



STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

Division of Facilities Construction and Management

DFCM

STANDARD LOW BID PROJECT Project Budgets Over \$100,000

February 3, 2010

HYRUM STATE PARK RESTROOM REPLACEMENT

DIVISION OF PARKS & RECREATION

HYRUM, UTAH

DFCM Project Number 09198510



TABLE OF CONTENTS

	<u>Page Numbers</u>
Title Sheet	1
Table of Contents	2
Notice to Contractors	3
Project Description	4
Project Schedule	5
Bid Form	6
Instructions to Bidders	8
Bid Bond	12
Instructions and Subcontractors List Form	13
Contractor's Agreement	16
Performance Bond	21
Payment Bond	22
Certificate of Substantial Completion	23
General Contractor Past Performance Rating Form	
Technical Specifications:	
Drawings:	

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/StdDocs/index.html> "Standard Documents" – "Reference Documents I" – "Item 6. Supplemental General Conditions" or are available upon request from DFCM:

DFCM Supplemental General Conditions dated July 1, 2009 *
DFCM Supplemental General Conditions dated July 15, 2008
DFCM General Conditions dated May 25, 2005
DFCM Application and Certification for Payment dated May 25, 2005.

*** NOTE: THE NEW SUPPLEMENTAL GENERAL CONDITIONS EFFECTIVE JULY 1, 2009 ADDRESSING HEALTH INSURANCE AND IMMIGRATION ARE REFERENCED AT THE LINK ABOVE.**

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:

HYRUM STATE PARK RESTROOM REPLACEMENT
DIVISION OF PARKS & RECREATION – HYRUM, UTAH
DFCM PROJECT NO: 09198510

Bids will be in accordance with the Contract Documents that will be available on **Wednesday February 3, 2010 at 2:00 PM**, and distributed in electronic format only on CDs from DFCM, 4110 State Office Building, Salt Lake City, Utah and on the DFCM web page at <http://dfcm.utah.gov>. For questions regarding this project, please contact Darrell Hunting, DFCM, at 801- 244-7647. No others are to be contacted regarding this bidding process. The construction estimate for this project is \$180,000.

A **mandatory** pre-bid meeting will be held at **10:00 AM on Monday February 8, 2010** at 405 West 300 South, Hyrum 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 Wednesday February 17, 2010** at DFCM, 4110 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.

A bid bond in the amount of five percent (5%) of the bid amount, made payable to the Division of Facilities Construction and Management on DFCM's bid bond form, shall accompany the bid.

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
Joanna Reese, Contract Coordinator
4110 State Office Building, Salt Lake City, Utah 84114

PROJECT DESCRIPTION

HYRUM STATE PARK RESTROOM REPLACEMENT CONSISTING OF:

1. Demolition of existing restroom facility.
2. Construction of new 512 square foot restroom facility including heating and ventilation.
 - A. Materials: Masonry walls, slab on-grade, pre-manufactured roof trusses with architectural asphalt shingles.
 - B. Men's room: (2) lavatories, (1) urinal, and (1) ADA accessible water closet.
 - C. Women's room: (2) lavatories with (2) sinks, (1) water closet and (1) ADA accessible water closet.
 - D. Showers: (1) ADA accessible shower room and (2) standard shower rooms.
 - E. Utility Room and Custodial Room.
3. Site improvements including utility connections, and new concrete sidewalks around building.

**PROJECT SCHEDULE**

PROJECT NAME: HYRUM STATE PARK RESTROOM REPLACEMENT
DIVISION OF PARKS & RECREATION – HYRUM, UTAH
DFCM PROJECT NO. 09198510

Event	Day	Date	Time	Place
Bidding Documents Available	Wednesday	February 3, 2010	2 :00 PM	DFCM 4110 State Office Bldg SLC, UT and the DFCM web site *
Mandatory Pre-bid Site Meeting	Monday	February 8, 2010	10:00 AM	405 West 300 South Hyrum, UT 84319
Last Day to Submit Questions	Wednesday	February 10, 2010	10:00 AM	<i>Darrell Hunting</i> – DFCM E-mail – dhunting@utah.gov
Addendum Deadline (exception for bid delays)	Monday	February 15, 2010	2:00 PM	DFCM web site *
Prime Contractors Turn In Bid and Bid Bond	Wednesday	February 17, 2010	3:00 PM	DFCM 4110 State Office Bldg SLC, UT
Sub-contractor List Due	Thursday	February 18, 2010	3:00 PM	DFCM 4110 State Office Bldg SLC, UT Fax 801-538-3677
Substantial Completion Date	Friday	May 21, 2010	5:00 PM	On site

* NOTE: 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 **Hyrum State Park Restroom Replacement – Division of Parks & Recreation – Hyrum, Utah DFCM Project No. 09198510** 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 Friday, May 21, 2010, should I/we be the successful bidder, and agree to pay liquidated damages in the amount of **\$250.00** 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 100% 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.

A bid bond properly signed by a qualified surety, as indicated on the DFCM Bid Bond form provided along with this Instruction to Bidders, in the amount of 5% of the bid, shall accompany the bid submission to DFCM. **THIS BID BOND MUST BE ON THE DFCM BID BOND FORM PROVIDED WITH THIS INSTRUCTION TO BIDDERS IN ORDER TO BE CONSIDERED AN ACCEPTABLE BID** unless only one bid is received by DFCM, or the failure to comply with the bid bond requirements is determined by the Director of DFCM to be nonsubstantial based on the following:

- (a) the bid bond is submitted on a form other than DFCM's required Bid Bond form and the bid bond meets all other requirements including being issued by a surety firm authorized to do business in the State of Utah and be listed in the U.S. Department of the Treasury Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies for an amount not less than the amount of the bond to be issued. A co-surety may be utilized to satisfy this requirement; and
- (b) the contractor provides a bid bond properly signed by a qualified surety and on the required DFCM Bid Bond form by the close of business of the next succeeding business day after the DFCM notifies the bidder of the defective bid bond.

3. Contract and Bond

The Contractor's Agreement will be in the form found 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. Permits

In concurrence with the requirements for permitting in the General Conditions, it is the responsibility of the Contractor to obtain the fugitive dust plan requirements from the Utah Division of Air Quality and the SWPPP requirements from the Utah Department of Environmental Quality and submit the completed forms and pay any permit fee that may be required for this specific project. Failure to obtain the required permit may result in work stoppage and/or fines from the regulating authority that will be the sole responsibility of the Contractor. Any delay to the project as a result of any such failure to obtain the permit or noncompliance with the permit shall not be eligible for any extension in the Contract Time.

11. Right to Reject Bids

DFCM reserves the right to reject any or all Bids.

12. Time is of the Essence

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

13. 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.

14. 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.

15. 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.

16. 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. 1953, 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: _____

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

NOTARY PUBLIC

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



Division of Facilities Construction and

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, based on the following:

DOLLAR AMOUNTS FOR LISTING

PROJECTS UNDER \$500,000: ALL FIRST-TIER SUBS \$20,000 OR OVER MUST BE LISTED
PROJECTS \$500,000 OR MORE: ALL FIRST-TIER 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.
- If there are no subcontractors for the job that are required to be reported by State law (either because there are no subcontractors that will be used on the project or because there are no first-tier subcontractors over the dollar amounts referred to above), then you do not need to submit a sublist. If you do not submit a sublist, it will be deemed to be a representation by you that there are no subcontractors on the job that are required to be reported under State law. At any time, DFCM reserves the right to inquire, for security purposes, as to the identification of the subcontractors at any tier that will be on the worksite.

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.

'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

INSTRUCTIONS AND SUBCONTRACTORS LIST FORM
Page No. 2

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	CONTRACTOR 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)

* Bidders may list "self", but it is not required.

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.

Table with 4 columns: 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 OWNER'S REFUSAL TO ENTER INTO A WRITTEN CONTRACT WITH BIDDER. ACTION MAY BE TAKEN AGAINST BIDDERS BID BOND AS DEEMED APPROPRIATE BY OWNER. ATTACH A SECOND PAGE IF NECESSARY.

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 and Supplemental General Conditions dated July 15, 2008 and July 1, 2009 ("also referred to as General Conditions") 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%

CONTRACTOR'S AGREEMENT
PAGE NO. 2

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 by _____. 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.

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

PAYMENT BOND

(Title 63, Chapter 56, U. C. A. 1953, 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, 1953, 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



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

**General Contractor Performance Rating Form**

Project Name:		DFCM Project#	
Contractor: (ABC Construction, John Doe, 111-111-1111)	A/E: (ABC Architects, Jane Doe, 222-222-2222)	Original Contract Amount:	Final Contract Amount:
DFCM Project Manager:		Contract Date:	
Completion Date:		Date of Rating:	

Rating Guideline	QUALITY OF PRODUCT OR SERVICES	COST CONTROL	TIMELINESS OF PERFORMANCE	BUSINESS RELATIONS
5-Exceptional	Contractor has demonstrated an exceptional performance level in any of the above four categories that justifies adding a point to the score. Contractor performance clearly exceeds the performance levels described as "Very Good"			
4-Very Good	Contractor is in compliance with contract requirements and/or delivers quality product/service.	Contractor is effective in managing costs and submits current, accurate, and complete billings	Contractor is effective in meeting milestones and delivery schedule	Response to inquiries, technical/service/administrative issues is effective
3-Satisfactory	Minor inefficiencies/errors have been identified	Contractor is usually effective in managing cost	Contractor is usually effective in meeting milestones and delivery schedules	Response to inquires technical/service/administrative issues is somewhat effective
2-Marginal	Major problems have been encountered	Contractor is having major difficulty managing cost effectively	Contractor is having major difficulty meeting milestones and delivery schedule	Response to inquiries, technical/service/administrative issues is marginally effective
1-Unsatisfactory	Contractor is not in compliance and is jeopardizing achievement of contract objectives	Contractor is unable to manage costs effectively	Contractor delays are jeopardizing performance of contract objectives	Response to inquiries, technical/service/administrative issues is not effective

1. Rate Contractors quality of workmanship, management of sub contractor performance, project cleanliness, organization and safety requirement.	Score
<u>Agency Comments:</u>	
<u>A & E Comments:</u>	
<u>DFCM Project Manager Comments:</u>	

2. Rate Contractor administration of project costs, change orders and financial management of the project budget.	Score
<u>Agency Comments:</u>	
<u>A & E Comments:</u>	
<u>DFCM Project Manager Comments:</u>	

3. Rate Contractor's performance and adherence to Project Schedule, delay procedures and requirements of substantial completion, inspection and punch-list performance.	Score
<u>Agency Comments:</u>	
<u>A & E Comments:</u>	
<u>DFCM Project Manager Comments:</u>	

4. Evaluate performance of contractor management team including project manager, engineer and superintendent also include in the rating team's ability to work well with owner, user agency and consultants.	Score
<u>Agency Comments:</u>	
<u>A & E Comments:</u>	
<u>DFCM Project Manager Comments:</u>	

5. Rate success of Contractor's management plan, completion of the plans mitigation of project risks and performance of value engineering concepts.	Score
<u>Agency Comments:</u>	
<u>A & E Comments:</u>	
<u>DFCM Project Manager Comments:</u>	

Signed by:	Date:	Mean Score
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Additional Comments:

**SPECIFICATIONS MANUAL
FOR:**

**HYRUM STATE PARK
RESTROOM REPLACEMENT
DFCM PROJECT #: 09198510**

**DATE OF PREPERATION:
DECEMBER 22, 2009**

**SKYLINE A/E/S, INC.
95 W. GOLF COURSE RD. SUITE 101
LOGAN, UT 84321
PROJECT #: 09-126**

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

TABLE OF CONTENTS

DIVISION 1 – GENERAL REQUIREMENTS

SOILS REPORT
ENERGY COMPLIANCE FORMS

DIVISION 2 – SITE CONSTRUCTION

SECTION 02080 – PIPED UTILITIES-BASIC MATERIALS AND METHODS
SECTION 02221 – PIPED BUILDING DEMOLITION
SECTION 02230 – SITE CLEARING
SECTION 02300 – EARTHWORK
SECTION 02553 – NATURAL GAS DISTRIBUTION
SECTION 02920 – LAWNS AND GRASSES

