior or exterior) will not be rejected for defective appearance.
2. Remove and replace architectural concrete with surface exceeding limitations.

D. Strength Criteria: Strength of structure in place will be considered potentially deficient if it fails to comply with any requirements which control strength of structure, including but not necessarily limited to the following:

1. Low concrete strength.
2. Reinforcing steel size, quantity, strength, position, damage, or arrangement at variance with requirements.
3. Concrete which differs from required dimensions or location in such manner as to reduce strength, curing less than that specified.
4. Inadequate protection of concrete from extremes of temperature during early stages of hardening and strength development.
5. Mechanical injury, construction fires, accidents or premature removal of formwork likely to result in deficient strength.
6. Workmanship likely to result in deficient strength.

E. Structural analysis and/or additional testing may be required when strength of structure is considered potentially deficient.

F. Core tests may be required when strength of concrete in place is considered potentially deficient.

G. If core test are inconclusive or impractical to obtain or if structural analysis does not confirm safety of structure, load tests may be required and their results evaluated in accord with Chapter 20 of ACI 318.

H. Replace concrete work judged inadequate by structural analysis or by results of load tests, if so directed by architect/engineer.

I. Contractor shall pay all costs incurred in providing additional testing and /or analysis required.

L. Tolerance Criteria:

1. Formed surfaces resulting in concrete outlines smaller than permitted by tolerances are potentially deficient in strength and subject to provisions of strength requirements.
2. Formed surfaces resulting in concrete outlines larger than permitted by tolerances may be rejected and excess material subject to removal. If removal of excess material is permitted, accomplish in such manner as to maintain strength of section and to meet all other applicable requirements of function and appearance.
3. Concrete members cast in wrong location may be rejected if strength, appearance or function of structure is adversely affected or if they interfere with other construction.
4. Inaccurately formed concrete surfaces exceeding limits of tolerances, which are exposed to view, may be rejected. Repair or remove and replace if required.
5. Finished slabs exceeding tolerances may be repaired provided strength or appearance is not adversely affected. Remove high spots with a terrazo grinder, fill low spots with patching compound, or other remedial measures performed as permitted.

J. Concrete Surface Tolerances: See specification section 03120 "Architectural Cast-In-Place Concrete Formwork" for allowable surface tolerances. (Both above grade and sub-surface).

K. Reinforcement Fabrication Tolerances:

1. Sheared length: plus or minus 1inch.
2. Depth of truss bars: Plus 0, minus 1 inch.
3. Overall dimensions of stirrups, ties and spirals: Plus or minus 1/2 inch.
4. All other bends: plus or minus 1 inch.

L. Reinforcement Placement Tolerances:

1. Clear distance to formed surfaces: Plus or minus 1/4 inch.
2. Minimum spacing between bars: Minus 1/4 inch.
3. Top bars in slabs and beams:
   a. Members 8 inches deep or less: Plus or minus 1/4 inch.
   b. Members between 8 and 24 inches deep: Plus or minus 1/2 inch.
   c. Members more than 24 inches deep: Plus or minus 1 inch.
4. Crosswise members: space evenly within 2 inches.
5. Lengthwise of members: Plus or minus 2 inches.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

B. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

C. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches (38 mm) to the plane of the exposed concrete surface.

1. Provide ties that, when removed, will leave holes not larger than 1 inch (25 mm) in diameter in the concrete surface.
2. Provide plastic cone snap ties for architecturally exposed concrete. Size: 1" diameter x 1" deep.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615-82 Grade 60 (ASTM A 615M Grade 400), deformed unless otherwise indicated.

B. Steel Wire: ASTM A 82, plain, cold-drawn steel.

C. Welded Wire Fabric: ASTM A 185-79, welded steel wire fabric. Provide fabric in flat sheets, not rolls, unless otherwise acceptable to Architect/Engineer.

D. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
2. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).

E. Stirrup Steel: Conform to ASTM A 82.

F. Smooth Dowel Bars for Construction Joints: ASTM A 29, Grade 60.

G. Tie Wire: Use minimum 16 gauge annealed type.

H. Fabrication: Fabrication of reinforcing bars to conform to required shapes and dimensions and in compliance with CRSI Manual and ACI 315. In the case of fabricating errors, rebended or straightening of reinforcing steel will not be permitted.

1. Locate of reinforcing splices at points of minimum stress.
2. Reinforcements with any of the following defects will not be permitted in the work:
   a. Bar lengths, depths and bends exceeding specified fabrication limits.
   b. Bends or kinks not indicated on drawings or final shop drawings.
   c. Bars with reduced cross-section due to excessive rusting or other cause.

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type II.

1. Use one brand of cement throughout Project unless otherwise acceptable to Architect.

B. Prohibited Admixtures: Calcium Chloride Thyocyanates or admixtures containing more than 0.1 percent chloride ions.

C. Air Entrainment: ASTM C 260, certified by manufacturer to be compatible with other required admixtures. 6-1/2 % plus or minus 1-1/2%.

D. Fly Ash (Pozzolant) : May be used in concrete not exposed to weather and may not replace cement. Use is limited to 15 percent of weight of cement with a 1.5 to 1 replacement ratio, but deducted from the aggregate weight. Loss of ignition at less than 1 percent and water requirement not to exceed 100 percent.

E. Normal-Weight Aggregates: ASTM C 33 and as specified. Provide aggregates from a single source for exposed concrete. Concrete mix weight should be in the range of 145 to 155 pounds per cubic foot.

1. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.
2. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Architect.

F. Lightweight Aggregates: ASTM C 330.

G. Water: Potable, clean, drinkable.

H. Water-Reducing Admixture: ASTM C 494, Type A and containing not more than .I percent chloride ions.

I. High Range Water Reducing Admixture: ASTM C 494, Type F or Type G and containing not more than .1 percent chloride ions.

J. Water Reducing, Non Chloride Accelerator Admixture: ASTM C 494, Type E and containing not more than .1 percent chloride ions.

2.4 RELATED MATERIALS

A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m), complying with AASHTO M 182, Class 2.

B. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.

1. Waterproof paper.
2. Polyethylene film.
3. Polyethylene-coated burlap.

C. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.

D. Bonding Agent: Acrylic or Styrene Butadiene.

E. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements.

F. Curing and Sealing: Curing and sealing compound to be used on all exposed concrete flatwork and exterior surfaces of concrete beams, walls and columns. Two coat application occurring immediately after surface water dissipation and concrete finishing and at approx. 28 days from placement. Products to be used:

1. Curing: Dayton Superior Crete Cure Concentrate J-12 Crete Cure
   Approved equals must be submitted to Architect and approved in writing.
2. Sealing: L & M Construction Chemicals, Inc. Pentane

2.5 ADMIXTURES

A. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability, and as approved by Engineer.

B. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F (10 deg C).

C. Use high-range water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight, and concrete with water-cement ratios below 0.50.

D. Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1-1/2 percent within the following limits:

1. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or hydraulic pressure:

   a. 6.5 percent (moderate exposure); for 3/4 inch maximum aggregate.

2. In all other concrete, including vertical concrete walls, columns, beams and floor slabs with any portion exposed to freezing and thawing conditions, use 5 percent air-entrainment for 3/4" maximum size aggregate.

E. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

2.6 PROPORTIONING AND DESIGNING 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. For the trial batch method, use an independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

1. Do not use the same testing agency for field quality control testing.
2. Limit use of fly ash (pozzolanic admixtures) to not exceed 15 percent of cement content by weight, with a 1.5 to 1 replacement ratio. Loss of ignition at less than 1 percent and water requirement not to exceed 100%.

B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by Architect.

C. Design mixes to provide normal weight concrete with the following properties as indicated on drawings and schedules:

1. Footings and foundations: 3000 psi (20.7 Mpa) and 5.5 bags, 28-day compressive strength; water-cement ratio, 0.50 maximum (non-air-entrained), 0.46 maximum (air-entrained).
2. All other conditions 4000 psi (27.6 Mpa) and 6.0 bags, 28-day compressive strength; water-cement ratio, 0.45 maximum (non-air-entrained), 0.35 maximum (air-entrained).

D. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Ramps, slabs, and sloping surfaces: Not more than 3 inches
2. Reinforced foundation systems: Not less than 1 inch (25 mm) and not more than 3 inches.
3. Concrete containing high-range water-reducing admixture (superplasticizer): Not more than 8 inches (200 mm) after adding admixture to site-verified 2 - 3 inch (50 - 75 mm) slump concrete.
4. Other concrete: Not more than 4 inches (100 mm).

E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in Work.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.

1. When air temperature is between 85 deg F (29 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

SCHEDULE 0 - FIBER REINFORCEMENT

A Synthetic Fiber: Fibrillated or monofilament polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.

B Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

C Products: Subject to compliance with requirements, provide one of the following:

1 Monofilament Fibers:

a Fibrasol IIP; Axim Concrete Technologies.
b Fiberstrand 100; Euclid Chemical Co.
c Fibermix Stealth; Fibermesh, Div. of Synthetic Industries.
d Forta Mono; Forta Corporation.
e Grace MicroFiber; W. R. Grace & Co., Construction Products Div.
f Hi-Tech PPM Fiber; Hi-Tech Fibers, Div. of Martin Color-Fi, Inc.
g Polystrand 1000; Metalcrete Industries.

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate the installation of joint materials, vapor retarder/barrier, and other related materials with placement of forms and reinforcing steel.

B. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:

1. Provide Class A tolerances for concrete surfaces exposed to view.
2. Provide Class C tolerances for other concrete surfaces.

B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings,

offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.

C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.

D. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.

E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

F. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.3 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.

1. Avoiding cutting or puncturing vapor retarder/barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete. Submit steel producer’s certificates of mill analysis including physical propoerties and chemical analysis of reinforcing steel.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect.

D. Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Reinforcement bars are to be secured with wire ties at all points of intersection unless the spacing is less than 12 inches in each direction, in which case tie alternate points of intersection. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

F. Tack welding of reinforcing bars will not be permitted.

G. The overlapping of sheets of metal mesh is one square plus 6 inches.

H. Splicing: All reinforcement shall be furnished in the full lengths indicated on the drawings. Splicing of bars is only permitted where shown on the drawings. Stagger splices as far apart as possible. Lap bars thirty diameters minimum in making a splice. Do not bend reinforcing steel after embedding in hardened concrete, unless authorized by Architect/Engineer.

3.5 JOINTS

A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Architect.

B. Provide keyways at least 1-1/2 inches (38 mm) deep in construction joints in walls and slabs and between walls and footings. Bulkheads designed and accepted for this purpose may be used for slabs.

C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.

D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

E. Isolation Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Joint fillers and sealants are specified in Division 7 Section "Joint Sealants."

F. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown. Use saw cuts 1/8 inch (3 mm) wide by one-fourth of slab depth or inserts 1/4 inch (6 mm) wide by one-fourth of slab depth, unless otherwise indicated.

1. Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.
2. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
3. If joint pattern is not shown, provide joints not exceeding 10 ft. in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).
4. Joint fillers and sealants are specified in Division 7 Section "Joint Sealants."

3.6 INSTALLING EMBEDDED ITEMS

A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

B. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.

C. Install dovetail anchor slots in concrete structures as indicated on drawings.

D. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.7 PREPARING FORM SURFACES

A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before placing reinforcement.

B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

1. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.8 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work. Architect/Engineer/Project Manager to review and approve formwork, reinforcement, etc. prior to commencement of concreting.

B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. (24 inches thick layers or less). If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches (600 mm) and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the

machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate. Concrete to be deposited as near as possible to its final position to avoid segregation due to rehandling or flowing.

3. Concrete shall not be allowed to freefall over six (6) feet.

E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.

1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
3. Maintain reinforcing in proper position on chairs during concrete placement.

F. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

G. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.

1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
3. If freezing may occur during curing period, the concrete shall be protected by means of an insulating covering and/or heating to prevent freezing for a period of not less than 10 days after placing. No combustion heating shall be allowed during the first 24 hours unless precautions are taken to prevent exposure to exhaust gases.

H. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Architect.

I. Adding Water to Concrete: Do not add water to concrete without approval of Engineer/Project Manager. Account for all water added to the concrete mix.

3.9 MONOLITHIC SLAB FINISHES

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and where indicated.

1. After placing slabs, finish surface to tolerances of F(F) 15 (floor flatness) and F(L) 13 (floor levelness) measured according to ASTM E 1155 (ASTM E 1155M). Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.

B. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or another thin film-finish coating system.

1. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F(F) 20 (floor flatness) and F(L) 17 (floor levelness) measured according to ASTM E 1155 (ASTM E 1155M). Grind smooth any surface defects that would telegraph through applied floor covering system.

C. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply a trowel finish as specified, then immediately follow by slightly scarifying the surface with a fine broom.

D. Nonslip Broom Finish: Apply a nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 MISCELLANEOUS CONCRETE ITEMS

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

B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

C. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.11 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

C. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.

D. Apply curing compound on exposed interior slabs and on exterior slabs, walks, and curbs as follows:

1. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
2. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.

E. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

F. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.

1. Final cure concrete surfaces to receive finish flooring with a moisture-retaining cover, unless otherwise directed.

3.12 SHORES AND SUPPORTS

A. General: Comply with ACI 347 for shoring and reshoring in multistory construction, and as specified.

B. Extend shoring from ground to roof for structures four stories or less, unless otherwise permitted.

C. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to support work without excessive stress or deflection.