DIVISION 3 – CONCRETE

SECTION 03300 – CAST-IN-PLACE CONCRETE

DIVISION 4 – MASONRY

SECTION 04810 – UNIT MASONRY ASSEMBLIES

DIVISION 6 – WOOD AND PLASTICS

SECTION 06100 – ROUGH CARPENTRY
SECTION 06402 – INTERIOR ARCHITECTURAL WOOD WORK

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 07115 – BITUMINOUS DAMPPROOFING
SECTION 07210 – BUILDING INSULATION
SECTION 07311 – ASPHALT SHINGLES
SECTION 07620 – SHEET METAL FLASHING & TRIM
SECTION 07920 – JOINT SEALANTS

DIVISION 8 – DOORS AND WINDOWS

SECTION 08111 – STANDARD STEEL DOORS & FRAMES
SECTION 08560 – VINYL WINDOWS
SECTION 08711 – DOOR HARDWARE

DIVISION 9 – FINISHES

SECTION 09260 – GYPSUM BOARD ASSEMBLIES
SECTION 09310 – CERAMIC TILE
SECTION 09911 – PAINTING

DIVISION 10 – SPECIALTIES

SECTION 10155 – TOILET COMPARTMENTS

DIVISION 22 – PLUMBING

SEE PLUMBING DRAWINGS FOR SPECIFICATIONS

DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING

SEE MECHANICAL DRAWINGS FOR SPECIFICATIONS

DIVISION 16 - ELECTRICAL

16050 COMMON WORK RESULTS FOR ELECTRICAL
16060 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
16071 HANGARS AND SUPPORTS FOR ELECTRICAL SYSTEMS
16072 VIBRATION AND SEISMIC CONTROLS
16075 IDENTIFICATION FOR ELECTRICAL SYSTEMS
16120 LOW VOLTAGE ELECTRICAL POWER CONDUCTERS AND CABLE
16130 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
16140 WIRING DEVICES
16145 LIGHTING CONTROL DEVICES
16211 ELECTRICAL METERING
16442 PANELBOARDS
16511 INTERIOR LIGHTING

DIVISION 1 – GENERAL REQUIREMENTS

SOILS REPORT

ENERGY COMPLIANCE REPORT

Soil, Water and Foundation Study
for the
New Restroom Facility
At the Hyrum State Park
in
Hyrum, Utah

November 9, 2009
09-126





November 9, 2009

Division of Facilities Construction and Management
Darrell Hunting
4110 State Office Building
Salt Lake City, UT 84114

Subject: Soils and Foundation Report the New Restroom Facility at the Hyrum State Park in Hyrum, Utah (DFCM Project No. 091958510)

Dear Darrell Hunting,

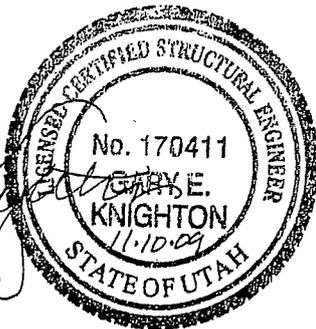
Submitted herewith is the report of our geotechnical engineering investigation for the subject site. This report contains the results of the findings and an engineering interpretation of the results with the respect to your project's characteristics to the extent that they have been made known to us. We have also included recommendations to aid in the design and construction of the soil related phases of this project.

We appreciate the opportunity to be of service to you on this project. If we can be of further assistance, or if you have any questions concerning this project, please do not hesitate to contact us.

Sincerely,

Skyline A/E/S, Inc.


Gary Knighton, P.E.




Lee Camp, E.I.T.

TABLE OF CONTENTS

1.0	Introduction -----	1
2.0	Existing Site Conditions -----	1-2
3.0	Design and Condition of Structures at the Site and on Nearby Properties --	2
4.0	Subsurface Exploration and Testing Programs -----	2
5.0	General Soil, Water, and Site Discussion-----	3
6.0	Structural Considerations-----	3
7.0	Construction, Structural Considerations & Cross-Sections-----	3-4
<hr/>		
8.0	Engineered-Fill, Roadbase and Compaction-----	5
9.0	Closure-----	6
10.0	Glossary/Explanation of Terms or Procedures-----	6-7

Appendix A

Plate 1 – Vicinity Map

Plate 2 – Existing Site Plan & Test Pit Locations

Appendix B

Soil Logs – Test Pits 1 - 2

Unified Soil Classification System

Soils and Foundation Report for a New Restroom Facility at the Hyrum State Park in Hyrum, Utah

1.0 Introduction

Skyline A/E/S, Inc. was contacted and asked to conduct a geotechnical engineering investigation at an existing restroom facility at the Hyrum State Park (*Park*) in Hyrum, Utah. The existing structure is located above the reservoir, on the west side of the boat dock. This building will be removed and a new restroom constructed. The new structure will be re-located about 10-15' away from the 'brow' and embankment overlooking Hyrum Reservoir. It will include new perimeter sidewalks. Please see the attached vicinity map, site plan, and soil logs in the Appendix.

The purpose of this study was to obtain information on the site conditions, conduct field and laboratory testing, perform engineering analysis, and to give recommendations regarding the design and construction of the proposed facility. Results of the field work, laboratory testing, site plans, and other pertinent information for the site are included in this report.

2.0 Existing Site Conditions

The study site is the area immediately around the existing restroom facility at the *Park*. The surrounding area is fully developed with a boat dock and fish cleaning facility to the east, a visitor center to the north, a large parking and drive to the east and day use sites to the west. All utilities are present including water, sewer, gas, telephone, and electrical.

The *Park* area slopes toward the reservoir. The study site and restroom are about 20' above the reservoir. A steep embankment (protected with rip-rap) is located within 6' of the south side of the structure.

Vegetation consists of lawn grass on the north and west, weedy species on the steep south embankment and large trees on the north and west (conifers and deciduous species). There are no springs, streams, or canals in the immediate vicinity of the site. The reservoir surface is well below the restroom site.

Seismically, the building site would be a *Seismic Design Category D* with a major fault line existing about 2 miles to the east. For seismic design, the soils at the *site* are *Site Class D* with site coefficients, F_a and F_v , of 1.03 and 1.60, respectively.

According to soil mappings by the U.S. Soil Conservation Service (SCS) in the 1970s, the site soils are classified as Provo Loam Series (PU). The surface soils are loams with some gravel and the deeper soils (below 3') become more gravelly. Permeability is moderate in the loams and rapid in the gravels. These soils are mildly alkaline and calcareous.

3.0 Design and Condition of Structures at the Site and on Nearby Properties

The *Park* area and facilities are in reasonable condition with no major problems. However, the steep embankment along the reservoir side of the existing restroom is vulnerable to erosion over time, and re-locating the facility away from the slope is advisable.

There are no known unusual water or unexplainable structural problems in this area of Hyrum. However, as with most areas, there are the normal problems with cracking and settling of asphalt and concrete structures. These defects are generally due to inadequate design, overloading, age or poor base preparation, and inadequate drainage. They can generally be avoided by good engineering, the proper use of fill materials, and an adequate quality control program during construction.

4.0 Subsurface Exploration and Testing Programs

Two test pits were excavated to 10-11' at the site, one on the southwest corner of the existing building and a second one on the northwest. Both test pits were excavated about 8-12' away from the existing footings. See the site sketch in the Appendix. A rubber tired backhoe with a 2' wide bucket was used for excavation.

The findings for the two test pits were very similar and can be summarized as follows:

- **0-0.5' depth;** pea gravel (test pit #1) or sod (#2)
- **0.5-3' depth;** dark brown gravelly clayey silt (loam), a GC, some moisture, tree roots, low plasticity fines
- **3-8' depth;** Poorly graded sandy gravel, a GP, cobbles, cementation of gravel, very stiff, dry. The footings should be placed on this native and undisturbed layer.
- **8-11' depth;** tan silty clay, an ML, saturated, moderately plastic, soft, cohesive. No groundwater found to 11'. The clay is probably saturated from watering during the growing season.

Please see the soil logs in the Appendix.

5.0 General Soil, Water, and Site Discussion

The site soils are satisfactory for the construction of a new restroom facility. The soils at footing depth (3-4' depth) are stiff cemented gravels, the deeper soils below 8' are cohesive clays and there is no water table to at least 11'. The site soils are well above the reservoir water surface.

The only concern is the steep erodible embankment along the south side of the facility. Also, the proximity of the restroom to this slope is a safety concern. The plan is to re-locate the restroom further to the north and away from the embankment.

6.0 Structural Considerations

The project will include a new restroom facility on the north side of the existing building. The construction of new sidewalks will also be required. The maximum wall loading will be about 1.5 klf.

For design purposes, the native and undisturbed silty gravels between 3-6' depth can be assumed to have a maximum bearing capacity of 2,000 psf.

If all report recommendations are followed and these maximum bearing capacities are used in the design, we estimate the maximum settlement of any structure to be no more than 1/2". Differential settlement should not exceed 1/4".

All footings which will be exposed to the full effects of frost should be established a minimum of three feet below the lowest adjacent final grade. Interior footings which are protected from the full effects of frost should be at least 18" below the finish grade.

Spread footings placed on prepared subgrade should have a minimum footing width of 18" for continuous footings, and 24" for isolated spot footings.

Continuous foundation walls should be reinforced to span an unsupported length of at least 10 feet. This is especially important where sewer and water line trenches are run under footings. The width of compacted fill beneath "spot" or interior footings should be equal to the width of the footing plus 2 feet.

Section 7.0 Construction Recommendations and Structural Sections

Before we begin this discussion, we recommend that the owner have a soils professional oversee the site work, especially footing preparation/construction.

The following is a listing and discussion of the construction procedure and minimum cross-sections for the various structures for this project:

A. Clearing, Grubbing, Filling and Rough Grading -

The existing restroom facility must be removed along with sidewalks. Care should be taken not to disturb the embankment on the south. Note: the footings are most likely bearing on gravels at about 3' below grade. Also, any trees or sod must be removed from the new building area. It is important to remove root balls from structural areas. Voids should be back-filled with compacted engineered fill (pit run).

At least 18" of topsoil should be removed across all structural areas. This excavation should be done with straight-bladed buckets so as not to disturb the underlying soils. Structural areas should then be brought to finish sub-grade using compacted pit run. The removed topsoil should be used for landscaping, backfilling in non-structural areas, or exported from the site.

B. Recommended Construction Procedure and Sections -

-
- Floor slabs: 4" of concrete over 4" of clean gravel over compacted pit run.
 - Footings: they should be founded on the native and undisturbed gravels/cobbles at 3-4' depth. If disturbed areas are found, they should be 'exed-out' and backfilled to design grade using compacted pit run.
 - Drives or Driveways: If asphalt, use 3" asphalt over 4" road base over at least 12" of pit run. If concrete, use 4" of air-entrained, fiber-mesh containing concrete (4,000 psi strength) over 3" of clean gravel over pit run. For moderate to heavily loaded areas, such as approaches, dumpster areas, etc., increase the asphalt thickness to at least 4" and concrete to at least 6". Reinforcement should be considered if concrete is used.
 - Sidewalks, Curb/gutters, Waterways, etc.: 4" of concrete over 4" of gravel over at least 12" of pit run.
 - Wall or Footing Backfill: fill in structural areas should be pit run compacted as in the chart in Section 8.0. In non-structural areas, the native soils can be used.
 - Utility Trenches: Use compacted pit run in structural areas and the site soils in the non-structural areas. Trench boxes or sloping of trench walls should be used for all work below 4' depth.
 - Landscaping: Use at least 12" of the site or imported topsoil.

8.0 Engineered Fill, Roadbase and Compaction

Engineered Fill Gradation Requirements

<u>Sieve Size</u>	<u>Percent Passing</u>
4"	70-100
1"	50-70
No. 4	30-50
No. 200	5-15

Crushed Gravel Gradation

<u>Sieve Size</u>	<u>Percent Passing</u>
1"	100
0.5"	70-100
No. 4	41-69
No. 16	21-41
No. 50	10-20
No. 200	4-9

SOIL AND ASPHALT COMPACTION		
Item	Specification	Rel. %
Under Footings and Slabs, structural fill	ASTM D - 1557	95
Wall Backfill, inside walls	ASTM D - 698	95
Trench Backfill under Structures	ASTM D - 698	95
Trench Backfill under Landscaping	ASTM D - 698	85
Under Asphalt	ASTM D - 1557	95
Asphalt	ASTM D - 1559	96
Curbs, gutters, and sidewalks	ASTM D - 698	95
Landscaping	ASTM D - 698	85

Note: all compaction should be done in 8" maximum lifts. Moisture should be adjusted to within + or - 2% of optimum moisture content. Lifts might have to be less if smaller compactors are used, i.e., "wackers", walk-behind plate compactors or lightweight "ram" type rollers.