D. Keep reshores in place a minimum of 15 days after placing upper tier, or longer, if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.13 REMOVING FORMS

A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

C. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.14 REUSING FORMS

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to Architect.

3.15 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Architect.

B. Mix dry-pack mortar, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh (1.2 mm) sieve, using only enough water as required for handling and placing.

1. Cut out honeycombs, rock pockets, voids over 1/4 inch (6 mm) in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch (25 mm). Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.

C. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.

1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
3. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Architect.
4. Repair defective areas, except random cracks and single holes not exceeding 1 inch (25 mm) in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4 inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

E. Repair isolated random cracks and single holes 1 inch (25 mm) or less in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Place dry-pack before bonding agent has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

F. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.

G. Repair methods not specified above may be used, subject to acceptance of Architect.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. General: The Owner will employ a testing agency to perform tests and to submit test reports. All laboratory testing and special inspections services will be performed at no cost to the Contractor except for testing specified in "Duties of Contractor" and "Additional Testing".

B. The Owner's paying for testing and services does not relieve the Contractor of responsibility to furnish materials and construction in full compliance with Contract Documents.

C. Failure to identify any defective work or material does not prevent later rejection when such defect is discovered, nor obligate Architect/Engineer for final acceptance.

D. The testing agency employed by the Owner will meet the requirements of ASTM E329.

E. To facilitate testing and inspection, Contractor will:

1. Furnish labor to assist testing agency in obtaining and handling samples at site or sources of materials.
2. Advise testing agency sufficiently in advance of operations to allow for completion of quality tests and assignment of personnel.
3. Provide and maintain adequate facilities for safe storage and proper curing of concrete test specimens on site for 24 hours as required by ASTM C 31.

F. Contractor is responsible for all retesting and remedial work required as a result of failed tests.

G. Sampling and testing for quality control during concrete placement will include the following, as directed by Architect.

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

a. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
d. Compression Test Specimen: ASTM C 31; one set of three standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
e. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of 20 cu.yds. one specimen tested at 7 days, one specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
3. When total quantity of a given class of concrete is less than 10 cu. yd. (38 cu. m), Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
4. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
5. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi (3.4 MPa).

C. Test results will be reported in writing to Owner, Architect, Structural Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in

structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

E. Core Tests: Obtain and test cores in accord with ASTM 42.

1. If concrete in structure will be dry under service conditions, air dry cores (temperature 60 to 80 degrees F relative humidity less than 60 percent) for 7 days before test.

2. Test dry.

3. If concrete in structure will be more than superficially wet under service conditions, test cores after moisture conditioning.

4. Take at least three representative cores from each member or area of concrete in place that is considered potentially different.

5. Location determined by Architect/Engineer so as least to impair strength of structure.

6. If, before testing, one or more of cores shows evidence of having been damaged subsequent to or during removal from structure, replace it.

7. Concrete in area represented by a core test will be considered adequate if average strength of concrete of cores is equal to at least 85 percent of and if no single core is less than 75 percent of specified strength (f`c). Fill core holes with low slump concrete or mortar and finish surface to match adjacent concrete.

F. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

G. Concrete Protection: Contractor is responsible to protect concrete from freezing, oil, grease, staining or defacement of any kind until it has set. If such protection is not provided, Contractor shall be responsible for removing and replacing concrete at own expense.

3.17 WARRANTY

A. Provide writtem warranty for concrete work, in form approved by Architect, to promptly repair and/or replace defective concrete as directed by the Owner and /or Architect at the contractor's expense. Defective concrete is defined as concrete failure due to pitting, spalling, flaking or cracking (cracks which exceed 1/16 inch width), or cracks which occur due to inadequate or untimely crack control proceedures as determined by the Architect. Defective work also includes concrete that does not meet Class A finish quality, or tolerances specified. New replacement work is required to be warranted according to terms of original warranty starting at date of replacement.

1. Terms of Warranty: Two (2) years starting from date of substantial completion.
2. Submit written warranty to Architect for approval as to form.

END OF SECTION 03300

SECTION 05811 - ARCHITECTURAL JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Types of joints for which architectural joint systems are specified include the following:

1. Interior pedestrian traffic joints.
2. Interior wall joints.

B. Related Sections include the following:

1. Division 7 Section "Joint Sealants" for elastomeric sealants and preformed compressed-foam sealants without metal frames.

1.3 DEFINITIONS

A. Architectural Joint System: Any filler or cover used to span, fill, cover, or seal a joint, except expanding foam seals and poured or foamed in-place sealants.

B. Cyclic Movement: Periodic change between widest and narrowest joint widths in an automatically mechanically controlled system.

C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist passage of flame and hot gases through a movement joint.

D. Maximum Joint Width: Widest linear gap a joint system tolerates and performs its designed function without damaging its functional capabilities.

E. Minimum Joint Width: Narrowest linear gap a joint system tolerates and performs its designed function without damaging its functional capabilities.

F. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint opening typically expressed in numerical values (mm or inches) or a percentage of nominal value of joint width.

G. Nominal Joint Width: Width of linear gap indicated as representing the conditions existing when architectural joint systems will be installed or, if no nominal joint width is indicated, a width equal to the sum of maximum and minimum joint widths divided by two.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide factory-fabricated architectural joint systems capable of withstanding the types of loads and of accommodating the kinds of movement, and the other functions for which they are designed including those specified below, without failure. Types of failure include those listed in Appendix X3 of ASTM E 1399.
   1. Pedestrian Traffic Joints: Support pedestrian traffic across joint.
   2. Exterior Joints: Maintain continuity of weather enclosure.
   3. Other Joints: Where indicated, provide joint systems that prevent penetration of water, moisture, and other substances deleterious to building components or content.
   4. Joints in Surfaces with Architectural Finishes: Serve as finished architectural joint closures.

1.5 SUBMITTALS

A. Product Data: Include manufacturer's product specifications, construction details, material and finish descriptions, and dimensions of individual components and seals.

B. Shop Drawings: For each joint system specified, provide the following:

   1. Placement Drawings: Include line diagrams showing entire route of each joint system, plans, elevations, sections, details, joints, splices, locations of joints and splices, and attachments to other Work. Where joint systems change planes, provide Isometric Drawings depicting how components interconnect to achieve continuity of joint covers and fillers.

C. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each exposed metal and elastomeric material of joint system indicated.

   1. Include similar Samples of material for joints and accessories involving color selection.

D. Samples for Verification: Full-size units 6 inches (150 mm) long of each type of joint system indicated; in sets for each finish, color, texture, and pattern specified, showing the full range of variations expected in these characteristics.

E. Product Test Reports: From a qualified testing agency indicating architectural joint systems comply with requirements, based on comprehensive testing of current products.

F. Research/Evaluation Reports: Evidence of architectural joint system's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain architectural joint systems through one source from a single manufacturer. Coordinate compatibility with adjoining joint systems specified in other Sections.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of architectural joint systems and are based on the specific systems indicated. Other

manufacturers' systems complying with requirements may be considered. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in Part 2 "Architectural Joint Systems" Article.

B. Basis-of-Design Products: The design for each architectural joint system specified in Part 2 "Architectural Joint Systems" Article below is based on the products named. Subject to compliance with requirements, provide either the named products or comparable products by one of the other manufacturers listed.

2.2 MATERIALS

A. Aluminum: ASTM B 221, alloy 6063-T5 for extrusions; ASTM B 209 (ASTM B 209M), alloy 6061-T6 for sheet and plate.

1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

B. Preformed Seals: Single or multicellular extruded elastomeric seals designed with or without continuous, longitudinal, internal baffles. Formed to be installed in frames or with anchored flanges, in color indicated or, if not indicated, as selected by Architect from manufacturer's standard colors.

C. Strip Seals: Elastomeric membrane or tubular extrusions with a continuous longitudinal internal baffle system throughout complying with ASTM E 1783; used with compatible frames, flanges, and molded-rubber anchor blocks.

D. Compression Seals: Preformed, elastomeric extrusions having internal baffle system complying with ASTM E 1612 in sizes and profiles indicated or as recommended by manufacturer.

E. Preformed Cellular Foams: Neoprene or polyurethane extruded, compressible foam.

F. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, flexible moisture barrier and filler materials, drain tubes, lubricants, adhesives, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.3 ARCHITECTURAL JOINT SYSTEMS

A. General: Provide joint systems of design, basic profile, materials, and operation indicated. Provide units with the capability to accommodate joint widths indicated and variations in adjacent surfaces.

1. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline mitered corners where joint changes directions or abuts other materials.
2. Include closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint systems.
3. Frames for Strip Seals: Designed with semiclosed cavity that provides a mechanical lock for seals of type indicated.
4. Public Arena Seals: Non-slip seals designed for installation on treads and risers and to lie flat with adjacent surfaces, and complying with ADA guidelines for public areas.

B. Architectural Joint System AJS-1: Metal frames and covers for interior joints on walls.

1. Basis-of-Design Product: Balco Inc., Type WD-1, P.O. Box 17249, 2626 South Sheridan, Wichita, KS, 67217; 1-800-767-0082, fax (316) 945-0789; or approved equal.

2. Maximum Joint Width: 1 inch.
3. Nominal Joint Width: 1 inch.
4. Minimum Joint Width: 1/4 inch.
5. Movement Capability: 1/4 inch – 1".
6. Type of Movement Capability: Expansion and contraction.
7. Cyclic-Movement-Test-Response Characteristics: No evidence of visual fatigue, inability to cycle between designated joint widths, or other types of failure as determined by testing products identical to those indicated per ASTM E 1399 including Appendix X3.
8. Exposed Cover Material: Aluminum.
9. Exposed Frame Material: Same material and finish as exposed cover material.
10. Moisture Barrier: Provide manufacturer's standard unit.

C. Architectural Joint System AJS-2: Metal frames and preformed seals for interior pedestrian traffic joints.

1. Basis-of-Design Product: Balco Inc., Type WD-1, P.O. Box 17249, 2626 South Sheridan, Wichita, KS, 67217; 1-800-767-0082, fax (316) 945-0789; or approved equal.

2. Maximum Joint Width: 1 inch.
3. Allowable load: 200 pounds per square foot uniform load, 300 pounds per square foor concentrated load.
4. Minimum Joint Width: As indicated.
5. Movement Capability: As indicated.
6. Type of Movement Capability: Expansion and contraction.
7. Cyclic-Movement-Test-Response Characteristics: No evidence of visual fatigue, inability to cycle between designated joint widths, or other types of failure as determined by testing products identical to those indicated per ASTM E 1399 including Appendix X3.
8. Preformed Seal Material: As indicated.

    a. Seal Color: As indicated.

9. Exposed Frame Material: Aluminum.

2.4 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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

2.5 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.

C. Mill Finish: AA-M10 (Mechanical Finish: as fabricated; no other applied finish unless buffing is required to remove scratches, welding, or grinding produced in fabrication process.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to architectural joint system manufacturer's written instructions.

B. Coordinate and furnish anchorages, Placement Drawings, and instructions for installing joint systems to be embedded in or anchored to concrete or to have recesses formed into edges of concrete slab for later placement and grouting-in of frames.

C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary to secure joint systems to in-place construction, including threaded fasteners with drilled-in expansion shields for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for handling and installing architectural joint assemblies and materials, unless more stringent requirements are indicated.

B. Coordinate installation of architectural joint assembly materials and associated work so complete assemblies comply with assembly performance requirements.

C. Terminate exposed ends of exterior architectural joint assemblies with factory-fabricated termination devices to maintain waterproof system.

D. Install factory-fabricated transitions between building expansion-joint cover assemblies and roof expansion-joint assemblies, specified in Division 7 Section "Roof Expansion Assemblies," to provide continuous, uninterrupted, watertight construction.

E. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required to install joint systems.

1. Install joint cover assemblies in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
2. Allow adequate free movement for thermal expansion and contraction of metal to avoid buckling.
3. Set covers in horizontal surfaces at elevations that place exposed surfaces flush with adjoining finishes.
4. Locate wall covers in continuous contact with adjacent surfaces.
5. Securely attach in place with required accessories.
6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.

F. Continuity: Maintain continuity of joint systems with a minimum number of end joints and align metal members. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames. Adhere flexible filler materials, if any, to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

G. Extruded Preformed Seals: Install seals to comply with manufacturer's written instructions and with minimum number of end joints.

1. For straight sections, provide preformed seals in continuous lengths.
2. Vulcanize or heat-weld field splice joints in preformed seal material to provide watertight joints using procedures recommended by manufacturer.
3. Apply adhesive, epoxy, or lubricant adhesive approved by manufacturer to both frame interfaces before installing preformed seals.
4. Seal transitions according to manufacturer's written instructions.
5. Install foam seals with adhesive recommended by manufacturer and heat seal all splices.

H. Joint Systems with Seals: Seal end joints within continuous runs and joints at transitions according to manufacturer's written instructions to provide a watertight installation.

3.3 CLEANING AND PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

END OF SECTION 05811

SECTION 07901 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes joint sealants for the following locations:

1. Exterior and interior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below:

    a. Joints between different materials listed above.
    b. Perimeter joints between materials listed above and frames of doors and windows.
    c. Control and expansion joints in overhead surfaces.
    d. Other joints as indicated.

2. Exterior joints in horizontal traffic surfaces as indicated below:

    a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
    b. Joints between different materials listed above.

3. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:

    a. Control and expansion joints on exposed interior surfaces of exterior walls.
    b. Perimeter joints of exterior openings where indicated.
    c. Perimeter joints between interior wall surfaces and frames of interior doors, and openings.
    d. Other joints as indicated.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

B. Provide joint sealants for interior applications that have been produced and installed to establish and maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrates.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data from manufacturers for each joint sealant product required.

C. Qualification data complying with requirements specified in "Quality Assurance" article. Include list of completed projects with project names addresses, names of Architects and Owners, plus other information specified.

D. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

E. Product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

C. Preconstruction Compatibility and Adhesion Testing: Submit to joint sealant manufacturers samples of materials that will contact or affect joint sealants for compatibility and adhesion testing as indicated below:

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1 When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg F (4.4 deg C).
2 When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.8 SEQUENCING AND SCHEDULING

A. Sequence installation of joint sealants to occur not less than 21 nor more than 30 days after completion of waterproofing, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide color of exposed joint sealants to comply with the following:

1 Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

2.2 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements indicated on each Elastomeric Joint Sealant Data Sheet at end of this Section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.

1. Additional Movement Capability: Where additional movement capability is specified in Elastomeric Joint Sealant Data Sheet, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for Uses indicated.

B. Available Products: Subject to compliance with requirements, elastomeric sealants that may be incorporated in the Work include, but are not limited to, the products specified in each Elastomeric Sealant Data Sheet.

2.3 SOLVENT-RELEASE-CURING JOINT SEALANTS

A. Acrylic Sealant: Manufacturer's standard one-part, nonsag, solvent-release-curing acrylic terpolymer sealant complying with AAMA 808.3 or FS TT-S-00230 or both, with capability when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to

withstand the following percentage change in joint width existing at time of application and remain adhered to joint substrates indicated for Project without failing cohesively:

1. 7-1/2 percent movement in both extension and compression for a total of 15 percent.

B Available Products: Subject to compliance with requirements, solvent-release-curing joint sealants that may be incorporated in the Work include, but are not limited to, the following:

1. Acrylic Sealant:

   a. "60+Unicrylic," Pecora Corp.
   b. "PTI 738," Protective Treatments, Inc.
   c. "PTI 767," Protective Treatments, Inc.
   d. "Mono," Tremco, Inc.

2. Butyl Sealant:

   a. "BC-158," Pecora Corp.
   b. "PTI 757," Protective Treatments, Inc.
   c. "Sonneborn Multi-Purpose Sealant," Sonneborn Building Products Div., ChemRex, Inc.
   d. "Tremco Butyl Sealant," Tremco, Inc.

2.4 LATEX JOINT SEALANTS

A. General: Provide manufacturer's standard one-part, nonsag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.

B. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.

C. Silicone Emulsion Sealant: Provide product complying with ASTM C 834 and, except for weight loss measured per ASTM C 792, with ASTM C 920 that accommodates joint movement of not more than 25 percent in both extension and compression for a total of 50 percent.

D. Available Products: Subject to compliance with requirements, latex joint sealants that may be incorporated in the Work include, but are not limited to, the following:

1. Acrylic-Emulsion Sealant:

   a. "AC-20," Pecora Corp.
   b. "Sonolac," Sonneborn Building Products Div., ChemRex, Inc.
   c. "Tremco Acrylic Latex 834," Tremco, Inc.

2. Silicone-Emulsion Sealant:

a. "Trade Mate Paintable Glazing Sealant," Dow Corning Corp.

2.5 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:

1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90.

B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

C Products: Subject to compliance with requirements, provide one of the following:

1. Acoustical Sealant:

a. "SHEETROCK Acoustical Sealant," United States Gypsum Co.
b. "AC-20 FTR Acoustical and Insulation Sealant," Pecora Corp.

2. Acoustical Sealant for Concealed Joints:

a. "BA-98," Pecora Corp.
b. "Tremco Acoustical Sealant," Tremco, Inc.

2.6 TAPE SEALANTS

A. Tape Sealant: Manufacturer's standard, solvent-free, butyl-based tape sealant with a solids content of 100 percent formulated to be nonstaining, paintable, and nonmigrating in contact with nonporous surfaces with or without reinforcement thread to prevent stretch and packaged on rolls with a release paper on one side.

B. Available Products: Subject to compliance with requirements, tape sealants that may be incorporated in the Work include, but are not limited to, the following:

1. "Extru-Seal Tape," Pecora Corp.
2. "Shim-Seal Tape," Pecora Corp.
3. "PTI 606," Protective Treatments, Inc.
4. "Tremco 440 Tape," Tremco, Inc.
5. "MBT-35," Tremco, Inc.

2.7 PREFORMED FOAM SEALANTS

A. Preformed Foam Sealants: Manufacturer's standard preformed, precompressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellent agent; factory-produced in precompressed

sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following requirements:

1. Properties: Permanently elastic, mildew-resistant, nonmigratory, nonstaining, and compatible with joint substrates and other joint sealants.
2. Impregnating Agent: Manufacturer's standard.
3. ensity: Manufacturer's standard.
4. acking: None.
5. vailable Products: Subject to compliance with requirements, preformed foam sealants that may be incorporated in the Work include, but are not limited to, the following:

    a. "Emseal," Emseal Corp.
    b. "Emseal Greyflex," Emseal Corp.
    c. "Wil-Seal 150," Wil-Seal Construction Foams Div., Illbruck.
    d. "Wil-Seal 250," Wil-Seal Construction Foams Div., Illbruck.

2.8 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1.Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.

C. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26 deg F (-32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.9 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

    a. Do not leave gaps between ends of joint fillers.
    b. Do not stretch, twist, puncture, or tear joint fillers.
    c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

F. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1 Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated.

G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

END OF SECTION 07901

Utah National Guard
RTI Classroom, Phase 5, Building 9, 10, 11, 12
DFCM Project No. 05236480

SECTION 10100 - SPECIFICATIONS FOR MODULAR BUILDING

Building Length	40 feet.
Building Width	32 feet.
Total Square Footage	1280 s. f.

Codes

IBC	2003.
Occupancy	B.
Const. Type	V-B.
NEC	2002.
IPC	2003.
IMC	2003.

Design Loads

SEE DRAWINGS FOR DESIGN CRITERA.

Chassis

Type	Outrigger at 8' o.c.
Beam Size	12" I Beam.
Axles	3 each.
Tires	6 each floor.
Hitch	Detachable.
Bottom Board	40 Mil Plastic.

Floor Construction

Joists	2 x 8 D.F. at 16" o.c.
Decking	¾ Struct II T & G Plywood.
Insulation	R-19 Faced Fiberglass Batts.
Bottom Board	40 Mil Plastic.
Floor Covering	VCT.
Base Molding	2 ½ Vinyl.

Exterior Wall Construction

Wall Studs	2 x 4 D.F. at 16" o.c.
Interior Finish	5/8" gypsum wallboard, painted.
Insulation	R-11 Faced Fiberglass Batts with vapor barrier.
Sheathing	None.
Siding	7/16" Abitco T 1-11.
Trim	1 x 4 and 1 x 6 Pro Trim, painted.

Interior Wall Construction

Lineal Feet	As indicated on plan.
Ceiling Height	As indicated on plan.
Wall Studs	Metal or wood.
Wall Covering	3/4" gyp bd. Painted.
Insulation	None.
Wainscoat	In Restrooms, FRP.

Roof Construction

Type	Pitched Roof.
Joist or Rafter	Mono Truss at 16" c.c.

Sheathing	7/16" osb.
Roofing Finish	235# shingles over 30# felt, ice and water shield at eaves.
Insulation	R-30 Faced Fiberglass Batts with vapor barrier.
Interior Finish	Prefinished metal T-Grid with 2' x 4' acoustical panels.
Eaves+Overhangs	3" on side walls
Rain Gutter & D. S.	Prefinished metal continuous two sides, (1) D. S. per side.
Venting	Per Code.

Exterior Doors

Size	3'-0" x 6'-8".
Quantity	1 EA.
Type	Active Steel, insulated and painted.
Frame	Aluminum.
Lock set	As per Hardware Schedule on drawings.
Closer	As per Hardware Schedule on drawings.
Panic	As per Hardware Schedule on drawings.
Closer	As per Hardware Schedule on drawings.

Interior Doors

Size	3'-0" x 6'-8".
Quantity	4 EA.
Type	Solid core wood slab, painted.
Frame of Jamb	Hollow Metal, painted.
Hardware	As per Hardware Schedule on drawings.
Pocket Door	As indicated.

Windows

Type	White Vinyl Slider with 5/8" Clear Insulated Glass.
Size	4'-0" x 3'-0".
Quantity	4 EA.
Miniblinds	Yes.
Security Screens	Yes.

Electrical

Panel Size	100 Amp.
Service	Through Floor.
Raceway	All electrical to be in ¾" conduit with THHN.
Lights (Interior)	2 x 4 and 1 x 4 Fluorescent. See Plan. Electronic Ballasts and T8 lamps.
Lights (Exterior)	Vandal 70 watts High Pressure Sodium.
Exit Signs	Yes
Quantity.	1
Receptacles	Duplex
Quantity.	See Plan.
GFI	YES
Quantity.	See Plan.

(Coordinate with drawings for non-standard requirements for this project).

HVAC

Unit Type	Wall Mount.
Size	1 Ton per 500 Sq BTU.
Brand	Bard.

Supply Duct Size	28 x 8	Type	Fiberglass.
Return Duct Size	At End Wall	Type.	
Diffusers	Size 12 x 12		
Quantity	8 Ea.		
Return Air Grills Type	At End Walls		
Quantity	1 Ea.		
Insulated Crossovers	8"		
Quantity	4 Ea.		
Exhaust Fans	Yes		
Quantity	2 Ea.		

Plumbing

Water Line	Copper	Service Size	¾".		
Drain Line	ABS	Main Drain Size	3".		
Water Closets	Elongated	Quantity	2.		
Water Heater	EMAX 6 Gal.	Quantity	2.		
Lavatory	Wall Hung	Quantity	2.		
Sinks	Wall Hung	Quantity	2.		
ADA Compliant	Yes.				
Accessories	Yes	See Plan.			
Floor Drains	Yes	See Plan.			

ALL SUPPLY AND WASTE LINES IN CRAWL SPACE TO BE INSULATED.

Miscellaneous

Provide 2 fire extinguishers and cabinets, surface mounted.

Pre-Fabricated Metal Ramp and Stairs

Provide as indicated on Plans, shop primered, field painted. Protect from rust.

END OF SECTION 10100

INDEX

DIVISION 16 - ELECTRICAL WORK

SECTION 16000 - GENERAL PROVISIONS, ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplemental General Conditions and Division 1 Specification Sections apply to work of this section and all other Division 16 specification sections.

B. This section applies to all Division 16 specification sections.

1.2 SUMMARY

A. This section includes general administrative and procedural requirements for electrical installations to expand the requirements of the General Conditions and Division 1 Specification Sections.

1.3 STANDARDS

A. The following industry standards are considered minimum requirements for electrical work and are made a part of the contract documents:

1. National Electrical Code, 2002 Edition (NEC)
2. Electrical Ordinances of Local Governing Authority
3. Utah State Fire Marshal's Rules and Regulations
4. International Building Code
5. International Fire Code
6. Underwriters Laboratories (UL) Standards
7. American National Standards Institute (ANSI)
8. National Electrical Manufacturer's Association (NEMA)
9. National Fire Protection Association (NFPA) Standards
10. Regulations of American Standards Association

B. If any conflict occurs between these rules and the contract documents or between the plans and specifications, notify the Architect promptly in writing. Do not proceed with any work in conflict until a solution is approved in writing by the Architect.

1.4 WORKMANSHIP

A. All Electrical Work of any nature shall be performed by qualified electricians, experienced in the type of work to be performed and licensed with the State of Utah. Electricians shall show their license upon request of the Owner, Architect and/or their representatives.

1.5 FEES AND PERMITS

A. Obtain all necessary fees, permits and inspections in accordance with the General Conditions and Division 1 Specifications. Coordinate requirements with the General Contractor.

1.6 ELECTRICAL WORK INCLUDED

A. The basic contract work includes all labor, material, tools, transportation, equipment, and superintendence specified, indicated on the drawings or necessary to make a complete

installation of, but not limited to, the following:

1. Appliances, apparatus and materials not specifically noted on drawings or mentioned herein, but which are necessary to make a complete working installation of all electrical systems required for the project.

2. Hangers, anchors, sleeves, chases, supports and fittings as may be required and as indicated.

3. Complete electric service with transformers, service conduits, service conductors, metering switchgear, meters, distribution system, and connections to classroom building panelboards.

4. All luminaries, wall switches, receptacles, etc. as indicated on drawings.

5. Complete telecommunication system with raceways, outlets, cables, cable splices, cable terminations, and equipment ready for connection to Owner furnished equipment.

1.7 SUBSTITUTIONS

A. Material or products specified by name of manufacturer, brand or trade name or catalogue reference will be the basis of the bid and furnished under the contract unless changed in writing by the Architect. Where two or more materials are named, the choice of these will be optional with the Contractor.

B. Submit requests for substitution in writing to the Architect, with copy to the Engineer, in accordance with the General Conditions.

1.8 ACCURACY OF DATA

A. Data given herein and on the drawings are as exact as could be secured, but their absolute accuracy is not guaranteed. Specifications and drawings are for the assistance and guidance of the Contractor.

B. Electrical drawings are diagrammatic, but will be followed as closely as existing conditions, actual construction, and work of other contractors will permit. All deviations from the drawings required to make the Electrical Work conform to, existing conditions, the buildings as constructed, and to the work of other contractors will be made by the Contractor as approved by the Architect.