9.0 Closure

The conclusions and recommendations presented in this report are based on the results of the field and laboratory tests which, in our opinion, define the characteristics of the soils at this site in a satisfactory manner. If during construction, conditions are encountered which appear to be different than those presented in this report, it is requested that our office be advised, in order that appropriate action be taken.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. Any persons using this report for bidding or construction purposes should perform independent investigations as they deem necessary to determine subsurface conditions.

10.0 Glossary/Explanation of Terms or Procedures

~~Throughout this report, we will be using a number of words or phrases. Also, several procedural concepts will be mentioned repeatedly. For this reason, we have decided to define or discuss these items in order to better communicate with the reader(s).~~

Compaction and Lift Size- Contractors should be aware that there is direct relationship between lift size and size of the compacting equipment. The smaller the compactor, the smaller the maximum lift height. With "wacker" compactors, the maximum lift should be held at about 3-4". With walk-behind trench compactors (2 ton or so), the lifts should be no more than 6" thick. Eight inch lifts can be used with large ride-on devices (7-10 tons or greater) that roll and vibrate/pound. Hoe pack devices on track hoes or backhoes can compact 6-8" lifts depending on size. However, the maximum lift size should not exceed 8" for any compactor. Note: a lift is defined as the loose or un-compacted thickness of the soil layer being compacted

Groundwater level- The groundwater level is a "rough guess" of where the uppermost water level is at. We look for the first sign of free water coming in from the trench walls or appearing on the soil. However, it is almost always **at or below** the piezowater level. As an example, the first water may be observed at some deeper depth, say 9' deep, but then the piezowater level rises to near the existing grade. This would mean that the groundwater was under some pressure, or about 9' of head. In this case, the soil may appear dry at 4-5' deep, but if excavated to 9', the groundwater may fill the excavation within several hours if the trench is not filled. In the soil logs, the groundwater level is identified by a solid or darkened triangle with a wavy line below it. Note: In permeable soils, such as sands and gravels, the groundwater and piezowater levels are usually at the same level. Finally, if the groundwater were above the piezowater level, it would suggest that the groundwater had been pumped "up" from recent loading by heavy equipment.

Liquifaction - Loss of bearing strength of saturated and very fine-grained silts and sands during severe earthquakes. This strength-loss is due to the slow dissipation of pore pressure (due to low permeability) and the subsequent reduction of particle-to-particle contact induced by the shaking motion of the earthquake.

Piezowater or Piezometer - Often, in clay soils, the groundwater is under pressure because of the tightness of the overlying clays; this is similar to an aquifer where the water is confined and under pressure. As in a confined aquifer, if a well is drilled or an excavation is made in clay soils, and the natural clay layers (are a hardpan) are removed, the groundwater may rise. In fact, it may rise to the surface grade or flood out over the surface. To measure this potential rise, after a soil test pit is excavated, a pipe (a piezometer) is placed in the pit (to 10' in this study) and left for at least 48 hours. The bottom 12" of the piezometer is slotted and capped to keep soil from entering. The piezometer is then backfilled. After 48 hours, the water level in the piezometer is recorded. This level is the piezowater level. It is often higher than the point where water is first seen in a test pit during excavation. The importance is that the piezometer level is the potential depth of the groundwater for a site location. However, this level may change over time depending on weather conditions (wet or dry years and periods). In the soil logs, the piezowater level is a line with an "open" triangle above it and a wavy line below the triangle. The "open" triangle signifies the fact that the overlying soil "cap" has been removed.

Topsoil - It is generally defined as surface soils (silts or clays) with greater than 2% organics; this soil is often dark brown to black in color. It generally has visible roots or organic matter and is highly compressible. Topsoil should never be used under a footing or load bearing structure; it is generally, too compressible. It should be stockpiled for use in landscaped areas, used for wetland mitigation/re-seeding, or exported from the site.

Undisturbed soil - This is soil in its natural state, undisturbed by past excavation, farming, construction, or perturbation of any type. It is a most important feature. Areas that have been filled are always considered disturbed. On the other hand, "cut" areas can be considered undisturbed if the soil was cut with a straight bladed bucket and not tines. If soils are disturbed, they must be re-compacted according to the chart in Section 8.0.

Appendix A

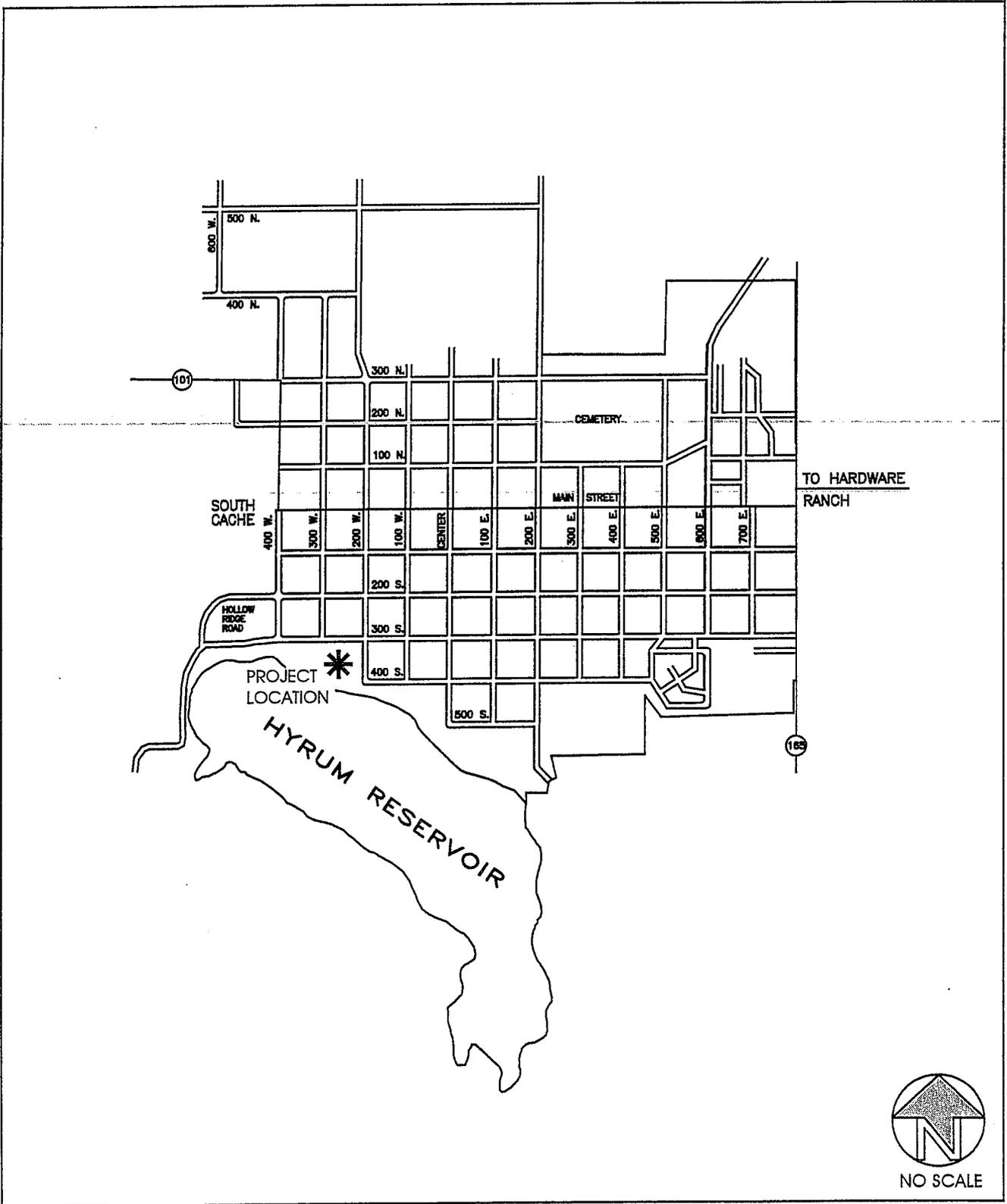


Skyline

A/E/S, INC.

Architecture / Engineering / Surveying

VICINITY MAP



NO SCALE

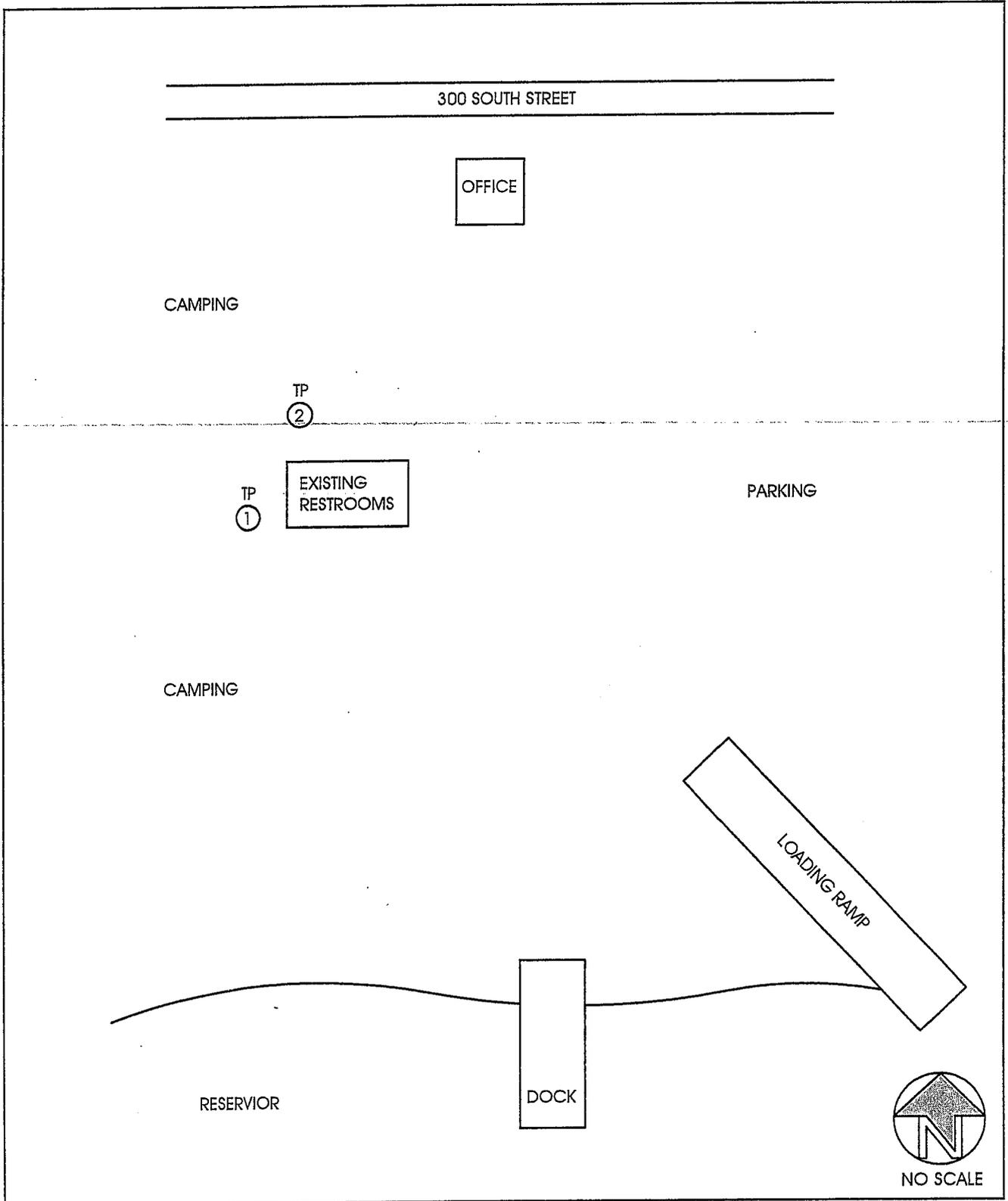


Skyline

A/E/S, INC.

Architecture / Engineering / Surveying

TEST PIT LOCATIONS



Appendix B



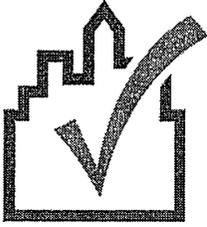
LOG OF TEST PIT

PROJECT: HYRUM STATE PARK RESTROOM															
LOCATION: SEE SITE PLAN						TEST PIT: 1		DATE: 10-30-09							
DEPTH IN FEET	SOIL PROFILE							BLOWS PER FOOT	DRY DENSITY lb/ft	MOISTURE CONTENT %	PLASTIC LIMIT %	LIQUID LIMIT %	PLASTIC INDEX	#200 SIEVE	OTHER TESTS
	DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL CLASSIFICATION	SAMPLE											
0	ELEVATION														
	NON-NATIVE PEA GRAVEL							ORIGINAL GRADE							
	DARK BROWN GRAVELLY CLAYEY SILT														
	POORLY GRADED SANDY GRAVEL, COBBLES, ROCKS TO 4", STIFF, CEMENTED, DRY							GC							
5								TAN SILTY CLAY, PLASTIC, SATURATED, COHESIVE							GP
	EXCAVATION STOPPED AT 10.5' NO GROUND WATER OBSERVED														ML
10															
EXCAVATION TYPE:								SPT - STANDARD PENETRATION TEST							
<input checked="" type="checkbox"/> BACKHOE				<input type="checkbox"/> PIEZOMETER INSTALLED				T - TORVANE (PSF)							
<input type="checkbox"/> BORING				<input checked="" type="checkbox"/> NO PIEZOMETER INSTALLED				P - PENETROMETER (PSF)							
JOB # 09-126.1				PLATE NO. X				C - DYNAMIC CONEHEAD							
								B - BAG G - GRAB							
								N - SPLIT SPOON SAMPLER							



LOG OF TEST PIT

PROJECT: HYRUM STATE PARK RESTROOM												
LOCATION: SEE SITE PLAN					TEST PIT: 2		DATE: 10-30-09					
DEPTH IN FEET	SOIL PROFILE										OTHER TESTS	
	DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL CLASSIFICATION	SAMPLE	BLOWS PER FOOT	DRY DENSITY lb/ft	MOISTURE CONTENT %	PLASTIC LIMIT %	LIQUID LIMIT %	PLASTIC INDEX		-#200 SIEVE
0	ELEVATION											
	DARK BROWN GRAVELLY CLAYEY SILT, ROCK TO 2"		GC									
5	NATIVE POORLY GRADED SANDY GRAVEL AND COBBLES, CEMENTED, VERY STIFF, MOSTLY DRY, ROCKS TO 4"		GP									
10	TAN SILTY CLAY, SATURATED, COHESIVE		ML									
	EXCAVATION STOPPED											
EXCAVATION TYPE:					SPT - STANDARD PENETRATION TEST							
<input checked="" type="checkbox"/> BACKHOE <input type="checkbox"/> PIEZOMETER INSTALLED <input type="checkbox"/> BORING <input checked="" type="checkbox"/> NO PIEZOMETER INSTALLED					T - TORVANE (PSF)							
					P - PENETROMETER (PSF)							
					C - DYNAMIC CONEHEAD							
					B - BAG G - GRAB							
					N - SPLIT SPOON SAMPLER							
JOB # 09-126.1			PLATE NO. X									



COMcheck Software Version 3.5.2

Interior Lighting Compliance Certificate

2006 IECC

Report Date: 12/23/09

Data filename: C:\Documents and Settings\All Users\Documents\Jobs\2009058 Hyrum Reservoir Restroom\02 Design\Hyrum RRR.cck

Section 1: Project Information

Project Type: **New Construction**

Project Title : Hyrum Reservoir Restroom

Construction Site:
Hyrum, UT

Owner/Agent:
Logan, UT

Designer/Contractor:
Shane Swenson
Sine Source Engineering
545 W 465 N
Suite 150
Providence, UT 84332
435-787-1445
shanes@sinesource.net

Section 2: General Information

Building Use Description by: **Activity Type**

<u>Activity Type(s)</u>	<u>Floor Area</u>
Warehouse	453

Section 3: Requirements Checklist

Interior Lighting:

1. Total proposed watts must be less than or equal to total allowed watts.

Allowed Watts	Proposed Watts	Complies
362	336	YES

Controls, Switching, and Wiring:

2. Independent controls for each space (switch/occupancy sensor).

Exceptions:

Areas designated as security or emergency areas that must be continuously illuminated.

Lighting in stairways or corridors that are elements of the means of egress.

3. Master switch at entry to hotel/motel guest room.
4. Individual dwelling units separately metered.
5. Each space provided with a manual control to provide uniform light reduction by at least 50%.

Exceptions:

Only one luminaire in space;

An occupant-sensing device controls the area;

The area is a corridor, storeroom, restroom, public lobby or sleeping unit.

Areas that use less than 0.6 Watts/sq.ft.

6. Automatic lighting shutoff control in buildings larger than 5,000 sq.ft.

Exceptions:

Sleeping units, patient care areas; and spaces where automatic shutoff would endanger safety or security.

7. Photocell/astronomical time switch on exterior lights.

Exceptions:

Lighting intended for 24 hour use.

8. Tandem wired one-lamp and three-lamp ballasted luminaires (No single-lamp ballasts).

Exceptions:

Electronic high-frequency ballasts; Luminaires on emergency circuits or with no available pair.

Section 4: Compliance Statement

Compliance Statement: The proposed lighting design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed lighting system has been designed to meet the 2006 IECC requirements in COMcheck Version 3.5.2 and to comply with the mandatory requirements in the Requirements Checklist.

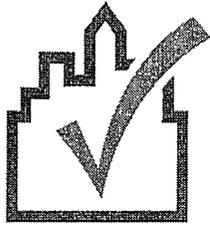
Shane Swenson, PE

Name - Title

Signature

12/23/09

Date



COMcheck Software Version 3.5.2

Interior Lighting Application Worksheet

2006 IECC

Report Date:

Data filename: C:\Documents and Settings\All Users\Documents\Jobs\2009058 Hyrum Reservoir Restroom\02 Design\Hyrum RRR.ock

Section 1: Allowed Lighting Power Calculation

A Area Category	B Floor Area (ft ²)	C Allowed Watts / ft ²	D Allowed Watts (B x C)
Warehouse	453	0.8	362
Total Allowed Watts =			362

Section 2: Proposed Lighting Power Calculation

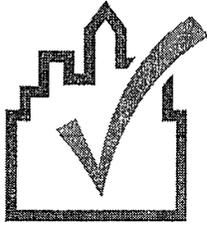
A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
Warehouse (453 sq.ft.)				
Linear Fluorescent 1: VS-132: Surface Mount: Vandal / 48" T8 32W / Electronic	1	3	28	84
Linear Fluorescent 1 copy 1: VW-232: Wall Wrap: Vandal / 48" T8 32W / Electronic	2	2	58	116
Linear Fluorescent 1 copy 2: S4-232: 4' Strip / 48" T8 32W / Electronic	2	1	58	58
Compact Fluorescent 1: RW-126: Recessed Can / Twin Tube 24/26/27W / Electronic	1	3	26	78
Total Proposed Watts =				336

Section 3: Compliance Calculation

If the Total Allowed Watts minus the Total Proposed Watts is greater than or equal to zero, the building complies.

Total Allowed Watts = 362
Total Proposed Watts = 336
Project Compliance = 26

Interior Lighting PASSES Design 7% better than code



COMcheck Software Version 3.5.2

Exterior Lighting Compliance Certificate

2006 IECC

Report Date: 12/23/09

Data filename: C:\Documents and Settings\All Users\Documents\Jobs\2009058 Hyrum Reservoir Restroom\02 Design\Hyrum RRR.ckk

Section 1: Project Information

Project Type: **New Construction**

Project Title : Hyrum Reservoir Restroom

Construction Site:
Hyrum, UT

Owner/Agent:
Logan, UT

Designer/Contractor:
Shane Swenson
Sine Source Engineering
545 W 465 N
Suite 150
Providence, UT 84332
435-787-1445
shanes@sinesource.net

Section 2: Exterior Lighting Area/Surface Power Calculation

A Exterior Area/Surface	B Quantity	C Allowed Watts / Unit	D Tradable Wattage	E Allowed Watts (C x D)	F Proposed Watts
Main entry/exit	10 ft of door width	30	Yes	300	100
Other entry/exit	13 ft of door width	20	Yes	260	100
Illuminated length of wall or surface	85 ft	5	No	425	0
Total Tradable Watts* =				560	200
Total Allowed Watts =				985	
Total Allowed Supplemental Watts** =				49	

* Wattage tradeoffs are only allowed between tradable areas/surfaces.

** A supplemental allowance equal to 5% of total allowed wattage may be applied toward compliance of both non-tradable and tradable areas/surfaces.

Section 3: Exterior Lighting Fixture Schedule

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
Main entry/exit (10 ft of door width): Tradable Wattage				
HID 1: OW-105: Wall Sconce / Metal Halide 50W / Electronic	1	2	50	100
Other entry/exit (13 ft of door width): Tradable Wattage				
HID 1 copy 1: OW-105: Wall Sconce / Metal Halide 50W / Electronic	1	2	50	100
Illuminated length of wall or surface (85 ft): Non-tradable Wattage				
Total Tradable Proposed Watts =				200

Section 4: Requirements Checklist

Lighting Wattage:

1. Within each non-tradable area/surface, total proposed watts must be less than or equal to total allowed watts. Across all tradable areas/surfaces, total proposed watts must be less than or equal to total allowed watts.

Compliance: Passes.

Controls, Switching, and Wiring:

- 2. All exemption claims are associated with fixtures that have a control device independent of the control of the nonexempt lighting.
- 3. All nonexempt lighting fixtures shall be controlled by a photosensor or astronomical time switch that is capable of automatically turning off the fixture when sufficient daylight is available or the lighting is not required.

Exterior Lighting Efficacy:

- 4. All exterior building grounds luminaires that operate at greater than 100W have minimum efficacy of 60 lumen/watt..
Exceptions:

Controlled by motion sensor or exempt from consideration under the provisions of Section 505.6.2.



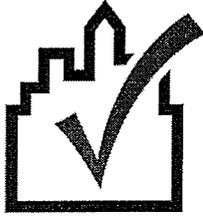
Section 5: Compliance Statement

Compliance Statement: The proposed exterior lighting design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed lighting system has been designed to meet the 2006 IECC requirements in COMcheck Version 3.5.2 and to comply with the mandatory requirements in the Requirements Checklist.

Shane Swenson, PE
Name - Title


Signature

12/23/09
Date



Envelope Compliance Certificate

2006 IECC

Section 1: Project Information

Project Type: **New Construction**

Project Title : HYRUM STATE PARK RESTROOM REPLACEMENT

Construction Site:
Hyrum, UT

Owner/Agent:
DFCM
Salt Lake City, UT

Designer/Contractor:
Skyline AES, Inc.
95 W. Golf Course Road Suite 101
Logan, UT 84341
435-752-8501

Section 2: General Information

Building Location (for weather data): **Hyrum, Utah**
Climate Zone: **6b**
Vertical Glazing / Wall Area Pct.: **2%**
Skylight Glazing / Roof Area Pct.: **1%**

<u>Activity Type(s)</u>	<u>Floor Area</u>
Warehouse	512

Section 3: Requirements Checklist

Envelope PASSES: Design 2% better than code.

Climate-Specific Requirements:

Component Name/Description	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor(a)
Orientation: NORTH					
Exterior Wall (North): Concrete Block:8", Partially Grouted, Cells Insulated, Normal Density, Furring: None	171	---	5.9	0.121	0.084
Window "A": Vinyl Frame: Double Pane, Tinted, SHGC 0.60	4	---	---	0.550	0.350
Window "A": Vinyl Frame: Double Pane, Tinted, SHGC 0.60	4	---	---	0.550	0.350
Orientation: EAST					
Exterior Wall (East): Concrete Block:8", Partially Grouted, Cells Insulated, Normal Density, Furring: None	192	---	5.9	0.121	0.084
Door #100: Insulated Metal, Swinging	21	---	---	0.600	0.700
Door #101: Insulated Metal, Swinging	21	---	---	0.600	0.700
Door #102: Insulated Metal, Swinging	21	---	---	0.600	0.700
Orientation: SOUTH					
Exterior Wall (South): Concrete Block:8", Partially Grouted, Cells Insulated, Normal Density, Furring: None	171	---	5.9	0.121	0.084
Window "A": Vinyl Frame: Double Pane, Tinted, SHGC 0.60	4	---	---	0.550	0.350
Window "A": Vinyl Frame: Double Pane, Tinted, SHGC 0.60	4	---	---	0.550	0.350
Orientation: WEST					
Exterior Wall (West): Concrete Block:8", Partially Grouted, Cells Insulated, Normal Density, Furring: None	192	---	5.9	0.121	0.084
Door #103: Insulated Metal, Swinging	21	---	---	0.600	0.700
Door #104: Insulated Metal, Swinging	21	---	---	0.600	0.700
Door #105: Insulated Metal, Swinging	21	---	---	0.600	0.700
Door #106: Insulated Metal, Swinging	21	---	---	0.600	0.700

Orientation: UNSPECIFIED ORIENTATION

Roof: All-Wood Joist/Rafter/Truss	709	30.0	0.0	0.034	0.034
Solatube: Other:Plastic, Clear, SHGC 0.21	2	---	---	0.550	0.900
Solatube: Other:Plastic, Clear, SHGC 0.21	2	---	---	0.550	0.900
Floor: Slab-On-Grade:Unheated, Vertical 2 ft.	91	---	10.0	---	---

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.