1.9 VISIT THE SITE

A. Contractors are assumed to have visited the site and thoroughly acquainted themselves with existing conditions affecting the proposed work. Verify existing conditions and measurements at the building before beginning work and immediately notify the Architect of any discrepancies.

1.10 TEMPORARY POWER

A. Provide temporary power for reasonable convenience during construction in accordance with the General Conditions.

B. Provide GFCI Protection for all temporary power outlets.

C. Use temporary power for construction purposes only. Do not use temporary power for electric

space heating, etc..

1.11 SHOP DRAWING SUBMITTALS

A. As soon as possible after contract award, submit shop drawings for review in accordance with the General Conditions and Division 1 Specifications.

B. Submit shop drawings in three ring loose-leaf binder.

C. Divide Electrical equipment into subsections of common equipment with a complete equipment list at the beginning of each subsection.

D. Provide manufacturers' catalogue and/or descriptive literature indicating specific model and/or catalog numbers, options, accessories and modifications for the following items:

1. Wiring devices and floor outlets.
2. Pole Mounted Transformers
3. Metering Switchgear
4. Watthour Demand Meters
5. Panelboards.
6. Light fixtures.
7. Telecommunication System.

E. Above lists are considered minimum. Additional items may be required to be submitted for review.

F. Refer to individual Specification Sections for additional Shop Drawing Submittal requirements.

1.12 RECORD DRAWINGS

A. Provide As-Built Record Drawings in accordance with the General Conditions and Division 1 Specifications.

B. Indicate location and routing of all underground raceways on the As-Built Record Drawings by dimension to permanent structures such as buildings, sidewalks, curbs, etc.

C. Indicate all changes made to the drawings such as changes in fixture and outlet location, changes in circuit routing and circuit numbering, etc. Include all changes by Addenda, Change Order, Supplemental Instruction or verbal instruction.

D. Refer to individual Specification Sections for additional Record Drawing requirements.

1.13 OPERATION AND MAINTENANCE MANUALS

A. Provide Operation and Maintenance Manuals in accordance with the General Conditions and Division 1 Specifications.

B. Include manufacturers' catalog and/or descriptive literature of equipment actually installed. Clearly indicate on literature the specific model and/or catalog numbers of equipment installed, including all options, accessories and/or modifications.

C. All copies of literature will be new, clean and clearly legible. Sheets used for shop drawing submittals with review stamp, remarks, etc., will not be acceptable.

D. Divide Electrical equipment into subsections of common equipment with a complete equipment list and recommended maintenance schedule at the beginning of each subsection.

E. Refer to individual Specification Sections for additional Operation and Maintenance Manual requirements.

1.14 WARRANTY

A. Provide Warranty for Electrical Work in accordance with the General Conditions and Division 1 Specifications.

B. Provide manufacturer's warranty for all equipment which the manufacturer normally provides a warranty in excess of twelve months. Refer to individual Specification Sections for extended warranty requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials and equipment for which U.L. Standards have been established, will be listed by and bear the label of Underwriters Laboratories, Inc..

B. All materials will be new and bear the manufacturer's name, trade name and catalog or model numbers. Similar items will be of the same manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation of materials will comply with all codes and be accomplished with good workmanship in the judgement of the Architect and Engineer.

3.2 COOPERATION WITH OTHER CONTRACTORS

A. Cooperate with other contractors doing work on the building as may be necessary for the proper execution of the work of various trades employed in construction of the building.

B. Refer to architectural, structural and mechanical drawings, for construction details, and coordinate the electrical work with that of other contractors to the end that unnecessary delays and conflicts will be avoided.

3.3 MATERIAL HANDLING

A. Use all means necessary to protect materials before, during and after installation and to protect the installed work and materials of all other trades.

B. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

3.4 CUTTING AND REPAIRING

A. Provide all required digging, cutting, etc. incidental to the Electrical Work. Make required repairs thereafter to the satisfaction of the Architect.

B. Do not cut into any major structural element, beam or column, without written approval of the Architect.

C. Install the Electrical Work to proceed with other trades in order to avoid unnecessary cutting of the construction.

D. Perform all excavating, trenching and backfill required for electrical work in accordance with Division 2 Specifications.

3.5 CONSTRUCTION REVIEW

A. The Owner, Architect and/or Engineer will perform construction review throughout the construction of the project. The construction review does not relieve the contractor from the responsibility of providing all materials and performing the work in accordance with the Contract Documents.

B. Notify the Architect in writing, giving ample notice, at the following stages of construction and allow the Owner, Architect and/or Engineer to review the installed work.

1. When underground electrical work is complete, before backfilling, including work under floor slabs.
2. When all electrical rough-in is complete, but not covered.
3. Pre-Final, upon completion of all electrical work.
4. Final, upon completion of all items noted in the Pre-Final Construction Review Report.

C. Prerequisite for Final Electrical Construction Review:

1. Electrical Engineer/Consultant must be present.
2. Electrical Contractor's job foreman must be present.
3. Communications System installer must be present.
4. DFCM and/or Utah National Guard Representatives must be present.
5. Service Disconnect and all Panelboard Enclosures must be open.
6. Clear access must be provided to all devices and equipment.
7. All panels, disconnects, etc. must be labeled and typed panel index cards installed.
8. All Classroom Buildings light fixtures, outlets, etc. must be energized and operable.
9. Contractor must have pad and pencil to list all deficient items.
10. Make all corrections and adjustments after the Final Construction Review, not during. Items requiring correction will appear on the Final Construction Field Report.
11. Contractor must have all required keys to provide access to all panels and doors.

D. Test all systems and equipment provided and/or connected under the Contract for short circuits, ground faults, proper neutral connections and proper operation in the presence of the Owner, Architect and/or Engineer.

1. Include testing of electrical systems furnished with modular classroom buildings. Coordinate responsibilities for correction of deficient items with the General Contractor.

E. The entire construction will be installed in accordance with the contract documents and be free of mechanical and electrical defects prior to final acceptance of the work.

* END OF SECTION 16000 *

SECTION 16110 - RACEWAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplemental General Conditions, Division 1 Specification Sections and Section 16000 - General Provisions, Electrical apply to work of this section.

1.2 SCOPE

A. Provide a complete raceway system for all wiring as shown on the drawings and as specified herein.

PART 2 - PRODUCTS

2.1 RACEWAYS

A. Provide minimum 3/4" trade diameter raceways for all wiring systems.

B. Do not use aluminum conduit, intermediate steel conduit (IMC), BX cable, MC cable, Flexible Non-metallic Tubing, NM cable, Direct Burial Cable or any other wiring methods not allowed by this specification unless approved in writing by the Architect and/or Engineer.

2.2 ABOVEGROUND RACEWAYS

A. Provide Electrical Metallic Tubing (EMT), galvanized inside and out, for raceways not subject to permanent moisture or damage.

B. Provide Galvanized Rigid Steel Conduit (GRC) where raceways are subject to permanent moisture such as underground, or damage such as vehicular traffic, etc..

2.3 UNDERGROUND RACEWAYS

A. Provide Schedule 40 PVC electrical conduit in earth or in concrete in contact with earth.

1. Provide a separate ground wire in all PVC conduits, except main electrical service conduits.
2. Provide Galvanized Rigid Steel Conduit (GRC) for all bends greater than 22 degrees in PVC conduits.
3. Do not use PVC conduit above grade nor for penetrations through structural elements such as foundation walls, floor slabs, etc..

B. Provide Galvanized Rigid Steel Conduit (GRC) for conduit penetrations through floor slab or grade to extend minimum 12" above floor or grade.

C. Provide Galvanized Rigid Steel Conduit (GRC) for conduit penetrations through foundation walls to extend minimum 36" beyond the foundation wall.

D. Corrosion protect all galvanized rigid steel conduit (GRC) installed in earth or in concrete in contact with earth with two (2) half-lapped layers of 0.010" thick approved waterproof PVC tape equal to Scotch No. 50 or use factory PVC coated rigid steel conduit with all field joints coated

after installation.

2.4 FLEXIBLE RACEWAY CONNECTIONS

A. Provide Flexible Steel Conduit for final connection to lay-in light fixtures, motors and other equipment subject to vibrations or movement, not to exceed 6 feet for fixture connections and 3 feet for motor and equipment connections.

B. Provide liquid-tight flexible steel conduit outside and in wet, humid, corrosive and oily locations.

1. Provide Sunlight Resistant liquid-tight flexible steel conduit outdoors.

C. Provide a ground conductor in all flexible steel conduit.

D. Minimum 1/2" flexible steel conduit or 3/8" factory fabricated fixture whips may be used to make final connections to lay-in light fixtures.

E. Flexible Steel Conduit may be used where misalignment or cramped quarters exist only with prior approval of the Architect and/or Engineer.

2.5 CONDUIT FITTINGS

A. Provide steel compression type or steel set screw type fittings for Electrical Metallic Tubing.

B. Provide malleable iron clamp type fittings for Flexible Steel Conduit.

C. Provide steel compression type fittings for Liquid-Tight Flexible Steel Conduit.

D. Provide threaded fittings for GRC conduit. Provide double locknuts and plastic bushing for GRC conduit terminations or provide boxes and enclosures with threaded hubs.

E. Provide liquid-tight and gas-tight conduit fittings underground using fittings and PVC cement as recommended by the conduit manufacturer.

F. Provide steel rain-tight, compression type fittings for all conduit installed outside and in wet, humid, corrosive and oily locations.

G. Provide Insulated Throat Connectors for all conduit terminations 1" diameter and smaller. Provide insulating bushings for all conduit terminations 1-1/4" diameter and larger.

H. Provide Grounding Bushings bonded to the electrical system ground:

1. On each end of all service conduits.
2. On each end of all feeder conduits in which a separate ground conductor is installed.
3. On each end of all conduits used to protect ground conductors.
4. On all conduit terminations installed in concentric or eccentric knockouts or where reducing washers have been installed.

I. Do not use cast metal or indenter type fittings. Do not use screw-in type fittings for Flexible Steel Conduit. Do not use spray (aerosol) PVC cement.

2.6 PULL BOXES

A. Provide pull boxes or conduit bodies in accessible locations where required to reduce the

number of bends in the conduit run to less than 360 degrees.

1. Indicate exact location of pull boxes and conduit bodies on the As-Built Record Drawings.

2.7 PULL STRING

A. Provide a nylon or polypropylene pull string with not less than 200 lb tensile strength in all spare conduits and conduits installed for use by others. Provide a hard cardboard tag for each raceway to indicate location of the opposite end of the raceway.

1. Include pull string in conduits stubbed for connection to alternate buildings. Extend pull string at stub end to grade and tie to metal stake marking location of the underground conduit stub.

B. Provide pull string in all underground communication conduits with communication cables.

PART 3 - EXECUTION

3.1 SUPPORTS

A. Securely support all raceways with full (2 hole) pipe straps, hangers, or ceiling trapeze directly from building structure such as roof trusses, beams, floor joists, etc., in accordance with Specification Section 16190 - Supporting Devices.

1. Do not support raceways from other electrical systems or mechanical systems.

B. Provide supports at 5'-0" on center with a minimum of two supports for each ten foot length of conduit or fraction thereof up to 6 feet.

C. Provide a support within 12" of each coupling, fitting, box, enclosure and bend.

1. Install supports at vertical to horizontal conduit bends on the upper side of the bend.

3.2 INSTALLATION

A. Raceway layouts on the drawings are generally diagrammatic and the exact routing of raceways will be governed by structural conditions and the work of other contractors.

B. Install raceways concealed within finished ceilings, walls and floors except where exposed raceways are specifically shown on the drawings or permitted by the Architect.

C. Install exposed raceways parallel with or perpendicular to walls and ceilings, with right angle turns consisting of symmetrical bends or conduit bodies equal to Crouse-Hinds "Condulet". Avoid all bends and offsets where possible.

1. Paint exposed raceways to match surrounding surfaces in accordance with Division 9 Specifications, except exterior raceways will not be required to be painted.

D. Install raceways minimum 12" from insulation of hot water piping, steam piping and other systems or equipment with temperatures in excess of 104^0 F (40^0 C).

E. Make all field bends and offsets with a radius not less than allowed by the National Electrical Code for the type of raceway system.

1. Do not install bends or offsets which are flattened, kinked, rippled or which destroy the smooth internal bore or surface of the conduit.

F. Cap the open ends of raceways during construction to prevent the accumulation of water, dirt or concrete in the raceways. Thoroughly clean raceways in which water or other foreign matter has been permitted to accumulate or replace the raceway where such accumulation cannot be removed by a method approved by the Architect and/or Engineer.

G. Do not install raceways which have been crushed or deformed in any manner.

H. Do not install wiring until work which might cause damage to the wires or raceways has been completed.

3.3 UNDERGROUND RACEWAY INSTALLATION

A. Install underground raceways outside of building minimum 24" below finished grade to the top of the raceway.

1. Provide a plastic red magnetic warning ribbon stating "CAUTION - BURIED ELECTRICAL" 12" directly above the top of the raceway.

B. Use select granular fill, free of rocks or hard clumps with sharp or angular edges, for the first 6" of backfill around underground raceways including raceways below concrete floor slabs.

1. Provide imported sand backfill where required by Division 2 Specifications or where excavated materials are not suitable, and where indicated on the drawings.