Air Leakage, Component Certification, and Vapor Retarder Requirements:

- 1. All joints and penetrations are caulked, gasketed or covered with a moisture vapor-permeable wrapping material installed in accordance with the manufacturer's installation instructions.
- 2. Windows, doors, and skylights certified as meeting leakage requirements.
- 3. Component R-values & U-factors labeled as certified.
- 4. Insulation installed according to manufacturer's instructions, in substantial contact with the surface being insulated, and in a manner that achieves the rated R-value without compressing the insulation.
- 5. No roof insulation is installed on a suspended ceiling with removable ceiling panels.
- 6. 'Other' components have supporting documentation for proposed U-Factors.
- 7. Stair, elevator shaft vents, and other outdoor air intake and exhaust openings in the building envelope are equipped with motorized dampers.
- 8. Cargo doors and loading dock doors are weather sealed.
- 9. Recessed lighting fixtures are: (i) Type IC rated and sealed or gasketed; or (ii) installed inside an appropriate air-tight assembly with a 0.5 inch clearance from combustible materials and with 3 inches clearance from insulation material.
- 10. Building entrance doors have a vestibule equipped with closing devices.
Exceptions:
 - Building entrances with revolving doors.
 - Doors that open directly from a space less than 3000 sq. ft. in area.
- 11. Vapor retarder installed.

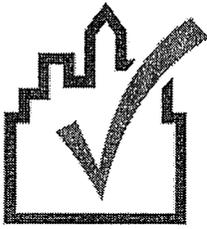
Section 4: Compliance Statement

Compliance Statement: The proposed envelope design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed envelope system has been designed to meet the 2006 IECC requirements in COMcheck Version 3.7.0 and to comply with the mandatory requirements in the Requirements Checklist.

COURTNEY WALLACE - PROJECT MANAGER
Name - Title

[Signature]
Signature

02/02/10
Date



COMcheck Software Version 3.7.0

Mechanical Compliance Certificate

2006 IECC

Section 1: Project Information

Project Type: **New Construction**

Project Title : Hyrum State Park Restroom Replacement

Construction Site:
Hyrum, UT

Owner/Agent:
DFCM

Designer/Contractor:
Kenneth Carrillo
Carrillo Engineering, P.C.
325 North 400 East
Hyde Park, UT 84318
(435)770-4702
kmcarrillo@comcast.net

Section 2: General Information

Building Location (for weather data): **Hyrum, Utah**
Climate Zone: **6b**

Section 3: Mechanical Systems List

Quantity System Type & Description

- | | |
|---|--|
| 1 | HVAC System 1: Heating: Duct Furnace, Gas, Capacity 125 kBtu/h, Efficiency: 80.00% Ec / Single Zone |
| 1 | Water Heating 1: Gas Storage Water Heater, Capacity: 60 gallons, Input Rating: 125 Btu/h w/ Circulation Pump, Efficiency: 95.00 % Et |

Section 4: Requirements Checklist

Requirements Specific To: HVAC System 1 :

1. Equipment minimum efficiency: Duct Furnace (Gas): 80.0 % Ec

Requirements Specific To: Water Heating 1 :

1. Hot water system sized per manufacturer's sizing guide
2. Gas Storage Water Heater efficiency: 80.0 % Et (170 SL, kBtu/h)
3. All piping in circulating system insulated
4. Hot water storage temperature adjustable down to 120 degrees F or lower
5. Automatic time control of heat tapes and recirculating systems present
6. Controls will shut off operation of circulating pump between water heater/boiler and storage tanks within 5 minutes after end of heating cycle

Generic Requirements: Must be met by all systems to which the requirement is applicable:

1. Load calculations per ASHRAE Fundamentals
2. Plant equipment and system capacity no greater than needed to meet loads
- Exception: Standby equipment automatically off when primary system is operating
 - Exception: Multiple units controlled to sequence operation as a function of load
3. Minimum one temperature control device per system
4. Minimum one humidity control device per installed humidification/dehumidification system
5. Automatic Controls: Setback to 55 degrees F (heat) and 85 degrees F (cool); 7-day clock, 2-hour occupant override, 10-hour backup
- Exception: Continuously operating zones
 - Exception: 2 kW demand or less, submit calculations

- 6. Outside-air source for ventilation; system capable of reducing OSA to required minimum
- 7. R-5 supply and return air duct insulation in unconditioned spaces R-8 supply and return air duct insulation outside the building R-8 insulation between ducts and the building exterior when ducts are part of a building assembly
 - Exception: Ducts located within equipment
 - Exception: Ducts with interior and exterior temperature difference not exceeding 15 degrees F.
 - Exception: Continuously welded and locking-type longitudinal joints and seams on ducts operating at static pressures less than 2 inches w.g. pressure classification
- 8. Mechanical fasteners and sealants used to connect ducts and air distribution equipment
- 9. Ducts sealed - longitudinal seams on rigid ducts; transverse seams on all ducts; UL 181A or 181B tapes and mastics
- 10. Operation and maintenance manual provided to building owner
- 11. Piping, insulated to 1/2 in. if nominal diameter of pipe is <1.5 in.; Larger pipe insulated to 1 in. thickness
- 12. Lavatory faucet outlet temperatures in public restrooms limited to 110 degrees F (43 degrees C)
- 13. Balancing devices provided in accordance with IMC (2006) 603.17
- 14. Stair and elevator shaft vents are equipped with motorized dampers
- 15. Exhaust air heat recovery included for systems 5,000 cfm or greater with more than 70% outside air fraction or specifically exempted

Section 5: Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2006 IECC requirements in COMcheck Version 3.7.0 and to comply with the mandatory requirements in the Requirements Checklist.

<p><u>Kenneth M. Carrillo, P.E.</u> Name - Title</p> <p><i>Mechanical Engineer</i></p>	<p><u><i>Kenneth M. Carrillo</i></u> Signature</p>	<p><u>12/23/07</u> Date</p>
--	--	---------------------------------

DIVISION 2 – SITE CONSTRUCTION

SECTION 02080 – PIPED UTILITIES-BASIC MATERIALS AND METHODS

SECTION 02221 – PIPED BUILDING DEMOLITION

SECTION 02230 – SITE CLEARING

SECTION 02300 – EARTHWORK

SECTION 02553 – NATURAL GAS DISTRIBUTION

SECTION 02920 – LAWNS AND GRASSES

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

SECTION 02080 - PIPED UTILITIES - BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Piping materials and installation instructions common to most piping systems.
 2. Transition fittings.
 3. Sleeves.
 4. Piped utility demolition.
 5. Metal supports and anchorages.

1.2 DEFINITIONS

- A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.
- B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

PART 2 - PRODUCTS

2.1 JOINING MATERIALS

- A. Refer to individual Division 2 piping Sections for special joining materials not listed below.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.
- C. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated;

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

and full-face or ring type, unless otherwise indicated.

- D. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- E. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- F. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- G. Brazing Filler Metals: AWS A5.8, BCuP Series, or BAg1, unless otherwise indicated.
- H. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- I. Solvent Cements for Joining Plastic Piping:
 - 1. ABS Piping: ASTM D 2235.
 - 2. CPVC Piping: ASTM F 493.
 - 3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - 4. PVC to ABS Piping Transition: ASTM D 3138.
- J. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

2.2 SLEEVES

- A. Mechanical sleeve seals for pipe penetrations are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- B. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- C. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- D. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D 1785, Schedule 40.
- G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

PART 3 - EXECUTION

3.1 PIPED UTILITY DEMOLITION

- A. Refer to Division 1 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

- B. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.
 - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 - 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make operational.
 - 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 2 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping to permit valve servicing.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches (50 mm) above finished floor level.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

- a. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.

J. Verify final equipment locations for roughing-in.

3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 2 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
 - 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 5. PVC Nonpressure Piping: Join according to ASTM D 2855.
 - 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

- K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
- L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End Pipe and Fittings: Use butt fusion.
 - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.
- M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
- 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
- 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 IDENTIFICATION

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
 - 1. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.
- 2. Locate pipe markers on exposed piping according to the following:
 - a. Near each valve and control device.
 - b. Near major equipment items and other points of origination and termination.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor piped utility materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

END OF SECTION 02080

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

SECTION 02221 - BUILDING DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes demolition and removal of the following:
 - 1. Buildings and structures.
- B. See Division 2 Section "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of building demolition.
- C. See Division 15 Sections for demolishing or relocating site mechanical items.
- D. See Division 16 Sections for demolishing or relocating site electrical items.

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or recycled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or recycled.

1.3 SUBMITTALS

- A. Proposed Protection and Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate. Include measures for the following:
 - 1. Environmental protection.
 - 2. Dust control.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

- B. Schedule of Building Demolition Activities: Indicate detailed sequence of demolition and removal work, with starting and ending dates for each activity, interruption of utility services, and locations of temporary protection and means of egress.

1.4 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Predemolition Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of Work.
- B. Owner will occupy another building immediately adjacent to demolition area. Conduct building demolition so Owner's operations will not be disrupted.
 - 1. Provide not less than **72** hours' notice to Owner of activities that will affect Owner's operations.
 - 2. Maintain access to existing walkways, exits, and other adjacent occupied or used facilities.
 - a. Do not close or obstruct walkways, exits, or other occupied or used facilities without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for buildings and structures to be demolished.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.

1.6 COORDINATION

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

- A. Arrange demolition schedule so as not to interfere with Owner's on-site operations.

PART 2 - PRODUCTS[(Not Used)]

2.1 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Division 2 Section "Earthwork."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Survey existing conditions and correlate with requirements indicated to determine extent of building demolition required.
- B. Inventory and record the condition of items to be removed and salvaged.
- C. When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element. Promptly submit a written report to Architect.

3.2 PREPARATION

- A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. If utility services are required to be removed, or relocated, before proceeding with building demolition provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
 - 3. Cut off pipe or conduit a minimum of **24 inches (610 mm)** below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit
- B. Existing Utilities: Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

- C. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

3.3 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, boat dock, building entries, and other building facilities during demolition operations.
- B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during demolition.
- C. Existing Utilities: Maintain utility services indicated to remain and protect them against damage during demolition operations.
 - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
- D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Division 1 Section "Temporary Facilities and Controls."
 - 1. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 2. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 3. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
 - 4. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.

3.4 DEMOLITION, GENERAL

- A. General: Demolish indicated existing buildings and structures completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 - 2. Maintain adequate ventilation when using cutting torches.
 - 3. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from building manager and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 - 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3.5 MECHANICAL DEMOLITION

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on next lower level.
- B. Concrete: Cut concrete full depth at junctures with construction indicated to remain, using power-driven saw, then remove concrete between saw cuts.
- C. Equipment: Disconnect equipment at nearest fitting connection to services, complete with service valves. Remove as whole units, complete with controls.
- D. Below-Grade Construction: Demolish foundation walls and other below-grade construction.
- E. Existing Utilities: Remove existing utilities to five foot outside of new foundation line, repair and cap ends for extension and connection to new facility.

3.6 SITE RESTORATION

- A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Division 2 Section "Earthwork."
- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.7 REPAIRS

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

- A. General: Promptly repair damage to adjacent construction caused by building demolition operations.
- B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
- C. Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.9 CLEANING

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

END OF SECTION 02221

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

SECTION 02230 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Protecting existing trees and grass to remain.
 2. Removing existing grass.
 3. Removing above- and below-grade site improvements.
 4. Disconnecting and capping or sealing site utilities.
 5. Temporary erosion and sedimentation control measures.