C. Coordinate location of underground raceways with the General Contractor to avoid areas where raceways may be damaged by subsequent installation of other utilities, structures, trees, shrubbery or other landscape vegetation.

D. Install underground raceways minimum 3'-0" from parallel runs, and minimum 1'-0" from perpendicular runs, of underground natural gas and propane lines.

E. Install underground raceways minimum 2'-0" from parallel runs, and minimum 1'-0" from perpendicular runs, of other underground utilities such as water and sewer lines. Increase horizontal separation by 12" for each 12" difference in vertical elevation.

F. Do not use torches to heat PVC conduit for field bends. Do not install PVC conduit that has been scorched by heating for bends.

* END OF SECTION 16110 *

SECTION 16120 - CONDUCTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplemental General Conditions, Division 1 Specification Sections and Section 16000 - General Provisions, Electrical apply to work of this section.

1.2 SCOPE

A. Provide all conductors for power and lighting as shown on drawings and as specified herein.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Provide Copper building wire, minimum #12 AWG, with type THHN/THWN or XHHW 600 volt insulation, except as otherwise noted on the drawings or required by NEC.

1. Provide conductors in underground raceways with insulation approved for wet locations such as type THWN or XHHW.

B. Provide stranded conductors for wires #8 AWG and larger and for terminal connections to all motors. Stranded or solid conductors may be used for sizes smaller than #8 AWG at the contractor's option.

C. Provide conductors rated 90^0 C minimum in wiring channels of Fluorescent and High Intensity Discharge lighting fixtures.

D. Provide conductors with surface printed identification showing conductor size and material, insulation type, voltage rating and approvals at regularly spaced intervals of 24".

E. Do not use sizes smaller than #12 AWG in branch circuits carrying load. Circuits requiring larger sizes to meet voltage drop conditions, etc., are indicated on the drawings.

1. Where branch circuit homeruns indicate conductor size, use that size conductor for the entire branch circuit, including switch legs, etc.

2.2 SPLICES

A. Provide Ideal wirenuts or Scotchlock spring connectors for all conductor splices #8 AWG and smaller. Provide split-bolt or compression type connectors for all conductor splices larger than #8 AWG.

B. Provide splices which are UL listed for the type, quantity and size of the conductors to be spliced.

C. Provide all splices with insulation at least equal to that of the conductor.

D. Provide watertight splices in junction or outlet boxes located outside and in wet locations. Provide heat shrink insulating kits or use connectors pre-potted with an approved waterproof compound.

E. Splice conductors only in approved boxes. Do not splice conductors in conduit bodies.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all conductors in approved raceway systems, except for overhead conductors on pole lines.

B. Install conductors continuous without splice between outlet boxes, devices and panelboards.

1. Provide suitable junction boxes in readily accessible locations where splices are necessary at intermediate points. Indicate exact location of all boxes on the As-Built Record Drawings.

C. Do not install wiring until work which might cause damage to the wires has been completed.

3.2 COLOR CODING

A. Color code all wiring at each enclosure and box where conductors are accessible and at each splice, tap or termination by means of colored conductor insulation.

1. For conductors #6 AWG and larger, colored self-adhesive tape with the appropriate color designations may be used.

B. Color code each conductor of each circuit as follows.

1. Ground: Green or Bare Copper

2. 120/240 Volt, 1 Phase, 3 Wire System
   a. Phase A - Black
   b. Phase B - Red
   c. Neutral - White

3.3 MULTI-WIRE BRANCH CIRCUITS

A. Where a common neutral is run for multi-wire branch circuits, connect phase conductors to separate phases such that the neutral conductor will carry only the unbalanced current. Use neutral conductors of the same size as the phase conductors unless specifically noted otherwise.

B. Do not install more than two phase conductors in any raceway except where specifically shown on the drawings or approved by the Architect and/or Engineer.

3.4 PHASE ROTATION

A. Phase rotation for Single Phase System will be A leads B from front to back, from left to right or from top to bottom as viewed from the front of the enclosure.

* END OF SECTION 16120 *

SECTION 16130 - ELECTRICAL BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplemental General Conditions, Division 1 Specification Sections and Section 16000 - General Provisions, Electrical apply to work of this section.

1.2 SCOPE

A. Provide junction boxes and outlet boxes at each outlet, fixture and other device location as shown on drawings and as specified herein.

PART 2 - PRODUCTS

2.1 OUTLET AND DEVICE BOXES

A. Provide galvanized or cadmium plated sheet steel electrical boxes in indoor dry locations, of the most suitable size and shape for the conditions encountered and in accordance with NEC requirements for the number of conductors allowed.

B. Provide minimum 4" Square or Octagonal, 1-1/2" Deep Boxes unless specifically indicated otherwise on the drawings.

1. Provide minimum 4" Square or Octagonal, 2-1/8" Deep Boxes where Three (3) conduit connections are required.

2. Provide minimum 4-11/16" Square, 2-1/8" Deep Boxes where Four (4) or more conduit connections are required.

3. Provide gang boxes where more than one device is located at the same point.

4. Boxes smaller than 4" Square or Octagonal, even though of equivalent cubic inch capacity, are not acceptable.

C. Provide Type FD cast metal boxes outside, in wet, humid or corrosive locations and where exposed to damage such as vehicular traffic.

D. Confer with the various equipment suppliers and either use or properly provide for boxes which are furnished with the equipment, such as speakers, horns, bells, etc..

E. Do not use "THRU-THE-WALL" boxes, sectional (gangable) boxes or non-metallic boxes.

2.2 JUNCTION BOXES

A. Provide junction boxes as specified for outlet and device boxes except that boxes 6" square and larger may be painted sheet steel.

2.3 BOX ACCESSORIES

A. Provide fittings, plaster rings, cover plates and other accessories suitable for the purpose and

location of each box.

B. Provide plaster rings which are minimum 1/8" deeper than wall covering for flush mounted boxes (i.e. use 3/4" plaster ring for 5/8" gypsum board wall covering) such that plaster ring will be flush with finished face of wall.

C. Provide industrial raised covers for surface mounted outlet and device boxes.

PART 3 - EXECUTION

3.1 SUPPORTS

A. Support each box from the building structure independent of the raceway system.

B. Support flush mounted wall boxes with metal bar hangers or metal stud backing behind the box secured to wall studs.

C. Support flush mounted ceiling boxes with metal bar hangers secured to ceiling support system or threaded rod hangers secured to structure.

D. Secure surface mounted boxes to building structure with minimum of 2 screws or bolts as required.

E. Do not use side mounted boxes or brackets.

3.2 INSTALLATION

A. Install flush mounted boxes, after being equipped with extensions, accessories, etc., flush with finished face of wall, ceiling or floor.

1. Replace or repair all boxes not installed flush with finished surfaces to the satisfaction of the Architect and/or Owner.

2. In order to meet this requirement, it is recommended that the Electrical Contractor be present during installation of gypsum board, tile or other wall coverings and during installation of outlet boxes in masonry walls.

3. Coordinate depth of wall coverings to be installed on all walls with the General Contractor prior to installing plaster rings.

B. Install boxes in opposite sides of common room walls in adjacent stud spaces where possible and with minimum 6" separation between the boxes. Provide minimum 10" of conduit between boxes which are connected by conduit.

C. Install outlet boxes for light switches on the strike side of door openings. Coordinate door swings with the General Contractor prior to roughing in switch boxes.

D. Install boxes in masonry walls in the cell of the block or behind brick with deep masonry ring to extend flush with the finished wall surface.

E. Seal around the surface of all switch and outlet boxes with plaster or grout to close any opening between the outlet box and the wall finish.

F. Install boxes level and plumb.

3.3 LOCATIONS

A. The wiring system layouts on the drawings are generally diagrammatic and the location of outlets and equipment are approximate.

B. Study all available drawing details, shop drawings, equipment drawings, building conditions and materials surrounding each outlet and device box prior to installing the box to ascertain the exact location required for each box.

C. Rough in the electrical work such that electrical outlets, fixtures and other fittings are properly fitted to the work of other trades.

D. Do not install boxes inside cupboards, behind drawers, or otherwise so located, as to be inaccessible or unsuited for the purpose intended.

E. The right is reserved to make any reasonable change in the location of the outlets before roughing in, without involving additional expense.

3.4 MOUNTING HEIGHT

A. Install outlet and device boxes at the heights shown on the drawings or as directed by the Architect. In general, mount outlets as follows.

1.	Convenience Outlet	18"
2.	Wall Switch	46"
3.	Telephone/Data Outlet	18"
4.	Special Receptacle	18"
5.	Exit Lights	8'-0"

B. All mounting heights, including mounting heights indicated on drawings, are to the center of the outlet box above finished floor or grade unless noted otherwise.

C. Install outlets above counters 4" above the top of the counter backsplash to the center of the outlet. Coordinate mounting heights with the cabinet installer prior to roughing in the outlets.

D. Refer to applicable Specification Sections for mounting heights of devices and equipment not included above or install at heights as directed by the Architect and/or Engineer.

* END OF SECTION 16130 *

SECTION 16140 - OUTLETS AND WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplemental General Conditions, Division 1 Specification Sections and Section 16000 - General Provisions, Electrical apply to work of this section.

1.2 SCOPE

A. Provide all wiring devices complete with coverplates and necessary accessories as shown on the drawings and as specified herein.

1.3 SUBMITTALS

A. Provide submittals for each type of wiring device to be used on the project in accordance with Division 1 Specifications and Section 16000 - General Provisions, Electrical to verify compliance with the contract documents.

PART 2 - PRODUCTS

2.1 WIRING DEVICES

A. Provide wiring devices rated 20 amps minimum, as specified below, or equivalent of Eagle, General Electric, Hubbell, Leviton or Pass & Seymour.

1.	Switch, Single Pole	Bryant 4901
2.	Switch, 3 - Way	Bryant 4903
3.	Receptacle, duplex convenience, 3-wire	Bryant 5352
4.	Receptacle, duplex, GFCI protected	Bryant GFR53FT

B. Color of devices in finished areas will be as selected by the Architect from the manufacturer's standard colors to compliment the color of architectural finishes.

C. Provide convenience outlets with GFCI protection in accordance with NEC requirements, where installed outside or within 6 feet of any sink and as indicated on the drawings.

1. Provide a self-adhesive printed label stating "GFCI PROTECTED" for each outlet protected by feed-through GFCI receptacles or GFCI circuit breakers.

2. Use feed-through GFCI outlets only to protect other outlets within sight of the GFCI protected outlet.

2.2 COVERPLATES

A. Provide a cover plate for each outlet and box suitable for the location and function of the outlet and box.

B. Provide blank cover plates for junction boxes and outlet boxes not used.

C. Provide nylon or impact resistant thermoplastic coverplates for outlets and boxes installed in

finished areas, of the same manufacturer and color as the wiring devices.

D. Provide weatherproof die cast metal coverplates with spring return lids and suitable gasket for all devices installed outside or in wet locations.

2.3 FLOOR OUTLETS

A. Provide Hubbell No. B2588275, single gang, cast iron, flush mounted floor outlet boxes with brass trim ring, minimum 18.0 cubic inch capacity and 3/4" threaded conduit hubs, suitable for use wood floors.

B. Provide each floor box with Hubbell No. SF3925 brass plate with flip lids for installation of duplex receptacle or telecommunication device mounting plate.

C. Other acceptable Manufacturers are Walker and Steel City.

2.4 ACCESSORIES

A. Equip each outlet with devices suitable for the purpose of the outlet and with means of properly connecting the equipment served, whether or not such devices are specifically mentioned.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Properly locate each outlet to fulfill its particular purpose. Do not install receptacles or boxes inside cupboards, behind drawers, or otherwise so located, as to be inaccessible or unsuited for the purpose intended.

B. Install all outlets and wiring devices flush with face of coverplate, with the coverplate in contact with the finished face of the wall and with mounting strap of device in contact with the outlet box.

* END OF SECTION 16140 *

SECTION 16190 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplemental General Conditions, Division 1 Specification Sections and Section 16000 - General Provisions, Electrical apply to work of this section.

1.2 SCOPE

A. Provide suitable supporting devices for all electrical equipment, raceways and components as specified herein and as shown on the drawings.

B. Refer to individual specification sections for additional supporting requirements.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Provide support anchors which will support in tension a minimum of 4 times the weight of the equipment to be supported but not less 100 lbs.

B. Provide wood screws in wood; toggle bolts in hollow masonry units; expansion bolts with lead shield or shot anchors in concrete and brick; and machine screws, threaded 'C' clamps or spring-tension clamps on steel work.

C. Do not use tie wire for support unless specifically called for in individual specification sections.

D. Do not use threaded C Clamps on tapered steel sections.

E. Do not weld supports, equipment, boxes, raceways, etc., to steel structures.

F. Do not use wooden plug inserts as a base for supports.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Secure supporting devices to building structure.

B. Do not install supporting devices with sheetrock or plaster as the sole means of support. Provide proper blocking behind the sheetrock or plaster as required to support equipment.

* END OF SECTION 16190 *

SECTION 16195 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplemental General Conditions, Division 1 Specification Sections and Section 16000 - General Provisions, Electrical apply to work of this section.

1.2 SCOPE

A. Provide identification of all electrical equipment, devices, enclosures, conductors, cables, etc., as shown on the drawings and as specified herein.