1.2 MATERIAL OWNERSHIP

- A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.3 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - EXECUTION

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

2.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly flag trees and vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

2.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to .
- B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

2.3 TREE PROTECTION

- A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.
- B. Do not excavate within tree protection zones, unless otherwise indicated.
- C. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

2.4 UTILITIES

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
 - 1. Arrange with utility companies to shut off indicated utilities.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

2.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

2.6 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

2.7 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 02230

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

SECTION 02300 - EARTHWORK

PART 1 - GENERAL

A. SUMMARY

- A. This Section includes the following:
1. Preparing subgrades for slabs-on-grade walks pavements lawns and grasses and exterior plants.
 2. Excavating and backfilling for buildings and structures.
 3. Drainage course for slabs-on-grade.
 4. Subbase course for concrete walks pavements.
 5. Subbase and base course for asphalt paving.
 6. Excavating and backfilling for utility trenches.

B. DEFINITIONS

- A. Backfill: Soil material used to fill an excavation.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Course placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions changes in the Work.
 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

above or below the ground surface.

- I. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

C. PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.

PART 2 - PRODUCTS

A. SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM AASHTO M 145 Soil Classification Groups A-1, A-2-4, A-2-5, and A-3, or a combination of these groups; free of rock or gravel larger than 6" in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve. Or as specified in the soils report, or as specified in soils report.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve. Or as specified in the soils report.
- H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve. Or as specified in the soils report.

B. ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility.

PART 3 - EXECUTION

A. PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 2 Section "Site Clearing."
- C. Protect and maintain erosion and sedimentation controls, which are specified in Division 2 Section "Site Clearing," during earthwork operations.

B. EXCAVATION

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

C. EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

D. EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

E. EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.
 1. Clearance: 12 inches (300 mm) each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material, 4 inches (100 mm) deeper elsewhere, to allow for bedding course.

F. SUBGRADE INSPECTION

- A. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

G. UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Compacted structural fill or lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Architect.
 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

H. STORAGE OF SOIL MATERIALS

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

I. UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 3 Section "Cast-in-Place Concrete.
- D. Place and compact initial backfill of subbase material, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the utility pipe or conduit.
 - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- E. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- F. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

J. SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
 - B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use engineered fill.
 - 4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

K. SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

- contain frost or ice.
- 2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

L. COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
 - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 - 2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 92 percent.
 - 3. Under lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 85 percent.
 - 4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

M. GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
 - 2. Walks: Plus or minus 1 inch (25 mm).
 - 3. Pavements: Plus or minus 1/2 inch (13 mm).
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

N. SUBBASE AND BASE COURSES

- A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase and base course under pavements and walks as follows:

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

1. Shape subbase and base course to required crown elevations and cross-slope grades.
2. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

O. DRAINAGE COURSE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 1. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

P. FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

Q. PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

R. DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 02300

HYRUM STATE PARK RESTROOM REPLACEMENT

SECTION 02553 - NATURAL GAS DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes piping, valves, and service regulators for natural gas distribution outside the building.

1.2 DEFINITIONS

- A. Gas Distribution: Piping from gas main to individual service-meter assemblies.
- B. Point of Delivery: Piping outlet from service-meter assembly.
- C. Natural Gas Piping: Piping that conveys natural gas from point of delivery to natural gas utilization devices inside the building.

1.3 PERFORMANCE REQUIREMENTS

- A. Minimum Working-Pressure Ratings:
 - 1. Service Meters: minimum, unless otherwise indicated.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. PE pipe and fittings.
 - 2. Valves.
 - 3. Service regulators. Indicate pressure ratings and capacities.
- B. Field quality-control test reports.

1.5 QUALITY ASSURANCE

HYRUM STATE PARK RESTROOM REPLACEMENT

- A. Comply with requirements of utility supplying natural gas and with authorities having jurisdiction for natural gas systems.

1.6 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

PART 2 - PRODUCTS

2.1 PIPES AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B; Schedule 40, black.
 - 1. Malleable-Iron Fittings: ASME B16.3, Class 150, standard pattern, with threads complying with ASME B1.20.1.
 - 2. Steel Flanges and Flanged Fittings: ASME B16.5.
 - 3. Unions: ASME B16.39, Class 150, black malleable iron; female pattern; brass-to-iron seat; ground joint.
- B. PE Pipe: ASTM D 2513, SDR 11.
 - 1. PE Fittings: ASTM D 2683, socket type or ASTM D 3261, butt type with dimensions matching ASTM D 2513, SDR 11, PE pipe.

2.2 VALVES

- A. Valves, General: Manual operation, suitable for natural gas service, and with **100-psig (690-kPa)** minimum working-pressure rating.
- B. Threaded Valves, **NPS 1 (DN 25)** and Smaller: Include listing by agency acceptable to authorities having jurisdiction.
- C. Earthquake Valves: ASCE 25, mechanical-operation and automatic-shutoff type with operating-pressure rating at least as great as system pressure.
 - 1. Pipe Connections:
 - a. **NPS 2 (DN 50)** and Smaller: Threaded.
 - b. **NPS 2-1/2 (DN 65)** and Larger: Flanged.

HYRUM STATE PARK RESTROOM REPLACEMENT

2.3 SPECIALTIES

- A. Valve Boxes: Cast-iron, two-section box. Include top section with cover with "GAS" lettering, bottom section with base to fit over valve and barrel **5 inches (125 mm)** in diameter, and adjustable cast-iron extension of length required for depth of bury. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head and with stem of length required to operate valve.
- B. Service Regulators: Natural gas service regulator complying with ANSI B109.4 or DIR 006.3-listed for service regulators.
 - 1. Construction: Single-stage, steel-jacketed, corrosion-resistant diaphragm type. Include atmospheric vent and elevation compensator.
 - 2. Pipe Connections: Threaded.
- C. Concrete Bases: Precast concrete made of **3000-psi- (20.7-MPa-)** minimum, 28-day compressive strength reinforced concrete; at least **4 inches (100 mm)** thick and **4 inches (100 mm)** larger in each dimension than supported item, unless otherwise indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.
- B. Close equipment shutoff valves before turning off gas to premises or piping section.
- C. Inspect natural gas piping according to fuel gas code to determine that natural gas utilization devices are turned off in piping section affected.
- D. Comply with fuel gas code requirements for prevention of accidental ignition.

3.2 PIPING APPLICATIONS

- A. Flanges, unions, and transition and special fittings with pressure ratings same as or higher than system pressure rating may be used, unless otherwise indicated.
- B. Aboveground Piping: Steel pipe, malleable-iron fittings, and threaded joints.
- C. Underground Piping: PE pipe, PE fittings, and heat-fusion joints.
- D. Underground-to-Aboveground Piping Connections: Service-line riser.

HYRUM STATE PARK RESTROOM REPLACEMENT

- E. PE-to-Steel Piping Connections: Transition fitting.

3.3 VALVE APPLICATIONS

- A. Drawings indicate types of shutoff valves to be used. If specific types are not indicated, the following requirements apply:
 1. Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping gas mains.
 2. Underground: Use PE valves.
 3. Aboveground, **NPS 2 (DN 50)** and Smaller: Lubricated tapered plug valves.

3.4 INSTALLATION

- A. Install underground, natural gas distribution piping buried at least [**36 inches (900 mm)**] below finished grade.
- B. Install underground, PE, natural gas distribution piping according to ASTM D 2774.
- C. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate would be subject to freezing.
 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than **3 inches (75 mm)** long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- D. Terminate service-regulator horizontal vents or horizontal vent piping with reducing-elbow fittings with large end as outlet. Install fitting outlet turned down with corrosion-resistant insect screen in outlet.
- E. Install PE shutoff valves on branch connections to existing underground, natural gas distribution piping. Install valves with valve boxes.
- F. Install metal shutoff valves on aboveground, natural gas distribution piping.
- G. Install earthquake valves aboveground, outside building, and according to listing applications.
- H. Refer to Division 2 Section "Piped Utilities -- Basic Materials and Methods" for basic piping joint construction.

HYRUM STATE PARK RESTROOM REPLACEMENT

- I. Connect gas distribution piping to natural gas source and extend to service-meter assemblies and points indicated. Connect to building's natural gas piping if it is installed; otherwise, terminate piping with caps, plugs, or flanges, as required for piping material. Refer to Division 15 Section "Fuel Gas Piping" for natural gas piping inside the building.
- J. Install unions adjacent to each valve and at final connection to each piece of equipment having threaded pipe connection.
- K. Do not use natural gas distribution piping as grounding electrode.
- L. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on or near each service regulator, service meter, and earthquake valve.
 - 1. Text: In addition to identifying unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- M. Warning Tapes: Arrange for installation of continuous, underground, detectable warning tape over natural gas distribution piping during backfilling of trenches for piping.

3.5 FIELD QUALITY CONTROL

- A. Test, inspect, and purge natural gas distribution according to requirements of fuel gas code and utility.
- B. Repair leaks and defective valves and specialties and retest system until no leaks exist.
- C. Report results in writing.
- D. Verify correct pressure settings for service regulators.

END OF SECTION 02553

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

SECTION 02920 - LAWNS AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes seeding and sodding.

1.2 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product certificates.
- C. Planting Schedule: Indicating anticipated planting dates.

1.4 QUALITY ASSURANCE

- A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.
- B. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Sod: Harvest, deliver, store, and handle sod according to requirements in TPI's "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in its "Guideline Specifications to Turfgrass Sodding."

1.6 LAWN MAINTENANCE

- A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

1. Seeded Lawns: 60 days from date of Substantial Completion.
 2. Sodded Lawns: 30 days from date of Substantial Completion.
- B. Mow lawn as soon as top growth is tall enough to cut. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings.

PART 2 - PRODUCTS

2.1 SEED

- A. Seed Species: State-certified seed of grass species.

2.2 TURFGRASS SOD

- A. Turfgrass Sod: Certified, complying with TPI's "Specifications for Turfgrass Sod Materials" in its "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

2.3 PLANTING MATERIALS

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth.
1. Topsoil Source: Reuse surface soil stockpiled on-site and supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Verify suitability of stockpiled surface soil to produce topsoil.
 2. Topsoil Source: Amend existing in-place surface soil to produce topsoil. Verify suitability of surface soil to produce topsoil. Surface soil may be supplemented with imported or manufactured topsoil from off-site sources.
- B. Inorganic Soil Amendments:
1. Lime: ASTM C 602, Class T or O, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.
 2. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 (3.35-mm) sieve and a maximum 10 percent passing through No. 40 (0.425-mm) sieve.
 3. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
 4. Aluminum Sulfate: Commercial grade, unadulterated.
- C. Organic Soil Amendments
1. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8.
 2. Peat: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with pH range of 3.4 to 4.8.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

3. Peat: Finely divided or granular texture, with pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having water-absorbing capacity of 1100 to 2000 percent.
 4. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.

- D. Fertilizer:
 1. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 10 percent phosphoric acid.
2. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
 3. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium.
 4. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium.

- E. Mulches:
 1. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
2. Peat Mulch: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with pH range of 3.4 to 4.8.
3. Peat Mulch: Finely divided or granular texture, with pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having water-absorbing capacity of 1100 to 2000 percent.
 4. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8.

PART 3 - EXECUTION

3.1 LAWN PREPARATION

- A. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches (150 mm) . Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 1. Apply fertilizer directly to subgrade before loosening.
 2. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.

- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.

- C. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

- D. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

3.2 SEEDING

- A. Sow seed at the rate of 3 to 4 lb/1000 sq. ft. (1.4 to 1.8 kg/92.9 sq. m).
- B. Rake seed lightly into top 1/8 inch (3 mm) of topsoil, roll lightly, and water with fine spray.
- C. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre (42 kg/92.9 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.
- D. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak and scatter uniformly to a depth of 3/16 inch (4.8 mm) and roll to a smooth surface.

3.3 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 - 1. Lay sod across angle of slopes exceeding 1:3.
- 2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below sod.

3.4 SATISFACTORY LAWNS

- A. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).
- B. Satisfactory Sodded Lawn: At end of maintenance period, a healthy, well-rooted, even-colored, viable lawn has been established, free of weeds, open joints, bare areas, and surface irregularities.
- C. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

END OF SECTION 02920

DIVISION 3 – CONCRETE

SECTION 03300 – CAST-IN-PLACE CONCRETE

HYRUM STATE PARKS RESTROOM REPLACEMENT
#09198510

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. See Division 2 Section "Earthwork" for drainage fill under slabs-on-grade.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture.
- C. Shop Drawings: For steel reinforcement.
- D. Material test reports certificates.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- C. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material.