B. Refer to individual specification sections for additional identification requirements.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Provide engraved laminated micarta or plastic nameplates to identify each panelboard, cabinet, motor starter, disconnect, etc., with the following minimum lettering heights:

1. Panelboards, etc. - 3/8"
2. Disconnects, motor starters, etc. - 1/4"
3. Metering Switchgear, Terminal Cabinets, etc. - 3/8"
4. Meters, breakers, etc. - 1/4"

B. Provide Black Nameplates with White Lettering unless noted otherwise, or required to contrast with equipment enclosures.

C. Do not use Dynamo Labels, printed labels, etc., unless specifically called for in other specification sections or approved by the Architect and/or Engineer.

2.2 EQUIPMENT IDENTIFICATION

A. Provide engraved nameplates on the exterior of each Motor Starter, Safety Switch, etc., to include the Equipment Description, Number or Designation, Voltage, Motor Horsepower and/or Full Load Amps and the Circuit from which the equipment is served.

1. Example: AIR COND. UNIT 1
   22.5 F.L.A. 240 VOLT, 1Ø
   CIRCUIT A-24

2.3 PANELBOARD IDENTIFICATION

A. Provide one engraved nameplate on the exterior trim of each Panelboard, visible without opening the door, to include the Panel Designation and the System Voltage.

1. Example: PANEL 'B3'
   120/240 V, 1Ø

2.4 METERING SWITCHGEAR IDENTIFICATION

A. Provide one engraved nameplate on the exterior trim of each Metering Switchgear Enclosure, to include the Buildings served and the System Voltage.

1. Example: R.T.I. BUILDINGS B-3 THRU C-4 SERVICE
120/240 V, 1Ø

B. Provide nameplates on each Meter and Branch Breaker of the Metering Switchgear to indicate the specific building served by the Meter and Branch Breaker.

1. Example: BUILDING >B-3'

C. Install the nameplates on the wireway cover trim of the metering switchgear. Do not install the nameplates on interchangeable dead-front trims.

2.5 CONDUCTOR IDENTIFICATION

A. Identify each branch circuit and each feeder conductor at each outlet box, pull box or other accessible location with hand lettering in black India ink in the enclosure to indicate panel and circuit numbers of all conductors in the enclosure.

2.6 PANELBOARD CIRCUIT INDEX

A. Provide a neatly typed index, to include type of load served and the specific location of the load for each branch circuit of each panelboard furnished with the modular classroom buildings.

B. Examples

1. Lighting, Classroom
2. Lighting, Office & Latrines
3. Outlets, Classroom west and north walls

C. Use room numbers or nomenclature assigned to rooms by the Owner.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install nameplates to be visible from normal viewing angles.

B. Attach nameplates to equipment enclosures with stainless steel screws or rivets. Adhesives are not acceptable.

C. Install panel index behind protective plastic covering.

* END OF SECTION 16195 *

SECTION 16300 - PRIMARY SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplemental General Conditions, Division 1 Specification Sections and Section 16000 - General Provisions, Electrical apply to work of this section.

B. Section 16400 - Secondary Service & Distribution

1.2 SCOPE

A. Provide complete primary electrical service and distribution as shown on drawings and as specified herein.

PART 2 - PRODUCTS

2.1 SYSTEM

A. The existing primary distribution system is 7,200/12,470 Volt, 3 Phase, 4 Wire, Grounded WYE.

B. New secondary service voltage will be as indicated on the drawings.

2.2 PRIMARY ELECTRICAL SERVICE

A. Provide new connections from existing primary distribution system to new distribution transformers, located as shown on the drawings and as detailed in the Power Riser Diagram.

2.3 FEEDERS

A. Sizes and connection of feeders are shown on the Single Line Diagrams. Feeders are sized to handle rated loads and to meet voltage drop conditions.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate installation of electrical service with Owner and contractors doing work in buildings under construction prior to beginning work.

3.2 POWER OUTAGES

A. Power outages to any portion of the existing Primary Electrical Distribution System will not be allowed except on weekends, holidays and/or as directed by the Owner.

B. Submit requests for power outages to the Owner in writing, a minimum of Seven (7) days prior to all proposed outages. Indicate areas and buildings which will be affected by the power outage and the expected length of the power outage.

C. Do not take any power outages without the Owners written permission.

* END OF SECTION 16300 *

SECTION 16321 - POLE MOUNTED DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplemental General Conditions, Division 1 Specification Sections and Section 16000 - General Provisions, Electrical apply to work of this section.

1.2 SCOPE

A. Provide new Pole Mounted, Oil-filled Distribution Transformers as shown on drawings and as described herein.

PART 2 - PRODUCTS

2.1 INSULATING OIL

A. Furnish transformers with mineral oil conforming to ASTM D 3487, Type II, tested in accordance with ASTM D 117.

B. Insulating oil shall be NON-PCB classified with less than 0.5 parts per million (PPM) of PCB content. Furnish each transformer with permanent NON-PCB label.

2.2 POLE MOUNTED TRANSFORMERS

A. Furnish weatherproof transformers which comply with the latest applicable NEMA and ANSI standards.

B. Transformers shall be given a rust inhibiting treatment and a standard finish coat by the manufacturer.

C. Grounding provisions shall be furnished on the tank wall.

D. Transformers shall be of the oil immersed, sealed tank construction with two separate windings per phase.

E. Furnish each transformer with a pressure relief device to automatically relieve slow pressure build up in the transformer tank. A self-venting and resealing cover assembly is not acceptable.

2.3 HIGH VOLTAGE TERMINALS

A. Furnish each transformer with cover mounted porcelain insulated bushings with eyebolt connectors.

2.4 LOW VOLTAGE TERMINALS

A. Furnish each transformer with tank wall mounted fiberglass reinforced polyester or porcelain insulated bushings with eyebolt terminals arranged for vertical take-off. Furnish and install transformer tap with suitable lugs where connection to multiple conductors is required.

2.5 RATINGS

A. Transformer primary shall be rated 7,200 Volt, Single Phase for use on a 7,200/12,470 GrdY system.

B. The transformer primary Basic Impulse Insulation Level (BIL) shall be 95 KV.

C. Furnish transformers with two (2) 2-1/2 % taps above and two (2) 2-1/2% taps below rated primary voltage on the high voltage windings with an external tap changer for de-energized operation. All taps shall be full capacity taps.

D. Transformer insulation shall be rated 65^0 C rise over a 40^0 C ambient.

E. Secondary voltage will be 120/240 Volt, 1 Phase, 3 Wire or as indicated on the drawings.

2.6 ACCESSORIES

A. Furnish the following standard accessories with each transformer.

1. Instruction nameplates to include switch operating procedures, wiring diagram and the number of gallons of transformer oil.

2. Lifting lugs.

3. Support lugs (brackets).

4. Oil fill plug with cover ground strap.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install transformers on wood poles as indicated on the drawings, in accordance with manufacturer's written instructions and in accordance with ANSI Standards. Carefully install units so as to not scratch finishes. After installation, inspect finished surfaces and touch up any scratches with a finish furnished by the transformer manufacturer prepared especially for this purpose.

* END OF SECTION 16321 *

SECTION 16371 - OVERHEAD CONDUCTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplemental General Conditions, Division 1 Specification Sections and Section 16000 - General Provisions, Electrical apply to work of this section.

B. Section 16400 - Secondary Service and Distribution.

1.2 SCOPE

A. Furnish and install new overhead conductors of the sizes and types indicated on drawings and make all connections to equipment as shown.

PART 2 - PRODUCTS

2.1 BARE MEDIUM VOLTAGE CONDUCTORS

A. Field verify existing overhead medium voltage conductor size and type.

B. Reduction in conductor size for connections to fused switches, cutouts, transformers, etc, will not be permitted except as noted on drawings or as approved in writing by the Owner.

2.2 SPLICES AND CONNECTORS

A. Connectors and splices shall be of copper alloys for copper conductors or of aluminum alloys for aluminum composition conductors and shall be of a type designed to minimize galvanic corrosion for copper to aluminum conductors.

B. Splice materials, sleeves, fittings and connectors shall be noncorrosive and shall not adversely affect conductors.

C. Wire brush aluminum composition conductors and install oxide inhibitor before making connections. Connectors which are factory filled with an inhibitor are acceptable.

D. Make primary line apparatus taps by means of hot line clamps attached to compression type bail clamps (stirrups).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Form drip loops on conductors at entrances to buildings, cabinets or conduits.

B. Supports, connectors, clamps and ties shall be installed in accordance with the manufacturer=s written installation instruction and/or standard practice.

* END OF SECTION 16371 *

SECTION 16400 - SECONDARY SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplemental General Conditions, Division 1 Specification Sections and Section 16000 - General Provisions, Electrical apply to work of this section.

B. Section 16110 - Raceways

C. Section 16120 - Conductors

D. Section 16300 - Primary Service and Distribution.

1.2 SCOPE

A. Provide complete secondary electrical service as shown on drawings and as specified herein.

PART 2 - PRODUCTS

2.1 SYSTEM

A. The Secondary Electrical Distribution System will be 120/240 Volt, Single Phase, Three Wire, 60 Cycle for Lighting, Equipment, Appliances and Outlets.

2.2 FEEDERS

A. Sizes and connection of feeders are shown on the Power Riser Diagram. Feeders are sized to handle rated loads and to meet voltage drop conditions.

B. Do not install conductors of different sizes or types in the same conduits.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate electrical service and metering with the Owner prior to beginning work.

B. Arrange with the Owner for proper voltage.

3.2 FEEDERS

A. Before or during final job site observation, check each panel feeder and main feeder for balance of load on each phase, and make necessary adjustments to insure acceptable balance.

3.3 POWER OUTAGES

A. Power outages to existing buildings which remain will not be allowed except on weekends, holidays and/or as directed by the Owner.

1. Submit written requests for power outages to the Owner not less than Seven (7) working days prior to all proposed outages.

2. Do not take any power outages without the Owners permission.

* END OF SECTION 16400 *

SECTION 16426 - MODULAR METERING SWITCHGEAR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions, Supplemental General Conditions, Division 1 Specification Sections and Section 16000 - General Provisions, Electrical apply to work of this section.

1.2 SCOPE

A. Provide Modular Metering Switchgear for Owner=s metering of the electrical service to each classroom building as shown on the drawings and as specified herein.

1.3 SUBMITTALS

A. Provide shop drawing submittals for Metering Switchgear in accordance with Division 1 Specifications and Section 16000 - General Provision, Electrical to verify compliance with the Contract Documents and the referenced Standards.

B. Include dimensioned construction drawings to clearly indicate voltage, ampacities, materials, options, accessories, finishes, etc., to be provided. Include Series-Rated verification where required.

C. Include manufacturer and catalog number of meter sockets, circuit breakers, etc.

D. Include details of construction including shipping splits, bussing construction and ratings, conductor landing pads and termination locations with available wire bending space, available conduit entrance space, etc.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide hot-sequence metering switchgear suitable for use as Service Equipment on a 120/240 Volt, 1 Phase, 3 Wire distribution system, constructed in accordance with applicable UL, NEMA, ANSI and EUSERC Standards.

B. The metering switchgear, as a complete unit, shall be given a single short circuit current rating by the manufacturer equal to or greater than the available short circuit current at the metering switchgear as indicated on the drawings. Such rating shall be established by actual tests by the manufacturer, in accordance with UL specifications, on equipment constructed similarly to the subject switchgear.

2.2 ENCLOSURE

A. Metering switchgear shall be totally enclosed, dead front, totally front accessible, NEMA Type 3R rainproof.

B. Enclosures shall be constructed of formed and welded code gauge steel, finished with light gray paint in accordance with ANSI Standards.

C. Each compartment containing unmetered conductors or bussing shall be barriered and provided with sealing provisions.

D. Provide switchgear suitable for either overhead or underground load cable exit as shown on the drawings.

E. The metering switchgear may be shipped in individual sections for field installation by the contractor to form a single unit. Equipment shall be constructed to allow installation of units with different branch ratings in the same switchgear assembly.

2.3 BUSSING

A. Provide metering switchgear with plated aluminum or copper bussing of sufficient cross-sectional area to meet UL Standard 891 temperature rise criteria for multiple metering equipment.

B. Provide through bus to extend full length of the switchgear line-up, 100% rated through-out the line-up, with provisions for splicing on additional sections.

C. Provide full capacity neutral bus and ground bus sized in accordance with UL Standards to extend full length of the switchgear line-up.

2.4 METER SOCKETS

A. Provide meter sockets to meet the requirements of ANSI C12.7, Requirements for Watthour Meter Sockets and ANSI/UL 414 Standard for Safety, Standard for Meter Sockets.

B. Meter sockets shall be 4 jaw ring type with sealing ring and manual link bypass. Continuous current rating shall not be less than indicated on the drawings.

C. Provide cable or bussing from load side of meter socket to line side of tenant breaker.

2.5 CIRCUIT BREAKERS

A. Provide thermal-magnetic type circuit breakers, of the ratings shown on the drawings, for each feeder.

B. Provide multi-pole breakers with trip elements in each pole and common trip handle.

2.6 MAIN DEVICE SECTION

A. Provide bussed pull section for termination of underground or overhead service conductors as shown on the drawings. Provide screw type mechanical lugs as required for termination of the power company service conductors.

2.7 ACCEPTABLE MANUFACTURERS

A. Drawings and specifications are based on the use of Square D AEZ Meter-Pak Meter Centers@ and is intended to establish the type and quality of metering switchgear required for the project.

B. Other acceptable metering switchgear manufacturers, subject to compliance with the Contract Documents are Challenger, Cutler Hammer, General Electric, and Siemens.

2.8 KILOWATTHOUR DEMAND METER

A. Provide a General Electric Type IM-70-S, 3 wire, 1 phase, Class 100, Watthour meter with 120/240 Volt nameplate and Type M-90 Electronic 15 minute cumulative demand register for each service connected to the new metering switchgear.

   1. Other acceptable meter manufacturers, subject to compliance with the contract documents are ABB and Sangamo.

B. Program each meter as required to display actual values without use of a multiplier.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install metering switchgear as shown on the drawings and in accordance with the manufacturer's written instructions.

3.2 SUPPORTS

A. Provide a minimum of four supports, located at each corner of each section of the switchgear. Where the section exceeds 36 inches in any dimension, provide additional supports at 36 inches on center maximum.

* END OF SECTION 16425 *

SECTION 16450 - SECONDARY GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplemental General Conditions, Division 1 Specification Sections and Section 16000 - General Provisions, Electrical apply to work of this section.

1.2 SCOPE

A. Ground all non-current carrying metallic parts of electrical equipment, raceway systems and the neutral conductor of the wiring system as shown on the drawings and specified herein.

PART 2 - PRODUCTS

2.1 GROUND CONDUCTORS

A. Provide copper ground conductors, minimum No. 8 AWG solid. Stranded conductors may be used for sizes No. 2 AWG and larger.

2.2 GROUND CONNECTIONS

A. Make the electrical service ground connection at the metering switchgear and connect to ground rods as shown on the drawings and in accordance with NEC Article 250-52.

B. Make the electrical service ground connection at each classroom building and connect to metallic water service, and metal building structure, as shown on the drawings and in accordance with NEC Article 250-32.

C. Bond the neutral conductor to electrical service ground system at the main transformer and the main service equipment only.

D. Bond all interior metallic piping systems to the electrical service ground system.

E. Make above ground connections by means of pressure connectors, compression connectors, clamps or other means which are UL Listed and classified as suitable for purpose.

F. Make all underground connections by means of an exothermic welding process equal to Cadweld or Thermoweld, in strict accordance with manufacturer's written instructions and recommendations.

2.3 GROUND RODS

A. Provide copper ground rods, minimum 3/4" diameter and 10'-0" long, which conform to UL 467, Grounding and Bonding Equipment where indicated on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Leave ground connections accessible for inspection.

B. Connect grounding conductors for grounding receptacles, etc., to a ground terminal in the panelboard. Provide a separate ground terminal for each grounding conductor as it is brought into the panelboard.

C. Install ground rods minimum 8 feet into earth. Space adjacent ground rods minimum 6 feet apart.

D. Install all grounding in accordance with the latest edition of the National Electrical Code.

3.2 GROUND RESISTANCE MEASUREMENTS

A. Measure the resistance to ground using the fall-of-potential method described in IEEE No. 81. The resistance values, soil conditions at the time of measurement and the location of each ground rod shall be recorded and forwarded to the Owner and Engineer.

B. If a ground resistance of 25 Ohms or less cannot be obtained with the indicated ground electrodes, provide a supplementary ground electrode consisting of 3/4" x 10'-0" copper ground rods or deep driven sectional ground rods until a resistance of 25 Ohms or less is obtained. Total length of additional ground rods will not be required to exceed 30 feet. Space additional ground rods as evenly as possible and at least 6 feet from any other ground rods.

* END OF SECTION 16450 *

SECTION 16470 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplemental General Conditions, Division 1 Specification Sections and Section 16000 - General Provisions, Electrical apply to work of this section.

1.2 SCOPE

A. Provide new panelboards in modular classroom buildings, complete with all necessary accessories as shown on drawings and as specified herein.

1.3 SUBMITTALS

A. Provide shop drawing submittals, with modular classroom building submittals, for each Panelboard in accordance with Division 1 Specifications and Section 16000 - General Provision, Electrical to verify compliance with the Contract Documents.

B. Include dimensioned construction drawings for each Panelboard. Clearly indicate voltage, ampacities, breaker types, conduit entrance areas, materials, options, accessories, finishes, etc., to be provided with each Panelboard. Include Series-Rated verification where required.

PART 2 - PRODUCTS

2.1 PANELBOARDS

A. Provide dead front safety type panelboards, constructed in accordance with NEMA and UL standards, with plated aluminum or copper bus bars.

B. Provide each panelboard with main circuit breaker, single lugs or double lugs for attaching feeder conductors and/or sub-feeder conductors as shown on the drawings.

C. All panelboards to be 20" wide minimum.

D. Provide panelboards with NEMA 1 enclosures unless indicated otherwise on the drawings.

E. Arrange circuit breakers in double vertical row configuration with bolted bus connections.

F. Provide panelboard fronts with concealed indicating trim clamps, concealed steel door hinges and a flush mounted combination latch and lock. Key all locks alike for all panelboards furnished for the project.

G. Provide each panelboard with an approved circuit index holder with transparent protective cover on the inside of panelboard door.

H. Provide a ground bus in each panelboard with a separate terminal for connection of each feeder and each branch circuit ground conductor.

I. Provide panelboards with minimum 25% spare capacity (spare breakers or space for future breakers, but not less than 30 circuit capacity.

2.2 CIRCUIT BREAKERS

A. Provide thermal-magnetic type circuit breakers unless noted otherwise.

B. Provide multi-pole breakers with trip elements in each pole and common trip handle.

C. Provide "HACR" rated circuit breakers to serve heating, ventilating and air conditioning equipment branch circuits.

D. Provide "SWD" rated circuit breakers to serve all lighting and outlet branch circuits.

E. Plug-in breakers, tandem breakers, and split breakers are not acceptable.

2.3 INTERRUPTING RATING

A. The interrupting rating of circuit breakers shall be at least equal to the available short circuit current at the line terminals of the circuit breaker and correspond to the UL listed integrated short circuit current rating specified for the panelboards.

B. The minimum interrupting ratings of circuit breakers used as feeders and branches may be in accordance with UL 489 tested and certified series-connected circuit breaker combinations. All electrical equipment using the Series Rated circuit breaker combinations shall be clearly marked on the panel nameplate and feeder breaker indicating the same.

2.4 ACCEPTABLE MANUFACTURERS

A. Acceptable panelboard manufacturers, subject to compliance with the contract documents:
   1. Challenger
   2. Cutler Hammer
   3. General Electric
   4. Siemens
   5. Square 'D'.

PART 3 - EXECUTION

3.1 SUPPORTS

A. Provide a minimum of four supports, located at each corner of each panelboard. Where the enclosure exceeds 36 inches in any dimension, provide additional supports at 24 inches on center maximum.

3.2 SPARE CONDUITS

A. Stub empty conduits out from each flush mounted panelboard and extend into accessible area such that circuits can be installed without damaging finish of walls in the area surrounding the panelboard. Provide one 3/4" empty conduit for each three spare breakers and/or spaces provided in the panelboard.

1 MOUNTING HEIGHT

A. In general, mount panelboards 6 feet above finished floor or grade to top of panel.

B. Where panelboard exceeds 6 feet in height, arrange the panelboard so that the top operating handle does not exceed 6'-6" above finished floor or grade.

3.4 IDENTIFICATION

A. Provide engraved nameplates and neatly typed circuit index for each panelboard in accordance with Section 16195 - Electrical Identification.

* END OF SECTION 16470 *

SECTION 16500 - LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplemental General Conditions, Division 1 Specification Sections and Section 16000 - General Provisions, Electrical apply to work of this section.

1.2 SCOPE

A. Provide modular classroom building with all lighting fixtures, as shown on drawings and as described herein, complete with all necessary wiring, sockets, lamps, auxiliaries, supports, etc..

1.3 SUBMITTALS

A. Provide shop drawing submittals for each Fixture and Ballast type in accordance with Division 1 Specifications and Section 16000 - General Provision, Electrical to verify compliance with the Contract Documents.

B. Include Manufacturer's standard published literature for each fixture type. Clearly indicate all options, accessories, finishes, etc., to be provided with each fixture type.

PART 2 - PRODUCTS

2.1 FIXTURES

A. Provide fixtures which comply with the appropriate Underwriters Laboratories (UL) Standards for the fixture type and which are UL Listed and UL Labeled.

B. Acceptable fixture types are indicated on the drawings to establish the general fixture type required and does not relieve the contractor and/or supplier from the responsibility to provide all accessories and options included in the fixture description nor from meeting the requirements of this specification.

C. Provide individual fixtures with multiple ballasts as required to meet lamp switching requirements shown on the drawings.

2.2 FLUORESCENT BALLASTS

A. Provide UL Listed, CBM-Certified by ETL, Premium Class >P@, Solid State Electronic, fluorescent ballasts with Class 'A' sound rating which meet the energy efficient requirements of Public Law 100-357 (National Appliance Energy Conservation Amendment of 1988 to the Energy Policy and Conservation Act of 1987) for the lamp types to be served by the ballast.

B. Electronic Ballasts shall operate lamps at a frequency of 20 to 35 KHz with no detectable lamp flicker, shall comply with FCC and NEMA limits governing EMI and RFI, and shall not interfere with the operation of other normal electric and electronic equipment.

C. Ballasts shall be potted, in a steel case and contain no PCBs. Operating temperature of the ballasts shall not exceed 60^0 C at any point on the case during normal operation.

D. Provide fluorescent ballasts with the proper lamp circuit voltage and rating for the lamp types to be served by the ballast and with the following operating characteristics:

1.	Minimum Ballast Factor	0.88
2.	Minimum Power Factor	95%
3.	Maximum Total Harmonic Distortion (THD)	10%

E. Ballasts shall be marked with manufacturer's name, part number, supply voltage, power factor, open circuit voltage, current draw for each lamp type, UL listing, CBM Certification and Date of Manufacture Code.

F. Electronic Ballast Warranty shall be 5 Years from the "Date of Manufacture" Code on the ballast.

G. Fluorescent Ballasts shall be of U.S. Manufacture. Acceptable Manufacturers, subject to compliance with Contract Documents, are Advance, Magnetek and Motorola.

2.3 HIGH INTENSITY DISCHARGE (HID) BALLASTS

A. Provide UL Listed, High Power Factor, High Intensity Discharge (HID) Ballasts which conform to the applicable ANSI Designation for the wattage and type of lamp served.

B. Ballasts shall be marked with manufacturer's name, part number, supply voltage, power factor, open circuit voltage, current draw for each lamp type, UL listing and Date of Manufacture Code.

C. HID Ballasts shall contain no PCB's.

D. HID Ballast Warranty shall be 2 Years from the "Date of Manufacture" Code on the ballast.

2.4 LAMPS

A. Provide lamps of the Wattages, Types, and with color characteristics as indicated on the drawings.

B. Provide fluorescent lamps which conform to the Energy Policy Act of 1992 and the applicable ANSI Designations for the lamp wattage and type.

1. Fluorescent Lamps shall be compatible with supplied ballasts to meet the energy conservation requirements of Public Law 100-357.

C. Provide new fluorescent lamps with reduced mercury content, such as Phillips "Alto" Series Fluorescent Lamps, to meet the requirements of the EPA Resource Conservation Recovery Act for Toxic Characteristic Leaching Procedure.

1. Reduced mercury content lamps will not be required for lamp types which are not available from any of the acceptable lamp manufacturers with reduced mercury content.

D. Provide High Intensity Discharge (HID) lamps suitable for the installed burning position which conform to the applicable ANSI designations for the wattage and type of lamps specified on the drawings.

E. Acceptable Lamp Manufacturers, subject to compliance with the Contract Documents are General Electric, Phillips, Sylvania and Venture.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Properly center fixtures in each room. Where multiple fixtures occur, space them uniformly and in straight lines with each other.

B. Locate recessed ceiling light fixtures to center on a single tile or at the intersection of four tiles.

C. Carefully lay out all openings required for recessed lighting units. Cooperate with other contractors and make provisions for openings of exact dimensions required and provide all required plaster rings and ground frames to be inserted in openings.

D. Where lighting fixtures are shown to conflict with locations of structural members and mechanical or other equipment, provide adequate supports and wiring to clear same.

3.2 SUPPORTS

A. Provide all necessary connectors, straps, etc., for secure mounting of all fixtures.

B. Support fixtures installed in suspended grid type ceilings from building structure independent of the ceiling support system with a 12 gauge galvanized steel tie wire or #10 jack chain located at each corner of the fixture.

1. Secure lay-in troffer type fixtures to the ceiling grid by means of tee bar clips equal to Caddy #515 at each corner of the fixture. Tee bar clips which are furnished as an integral part of the fixture are acceptable.

2. Support surface mounted fluorescent fixtures from the building structure by means of independent support clips equal to Caddy No. IDS with proper stud length for fixture installed.

3.3 LAMP BURN-IN

A. Burn-in all fluorescent and HID lamps for a minimum of 100 hours prior to completion of the project and replace all defective lamps.

3.4 COORDINATION

A. Coordinate ceiling types with General Contractor and verify compatibility with fixture mounting provisions prior to ordering fixtures. Immediately notify the Architect in writing of any discrepancies between ceiling types and specified fixture types.

B. Verify available voltages and coordinate fixture voltage with the fixture supplier prior to ordering fixtures. Immediately notify the Architect in writing of any discrepancies between available voltages and the specified fixture voltages.

C. Coordinate fixture locations with other contractors to provide adequate clearance between fixtures and ductwork, piping, structural members, etc., for proper installation of fixtures and provide access for maintenance or replacement of the fixtures.