HYRUM STATE PARKS RESTROOM REPLACEMENT
#09198510

Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, I/II:
- B. Normal-Weight Aggregates: ASTM C 33, graded, 3/4-inch (19-mm) nominal maximum coarse-aggregate size.
 - 1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.4 CURING MATERIALS

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

HYRUM STATE PARKS RESTROOM REPLACEMENT
#09198510

- B. Water: Potable.
- C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- D. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.5 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Proportion normal-weight concrete mixture as follows:
 - 1. Minimum Compressive Strength: 4000 psi (27.6 MPa) 3000 psi (20.7 MPa) at 28 days.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Slump Limit: 4 inches (100 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
 - 4. Air Content: 5 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.
 - 5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

2.6 FABRICATING REINFORCEMENT

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

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment,

HYRUM STATE PARKS RESTROOM REPLACEMENT
#09198510

elevation, and position indicated, within tolerance limits of ACI 117.

- C. Chamfer Do not chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

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

3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.5 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as

HYRUM STATE PARKS RESTROOM REPLACEMENT
#09198510

indicated. Deposit concrete to avoid segregation.

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

C. Cold-Weather Placement: Comply with ACI 306.1.

D. Hot-Weather Placement: Comply with ACI 301.

3.6 FINISHING FORMED SURFACES

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

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

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.7 FINISHING FLOORS AND SLABS

HYRUM STATE PARKS RESTROOM REPLACEMENT
#09198510

- A. General: Comply with ACI 302.1R recommendations for screeding, restraigthening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraigten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
- C. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

3.8 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.9 CONCRETE SURFACE REPAIRS

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

HYRUM STATE PARKS RESTROOM REPLACEMENT
#09198510

3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
 - 1. Testing Services: Tests shall be performed according to ACI 301.

END OF SECTION 03300

DIVISION 4 – MASONRY

SECTION 04810 – UNIT MASONRY ASSEMBLIES

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

SECTION 04810 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

A. SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
 - 1. Concrete masonry units (CMUs).

B. SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for each type and color of exposed masonry units.
- C. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.
- D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

C. PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

A. COLORS, TEXTURES, AND PATTERNS

- A. Exposed Masonry Units: Standard block.

B. CONCRETE MASONRY UNITS (CMUs)

- A. Shapes: Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions. Provide radiused bullnose at exterior exposed corners.
- B. Concrete Masonry Units: ASTM C 90.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

1. Weight Classification: Normal weight, Type 1.
2. A minimum average net area compressive strength of 2100 psi is required at 28 days.

C. MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate for Mortar: ASTM C 144.

1. For joints less than 1/4 inch (6.5 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

D. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

E. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

F. Water: Potable.

D. REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M, A 616/A 616M or A 617/A 617M, Grade 60 (Grade 400).

E. TIES AND ANCHORS

A. Materials:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with Division 7 Section "Sheet Metal Flashing and Trim."

1. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches (75 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

- C. Flexible Flashing: For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:
 - 1. Copper-Laminated Flashing: copper sheet bonded with asphalt between 2 layers of glass-fiber cloth.
 - 2. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film .
 - 3. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy 0.025 inch (0.6 mm) thick, with a 0.015-inch- (0.4-mm-) thick coating of rubberized-asphalt adhesive.
 - 4. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch (1.0 mm) thick.
- D. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."
- E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer.

F. MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains from new masonry without damaging masonry. Use product approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

G. MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Limit cementitious materials in mortar for masonry to portland cement and lime.
 - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Mortar for Unit Masonry: Comply with ASTM C 270 Proportion Specification.

PART 3 - EXECUTION

A. INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

- B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
- C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.
- D. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
 - 1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
- E. Walls shall comply with fire resistant rating per ASTM E119.
- F. All masonry products shall be protected from rain.

B. LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
- E. Brace all walls that are subject to lateral forces.

C. QUALITY CONTROL / TESTING

A. Cmu tests shall be conducted according to ASTM C140.

- B. Tolerance tests for grout shall be in accordance to ACI 530.1/ASCE 6/TMS 602 should be performed.

D. CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 2. Protect adjacent surfaces from contact with cleaner.
3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
4. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

E. MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
1. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.
 2. Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04810

DIVISION 6 – WOOD AND PLASTICS

SECTION 06100 – ROUGH CARPENTRY

SECTION 06402 – INTERIOR ARCHITECTURAL WOOD WORK

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wood framing.
2. Wood sheathing.

1.2 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product indicated.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses.

C. Research/Evaluation Reports: For the following:

1. Treated wood.
2. Engineered wood products.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Metal framing anchors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive stained or natural finish, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Provide dressed lumber, S4S, unless otherwise indicated.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

- B. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
- C. Wood Structural Panels:
 - 1. Plywood: DOC PS 2, unless otherwise indicated.
 - 2. Oriented Strand Board: DOC PS 2.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPAC2 (lumber), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPAC31 with inorganic boron (SBX).
- B. Mark each treated item with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
- C. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood members in contact with masonry or concrete.

2.4 DIMENSION LUMBER

- A. General: Of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.
- B. Framing Other Than Non-Load-Bearing Partitions: Construction or No. 2 .
 - 1. Douglas fir-larch, WCLIB, or WWPA.

2.5 TIMBER AND MISCELLANEOUS LUMBER

- A. Provide miscellaneous lumber for support or attachment of other construction, including the following:
 - 1. Blocking.

2.6 SHEATHING

- A. Plywood Roof Sheathing: Exterior, Structural I sheathing.
- B. Oriented-Strand-Board Roof Sheathing: Exposure 1, Structural I sheathing.

2.7 MISCELLANEOUS MATERIALS

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

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

2. Power-Driven Fasteners: CABO NER-272.
 3. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- B. Metal Framing Anchors: Made from hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 1. CABO NER-272 for power-driven fasteners.
 2. Published requirements of metal framing anchor manufacturer.
3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in the Uniform Building Code.
 4. Table 2305.2, "Fastening Schedule," in the BOCA National Building Code.
 5. Table 2306.1, "Fastening Schedule," in the Standard Building Code.
 6. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in the International One- and Two-Family Dwelling Code.
- C. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
- D. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.
- E. Fastening Methods:
 1. Sheathing: Nail to wood framing.

END OF SECTION 06100

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes interior woodwork including for the following applications:
 - 1. Solid-surfacing-material countertops.
- B. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips, unless concealed within other construction before woodwork installation.

1.2 SUBMITTALS

- A. Product Data: For the following:
 - 1. Finishing materials and processes.
- B. Shop Drawings: Include location of each item, plans and elevations, large-scale details, attachment devices, and other components.
- C. Samples:
 - 1. Solid-surfacing materials.

1.3 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install Solid surface materilas until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ANSI Z124.3, for Type 5 or Type 6 material and performance requirements, without a precoated finish.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Avonite, Inc.; Avonite.
 - b. DuPont Polymers; Corian.
 - c. Formica Corporation; Surell.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

- d. Swan Corporation (The); Swanstone.
- e. Wilsonart International, Div. of Premark International, Inc.; Gibraltar.

2.2 FABRICATION

- A. General: Complete fabrication to maximum extent possible before shipment to Project site. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.
 - 1. Shop cut openings to maximum extent possible. Sand edges of cutouts to remove splinters and burrs.
- B. Solid-Surfacing-Material Countertops:
 - 1. Solid-Surfacing-Material Thickness: 1/2 inch (13 mm).
 - 2. Colors, Patterns, and Finishes: As indicated by manufacturer's designations.
 - 3. Fabricate tops in one piece with shop-applied backsplashes and edges, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Countertops: Anchor securely by screwing through supports into underside of countertop. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."

END OF SECTION 06402

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 07115 – BITUMINOUS DAMPPROOFING

SECTION 07210 – BUILDING INSULATION

SECTION 07311 – ASPHALT SHINGLES

SECTION 07620 – SHEET METAL FLASHING & TRIM

SECTION 07920 – JOINT SEALANTS

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

SECTION 07115 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes cold-applied, emulsified asphalt dampproofing.

1.2 SUBMITTALS

- A. Product Data: For each product indicated.

PART 2 - PRODUCTS

2.1 BITUMINOUS DAMPPROOFING

- A. Cold-Applied, Emulsified-Asphalt Dampproofing:
 - 1. Trowel Coats: ASTM D 1227, Type II, Class 1.
 - 2. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.

2.2 MISCELLANEOUS MATERIALS

- A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.

PART 3 - EXECUTION

3.1 APPLICATION, GENERAL

- A. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.
- B. Apply dampproofing to footings and foundation walls from finished-grade line to top of footing, extend over top of footing.
 - 1. Extend 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
- C. Apply dampproofing to provide continuous plane of protection on exterior face of inner wythe of exterior masonry cavity walls.

3.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. On Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal./100 sq.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

ft. (0.6 L/sq. m) for first coat and 1 gal./100 sq. ft. (0.4 L/sq. m) for second coat, one fibered brush or spray coat at not less than 3 gal./100 sq. ft. (1.2 L/sq. m), or one trowel coat at not less than 4 gal./100 sq. ft. (1.6 L/sq. m).

- B. On Concrete Backup for Stone Veneer Assemblies: Apply one brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).

3.3 INSTALLATION OF PROTECTION COURSE

- A. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing material manufacturer's written recommendations for attaching protection course. Support protection course with spot application of trowel-grade mastic where not otherwise indicated.

END OF SECTION 07115

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Foundation wall insulation (supporting backfill).
 - 2. Concealed building insulation.
 - 3. Loose fill concrete block insulation.

1.2 SUBMITTALS

- A. Product Data: For each product indicated.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84 for surface-burning characteristics, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

PART 2 - PRODUCTS

2.1 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements.
- B. Extruded-Polystyrene Board Insulation: at perimeter foundation wall, ASTM C 578, Type IV, R value of 5 per inch.
- C. Kraft faced fiberglass blanket insulation. for roof insulation.
- 1.Faced Mineral-Fiber Blanket Insulation: R-30, Attic insulation, ASTM C 665, Type II, Class C.
- D. Perlite loose-fill masonry insulation: at CMU wall cavity, lightweight, per ASTM C549.

2.2 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

PART 3 - EXECUTION

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

3.1 INSTALLATION

- A. General: Install insulation to comply with insulation manufacturer's written instructions applicable to products and application indicated. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- B. Install perimeter insulation on vertical surfaces by setting units in adhesive.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.
 - 2. For wood-framed construction, install mineral-fiber blankets according to ASTM C 1320 and as follows:
 - a. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.

END OF SECTION 07210

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

SECTION 07311 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Asphalt shingles.
 - 2. Felt underlayment.
 - 3. Self-adhering sheet underlayment.

1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Samples: For asphalt shingles.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain ridge and hip cap shingles through one source from a single asphalt shingle manufacturer.
- B. Fire-Test-Response Characteristics: Provide asphalt shingle and related roofing materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.

1.4 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials within specified warranty period.
 - 1. Material Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Laminated-Strip Asphalt Shingles: ASTM D 3462, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

2.2 UNDERLAYMENT MATERIALS

- A. Felts: ASTM D 226, Type I, asphalt-saturated organic felts, nonperforated.

2.3 ACCESSORIES

- A. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized steel wire shingle nails, minimum 0.120-inch- (3-mm-) diameter, barbed shank, sharp-pointed, with a minimum 3/8-inch- (9.5-mm-) diameter flat head and of sufficient length to penetrate 3/4 inch (19 mm) into solid wood decking or extend at least 1/8 inch (3 mm) through OSB or plywood sheathing.

- 1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

- B. Felt Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized steel wire with low profile capped heads or disc caps, 1-inch (25-mm) minimum diameter.

2.4 METAL FLASHING AND TRIM

- A. Sheet Metal Flashing and Trim: Comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."

- 1. Sheet Metal: Aluminum, mill finished.

- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

- A. Single-Layer Felt Underlayment: Install single layer of felt underlayment on roof deck perpendicular to roof slope in parallel courses. Lap sides a minimum of 2 inches (50 mm) over underlying course. Lap ends a minimum of 4 inches (100 mm). Stagger end laps between succeeding courses at least 72 inches (1830 mm). Fasten with felt underlayment nails.

- B. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated, lapped in direction to shed water. Lap sides not less than 3-1/2 inches (89 mm). Lap ends not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Roll laps with roller. Cover underlayment within seven days.

3.2 METAL FLASHING INSTALLATION

- 1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

NRCA Roofing and Waterproofing Manual."