* END OF SECTION 16500 *

SECTION 16740 - TELECOMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplemental General Conditions, Division 1 Specification Sections and Section 16000 - General Provisions, Electrical apply to work of this section.

B. Section 16110 - Raceways

C. Section 16140 - Electrical Boxes

1.2 SCOPE

A. Provide complete telecommunication service to each classroom building including, but not limited to, telephone service cables, fiber optic service cables, cable splices, and cable terminations ready for connection to Owner furnished communication equipment as shown on the drawings and as specified herein.

B. Provide each classroom building with Telephone/Data outlets, cables, terminations and equipment ready for connection to Owner furnished equipment as shown on the drawings and as specified herein.

C. Install all telecommunication system cables in approved raceway systems.

D. All telecommunication system work, exclusive of raceway system and outlet boxes, shall be provided by a single qualified installer (company) to establish a single source of responsibility for all telecommunications system work.

1. Inside wiring for the modular classroom buildings may be installed at the modular building manufacturer=s production site or at the project site after the modular buildings are delivered and set in place. Coordinate requirements with the modular building manufacturer and the General Contractor.

1.3 STANDARDS

A. TIA/EIA-568 - Commercial Building Wiring Standard.

B. TIA/EIA-569 - Commercial Building Standard for Telecommunication Pathways and Spaces.

C. TIA/EIA-606 - Administrative Standard for the Telecommunications Infrastructure of Commercial Buildings.

D. NFPA 70-2002 - National Electrical Code

1.4 TELECOMMUNICATION CONTRACTOR QUALIFICATIONS

A. All telecommunication system work will be performed by Siemon Certified company regularly engaged in telecommunications systems installation and service with a documented work experience of not less than five years. Work experience shall include telecommunication systems using industry standard TIA/568B.

B. Submit telecommunication system contractor, qualifications and Siemon Company Certification with required shop drawing submittals.

1.5 SUBMITTALS

A. Provide telecommunication system shop drawing submittals in accordance with Division 1 Specifications and Section 16000 - General Provision, Electrical to verify compliance with the Contract Documents and the above referenced standards.

1. Provide 1 additional set of Telecommunication submittals to be reviewed by the Utah National Guard State Telecommunications.

B. Provide descriptive literature to verify the Telecommunication Contractor Qualifications including, but not limited to the following:

1. Experience of communications system contractor including verifiable experience for successful completion of projects using Industry Standard TIA/586B.
2. Qualifications of installing technician(s) including Siemon Company Certification.
3. Ability to provide The Siemon Company Warranty.

C. Provide manufacturers' catalogue and/or descriptive literature indicating specific model and/or catalog numbers, options, accessories and modifications for each of the following items:

1. Outside feed fiber optic cable.
2. Outside feed fiber optic cable fusion splice closures.
3. Fiber optic termination cabinet.
4. Outside feed telephone cables
5. Outside feed telephone cable splice closures.
6. Telephone surge protection modules and fuses.
7. Telephone termination patch block.
8. Inside wiring station cable.
9. Inside wiring station cable patch panels.
10. Telephone/Data outlet couplers and coverplates.
11. Color coded metal backboards.

D. Above list is considered minimum. Additional items may be required to be submitted for review.

E. Incomplete submittals will be considered non-responsive and returned to the contractor for inclusion of missing items.

1.6 WARRANTY

A. Provide 1 Year warranty for the entire telecommunication system in accordance with the General Conditions and Division 1 Specification Sections.

B. Provide a 20 Year premium Siemon Company warranty covering application assurance, product, cable, and labor in accordance with The Siemon Company published warranty.

1. The Siemon Company warranty requires that the telecommunication system be installed by Siemon Certified Installers in a registered cabling system using Siemon connecting hardware and qualified premium hardware.
2. Notify the Architect in writing of any changes or modifications to the contract documents

required for the Siemon Company warranty prior to installation of the telecommunication system.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Telecommunication system material and products specified by name of manufacturer, brand or trade name or catalogue reference is intended to establish the type, quality, and performance characteristics required for this project and will be the basis of the bid and furnished under the contract unless changed in writing by the Architect. Where two or more materials are named, the choice of these will be optional with the Contractor.

B. Submit requests for substitution in writing to the Architect, with copy to the Engineer, in accordance with the General Conditions.

1. Substitution of telecommunication system material and products will be limited manufacturers and products acceptable to the Siemon Company to provide the 20 year Siemon Company Warranty described above.

2.2 OUTSIDE FEED FIBER OPTIC CABLES

A. Provide Corning ALTOS/LST series outside feed fiber optic cables consisting of 62.5 micron optical fibers with 125 micron cladding in a 3.0 mm filled buffer tube, a dielectric central member, water swellable yarn, and filler tubes as required, surrounded by a water swellable tape and strength members, with an overall medium density polyethylene jacket with ripcord.

1. 4 Fiber Cable Corning # 004KS4-14130A20
2. 24 Fiber Cable Corning # 024KS4-14130A20

B. Provide Coyote 80805514 waterproof, reenterable, fusion type fiber optic cables splices, where indicated on the drawings, using equipment and tools specifically designed for the purpose. Provide all necessary accessories, tools, etc., required for the installation location and the quantity of cables to be spliced.

1. Do not splice fiber optic cables except where specifically indicated on the drawings. Additional splices must be approved in writing by the Owner.

C. Leave minium 20 foot maintenance loop of cable in each manhole.

2.3 FIBER OPTIC CABLE TERMINATION CABINETS

A. Terminate MDF fiber optic cables in a Secor (Corning Cable Systems) CCH-03U wall mounted interconnect center. Provide type CCH panels with SC compatible adapters and other accessories as required for the fiber optic cables to be terminated.

B. Terminate IDF fiber optic cables in a Secor (Corning Cable Systems) WIC-012 wall mounted interconnect center. Provide SC compatible adapters and other accessories as required for the fiber optic cables to be terminated.

2.4 OUTSIDE FEED TELEPHONE CABLES

A. Provide outside feed telephone cables suitable for direct burial and underground duct installation conforming to the requirements of REA PE89.

1. Assembled cable shall consist of #24 AWG solid annealed copper conductors with color coded polyolefin insulation. Pairs shall be arranged into groups not exceeding 25 pairs with each group having a color coded unit binder.
2. The core assembly shall be completely filled to minimize water entry and flow. The filling compound shall be compatible with all other cable components and shall not drip from an exposed end of the cable.
3. A non-hygroscopic dielectric tape shall be applied longitudinally with overlap over the core assembly.
4. A corrugated, copolymer coated, 0.008" thick aluminum tape shall be applied with overlap over the dielectric. The sheath interfaces shall be flooding with an adhesive water blocking compound.
5. A black low density polyethylene jacket shall be applied over the completed cable assembly.

B. Do not splice telephone cables except where specifically indicated on the drawings. Additional splices must be approved in writing by the Owner.

C. Leave minium 20 foot maintenance loop of cable in each manhole.

2.5 TELEPHONE SURGE PROTECTION MODULES

A. Terminate MDF outside feed telephone cables at each Building 617 in Avaya 107894966 100 pair surge protection module with 110 style terminations.

B. Terminate IDF outside feed telephone cables at each classroom building terminal backboard in a Marconi type R66P25QC 25 pair surge protection module with quick-connect clips, and connect to the building telephone termination patch block.

C. Provide 104 410 147 gas protection fuses as required to protect all outside feed cable pairs.

2.6 TELEPHONE TERMINATION PATCH BLOCK

A. Provide Siemon type SPB-V1 modular patch block with 25 pair female connector input wired to 24, 1 pair, 6 position, modular jacks in accordance with USOC wiring standards at each classroom building terminal backboard.

2.7 TELEPHONE/DATA INSIDE WIRING STATION CABLE

A. Provide CommScope Ultra II Enhanced Category 5e, Type 55N4R, inside station wiring cables consisting of #24 AWG, 100 Ohm solid copper conductors individually insulated with minimum .008" (.20 mm) polyethylene, formed into twisted pairs, stranded together to form the cable core, and covered with a flame retardant PVC jacket with ripcord.

   1. Provide telephone cables with yellow jacket and data cables with blue jacket and provide one of each cable color from each telephone/data outlet to the building terminal board.

B. Provide Cables which comply with National Electrical Code Article 800 for type CMR riser cables.

C. Provide cables which are UL Listed Category 5e in accordance with ANSI/EIA/TIA 568B.2-1.

D. Provide cables with band marked color coding for each twisted pair as follows:

1. Pair No. 1: Blue/White with blue tracer stripe
2. Pair No. 2: Orange/White with orange tracer stripe
3. Pair No. 3: Green/White with green tracer stripe
4. Pair No. 4: Brown/White with brown tracer stripe

2.8 INSIDE WIRING PATCH PANELS

A. Provide Siemon type HD5-89D-12 bracket mounted 12 port patch panels with T568B wiring, suitable for ANSI/EIA/TIA 568 Category 5E applications, with component and channel performance to 160 MHz, for termination of all inside wiring station cables.

2.9 TELEPHONE/DATA OUTLETS

A. Provide Siemon type CT-C5-C5-O2 angled double couplers with T568B wiring, and white finish mounted in a Siemon type CT2-FP-02 single gang faceplate with white finish at each wall mounted and each ceiling mounted telephone/data outlet.

B. Provide 2 Siemon type MX5-F02-D flat single couplers with T568B wiring, white finish, and protective rubber door mounted in a Siemon type MX-E2F-02 duplex mounting frame at each floor mounted telephone/data outlet.

C. All couplers shall be suitable for ANSI/EIA/TIA 568 Category 5E applications, with component and channel performance to 160 MHz.

2.10 TERMINAL BOARDS

A. Provide 3/4" thick, by 4 ft high CDX grade plywood terminal boards in each classroom building as indicated on the drawings. Mount top of terminal board at 6 ft above floor. Coat plywood terminal board with two coats of white fire retardant paint prior to installation of equipment and backboards.

B. Provide full module, color coded, metal backboards such as Allen Tel Products GB183 series, on each building terminal board of appropriate size and of quantities required for installation of telephone/data terminals, patch blocks, etc.. Leave space for future equipment and growth as available.

1. Provide green backboards at left end of terminal board for installation of outside feed cable termination devices.
2. Provide blue backboards in center of terminal board for installation of data cable patch panels.
3. Provide yellow backboards at right end of terminal board for installation of telephone cable patch panels.

C. Provide white metal spool backboard with cross connect wire distribution posts such as Allen Tel GB187B1 at the bottom each termination backboard.

2.11 RACEWAY SYSTEM

A. Provide a complete underground raceway system for communication service cables to each classroom building as specified in Section 16110 - Raceways, except that minimum conduit size will be 4".

B. Provide each modular classroom building with a complete telephone/data raceway system as specified in Section 16110 - Raceways, except minimum raceway size will be 3/4".

C. Provide each modular classroom building with an outlet box at each telephone/data outlet location as specified in Section 16130 - Electrical Boxes, except that minimum outlet box size will be 4" Square x 2-1/8" deep.

2.12 GROUNDING

A. Provide each modular classroom building with a #6 AWG insulated green ground conductor from the building to electrical panel to the building terminal board and terminate in a ground terminal suitable for connection of not less than four #6 AWG copper conductors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all communications systems equipments, cables, outlets, etc., in accordance with the applicable ANSI/TIA/EIA Standards, National Electrical Code, and in accordance with the manufacturer=s written installation instruction and recommendations.

3.2 PULL STRING

A. Provide a nylon or polypropylene pull string with not less than 200 lb tensile strength in all communication conduits. Leave 18 inches slack string coiled at each end of all raceways. Provide a hard cardboard tag for each raceway at all terminal boards, terminal cabinets, etc. to indicate location to which the raceway is connected.

3.3 COORDINATION

A. Coordinate installation of telecommunication system with the Utah National Guard (UTNG) prior to beginning work. Contact Mike Hansen (801) 523-4118.

B. Coordinate installation of raceway system with electrical contractor to provide required bending radius for cables, ample space for terminations, etc..

3.4 LABELING

A. Label each telephone/data outlet port, each cable at terminal board, and each port of modular patch panels with numbering system as designated by UTNG. Labels shall be printed self-adhesive labels as approved by the UTNG.

B. Label each outside feed communication cable in each manhole and at ech termination with identification of the location of the opposite end of the cable or cable designation as designated by owner. Labels shall be embossed aluminum or stainless steel tags attached to cable with cable tie wrap as approved by the UTNG

C. Provide additional labeling of communication equipment, cables, splices, etc., as recommended by TIA/EIA 606 Standards.

3.5 TESTING

A. The Siemon Certified telecommunication system technician shall provide testing of each communication cable after installation, terminations, and splices are completed to verify ability of the completed cable assembly to meet the applicable ANSI/TIA/EIA standards for the type of

cable, meet the performance parameters published by the cable manufacturer, and verify eligibility for the Siemon Company 20 year warranty.

1. Individually test each pair of conductors for multi-conductor cables.
2. Individually test each fiber of fiber optic cables.
3. Test equipment shall be approved by The Siemon Company for the 20 year warranty.

B. For cables which fail initial testing, replace cable terminations and/or splices and retest the cable. If more than two subsequent test failures occur, the cable shall be replaced without additional cost to the owner.

C. Provide a written test report for each tested cable and submit to UTNG and/or Engineer prior to Substantial Completion. Include copies of all test reports in the Operation and Maintenance Manuals.

* END OF SECTION 16740 *