3.3 ASPHALT SHINGLE INSTALLATION

- A. Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with self-sealing strip face up at roof edge.
 - 1. Extend asphalt shingles 1/2 inch (13 mm) at eaves and rakes.
- C. Woven Valleys: Extend succeeding asphalt shingle courses from both sides of valley 12 inches (300 mm) beyond center of valley, weaving intersecting shingle-strip courses over each other. Use one-piece shingle strips without joints in the valley.
- D. Ridge and Hip Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

END OF SECTION 07311

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

SECTION 07620 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. flashing.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Show layouts, profiles, shapes, seams, dimensions, and details for fastening, joining, supporting, and anchoring sheet metal flashing and trim.

1.3 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14.

B. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality, mill phosphatized for field painting.

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Felt Underlayment: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

C. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and other suitable fasteners designed to withstand design loads.

1. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

2.3 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.
- B. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 - 1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams.
- C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.
- D. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with elastomeric sealant concealed within joints.
- E. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal, and in thickness not less than that of metal being secured.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
- C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

- E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
- G. Seal joints with elastomeric sealant as required for watertight construction.

END OF SECTION 07620

HYRUM STATE PARK RESTROOM REPLACEMENT

SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes joint sealants for the: following applications:
 - 1. Exterior joints in vertical surfaces.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

1.4 QUALITY ASSURANCE

- A. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint-sealant manufacturers for testing according to manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

1.5 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be

HYRUM STATE PARK RESTROOM REPLACEMENT

incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, 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.

2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Single-Component Neutral-Curing Silicone Sealant:

- 1. Available Products:
 - a. Dow Corning Corporation; 799.
 - b. GE Silicones; UltraGlaze SSG4000.
 - c. GE Silicones; UltraGlaze SSG4000AC.
 - d. Polymeric Systems Inc.; PSI-631.
 - e. Schnee-Morehead, Inc.; SM5731 Poly-Glaze Plus.
 - f. Tremco; Proglaze SG.
 - g. Tremco; Spectrem 2.
 - h. Tremco; Tremsil 600.
- 2. Type and Grade: S (single component) and NS (nonsag).
- 3. Class: 25.
- 4. Use Related to Exposure: NT (nontraffic).

C. Single-Component Nonsag Urethane Sealant:

- 1. Available Products:
 - a. Sika Corporation, Inc.; Sikaflex - 1a.
 - b. Sika Corporation, Inc.; Sikaflex - 15LM.
 - c. Sonneborn, Division of ChemRex Inc.; Ultra.
 - d. Sonneborn, Division of ChemRex Inc.; NP 1.
 - e. Tremco; Vulkem 116.
- 2. Type and Grade: S (single component) and NS (nonsag).
- 3. Uses Related to Exposure: T (traffic) and NT (nontraffic).

2.4 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are

HYRUM STATE PARK RESTROOM REPLACEMENT

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.

2.5 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 joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.
 - a. Clean 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 after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. 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.

3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

HYRUM STATE PARK RESTROOM REPLACEMENT

- B. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

- C. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

- D. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.

- E. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION 07920

DIVISION 8 – DOORS AND WINDOWS

SECTION 08111 – STANDARD STEEL DOORS & FRAMES

SECTION 08560 – VINYL WINDOWS

SECTION 08710 – DOOR HARDWARE

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

SECTION 08111 - STANDARD STEEL DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes standard hollow-metal steel doors.

1.2 SUBMITTALS

- B. Product Data: Include construction details, material descriptions, core descriptions, label compliance, and finishes for each type of steel door specified.
- C. Shop Drawings: Provide a schedule of standard steel doors using same reference numbers for details and openings as those on Drawings.

1.2 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. 25 gage galvanized steel.
- B. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.

2.2 STANDARD STEEL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces.
 - 1. Core Construction: Manufacturer's standard.
- 2. Vertical Edges for Single-Acting Doors: Square edge.
 - 3. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick end closures or channels of same material as face sheets.

2.3 FABRICATION

- A. Standard Steel Doors:
 - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

2. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.
- B. Hardware Preparation: Factory prepare standard steel doors to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."
- 2.4 FINISHES
- A. Steel Finish: Factory priming for field-painted finish.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Remove welded-in shipping spreaders installed at factory.
- B. Provide doors of sizes, thicknesses, and designs indicated. Install standard steel doors plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- C. Standard Steel Doors: Fit hollow-metal doors accurately in frames. Shim as necessary.
- D. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including standard steel doors that are warped, bowed, or otherwise unacceptable.
- E. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

END OF SECTION 08111

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

SECTION 08560 - VINYL WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes horizontal sliding PVC extrusion window frames with obscure insulated glazing.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Provide vinyl windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified and that are of minimum test size required by AAMA/NWWDA 101/I.S.2-97.
- B. Structural Performance: Provide vinyl windows capable of withstanding the following, including wind loads based on passing AAMA/NWWDA 101/I.S.2, Uniform Load Structural Test, at basic wind speed indicated:
 - 1. Deflection: Not to exceed .190". ASTM E-330
 - 2. Basic Wind Speed: No breakage, failure or deformation using both positive and negative pressures of 30 psf.

- C. Air Infiltration: Not to exceed .13 cfm/ft.

- D. Water Resistance: No entry with WTP = 4.5 psf.

1.3 SUBMITTALS

- A. Product Data: For each type of Vinyl window indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other Work, and operational clearances.

- C. Samples: For each exposed finish.

- D. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer: A qualified installer, approved by manufacturer to install manufacturer's products.
- B. All windows shall be marked with AAMA and NFRC certification labels in accordance with the requirements of the applicable referenced standard.
- C. Insulated glass units to conform to ASTM Class A standards.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace vinyl windows that fail in materials and workmanship within ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Amsco Windows
 - 2. Window Products Inc.

2.2 INSECT SCREENS

- A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Locate screens on outside of window and provide for each operable exterior sash or ventilator.

2.3 FABRICATION

- A. Fabricate all windows in a neat workmanlike manner in a facility having appropriate equipment and skilled personnel. All frame and sash corner joinery shall be mitre-cut and fusion welded.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- B. Set sill members in bed of sealant or with gaskets, as per manufacturers recommendations, for weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Adjust operating sashes and ventilators, screens, and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.
- E. Protect window surfaces from contact with contaminating substances resulting from

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

- F. Clean surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- G. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.
- H. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 08520

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

SECTION 08711 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. door hardware.

1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings:
- C. Door Hardware Schedule: Organized into door hardware sets indicating type, style, function, size, label, hand, manufacturer, fasteners, location, and finish of each door hardware item. Include description of each electrified door hardware function, including sequence of operation.
- D. Keying Schedule: Detail Owner's final keying instructions for locks.

1.3 QUALITY ASSURANCE

- A. Supplier Qualifications: Person who is or employs a qualified DHI Architectural Hardware Consultant.
- B. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying schedule.
- C. Preinstallation Conference: Conduct conference at Project site.
- D. Standards: Comply with BHMA A156 series standards, Grade 1, unless Grade 2 is indicated.
- E. Certified Products: Provide door hardware that is listed in BHMA directory of certified products.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within warranty period.
 - 1. Warranty Period for five years from date of substantial completion.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Product named for each door hardware item indicated in Door Hardware Sets establishes the basis of design. Provide either the named product or a comparable product by one of the manufacturers specified for each type of hardware item.

2.2 DOOR HARDWARE

- A. Scheduled Door Hardware: Provide door hardware according to Door Hardware Sets at the end of Part 3.

2.3 FABRICATION

- A. Base Metals: Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials if different from specified standard.
- B. Fasteners: Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated. Provide steel machine or wood screws or steel through bolts for fire-rated applications.
- C. Spacers or Sex Bolts: For through bolting of hollow metal doors.
- D. Finishes: Comply with BHMA 626

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine doors and frames for compliance with requirements for installation tolerances, wall and floor construction, and other conditions affecting performance.
- B. Steel Door Preparation: Comply with DHI A115 series. Drill and tap doors and frames for surface-applied hardware according to SDI 107.
- C. Mounting Heights: Comply with the following requirements, unless otherwise indicated:
1. Standard Steel Doors: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
- D. Adjust and reinforce attachment substrates as necessary for proper installation and operation. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
1. Thresholds: Set thresholds for exterior doors in full bed of sealant.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

3.2 DOOR HARDWARE SETS

Exterior doors: Typical all doors.

Corridor Lock	Schlage D73P Rhodes style lever.
Lock Cylinder	Provide construction core with standard 23-013 permanent cylinder.
3 Butt hinges	Hagar BB1191 or approved equal
Threshold	Pemco 172 A or approved equal
Weather strip	Pemco S88D or approved equal
Closer	LCN 4010 Series, parallel Arm.

END OF SECTION 08711

DIVISION 9 – FINISHES

SECTION 09260 – GYPSUM BOARD ASSEMBLIES

SECTION 09310 – CERAMIC TILE

SECTION 09911 – PAINTING (CONSUMER LINE PRODUCTS)

HYRUM STATE PERK RESTROOM REPLACEMENT
#09198510

SECTION 09260 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum wallboard.(restroom and custodial room ceilings)
 - 2. Water resistant gypsum board. (shower and utility room ceilings)

1.2 SUBMITTALS

- A. Product Data: For each product indicated.

PART 2 - PRODUCTS

2.1 PANEL PRODUCTS

- A. Panel Size, General: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
- B. Gypsum Wallboard: ASTM C 36.
 - 1. Regular Type: In thickness indicated and with long edges tapered.
- C. Water resistant gypsum wallboard:
 - 1. Water-Resistant Gypsum Board: ASTM C 630/C 630M, with core type and in thickness indicated.

2.2 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475.
- B. Joint Tape:
 - 1. Interior Gypsum Wallboard: Paper.
 - 2. Water resistant gypsum wallboard: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, flanges of trim accessories, and fasteners, use drying-type, all-purpose compound.

HYRUM STATE PERK RESTROOM REPLACEMENT
#09198510

3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for water resistant gypsum wallboard:

1. Water-Resistant Gypsum Board: Use setting-type taping and setting-type, sandable topping compounds.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

PART 3 - EXECUTION

3.1 PANEL PRODUCT INSTALLATION

- A. Gypsum Board: Comply with ASTM C 840 and GA-216.

1. Space screws a maximum of 8 inches (304.8 mm) o.c. for horizontal applications.
2. On ceilings, apply gypsum panels at right angles to framing, unless otherwise indicated.
3. Stagger abutting end joints not less than one framing member in alternate courses of board.

4. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.2 FINISHING

- A. Finishing Gypsum Board Panels: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.

3.3 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture finish manufacturer's written recommendations.

HYRUM STATE PERK RESTROOM REPLACEMENT
#09198510

END OF SECTION 09260

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

SECTION 09310 - CERAMIC TILE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Ceramic mosaic tile.
2. Glazed wall tile.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints.

C. Samples:

1. Each type, composition, color, and finish of tile.

1.3 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

HYRUM STATE PARK RESTROOM REPLACEMENT

#09198510

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 TILE PRODUCTS

A. Available Manufacturers:

1. American Marazzi Tile, Inc.
2. American Olean; Div. of Dal-Tile International Corp.
3. Crossville Ceramics Company, L.P.
4. Daltile; Div. of Dal-Tile International Inc.
5. Florida Tile Industries, Inc.
6. KPT, Inc.
7. Lone Star Ceramics Company.
8. Summitville Tiles, Inc.
9. United States Ceramic Tile Company.

- #### B. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

C. Unglazed Ceramic Mosaic Tile (shower floor): Factory-mounted flat tile as follows:

1. Composition: Porcelain.
2. Surface: Smooth, without abrasive admixture.
3. Module Size: **1 by 1 inch.**
4. Nominal Thickness: **1/4 inch (6.35 mm).**
5. Face: Plain, with cushion edges.

D. Glazed Wall Tile (shower walls): Flat tile as follows:

1. Module Size: **4-1/4 by 4-1/4 inches.**
2. Thickness: **5/16 inch (8 mm).**
3. Face: Plain with modified square edges or cushion edges.
4. Finish: Mat, opaque glaze.

2.3 SETTING AND GROUTING MATERIALS

- #### A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.1A.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

- B. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.
 - 1. For wall applications, provide nonsagging mortar.
- C. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
 - 1. Prepackaged dry-mortar mix containing dry additive to which only water must be added.
 - 2. For wall applications, provide nonsagging mortar.

2.4 MISCELLANEOUS MATERIALS

- A. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.
- B. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions.
- C. Remove protrusions, bumps, and ridges by sanding or grinding.
- D. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.

3.2 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

HYRUM STATE PARK RESTROOM REPLACEMENT

#09198510

- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Grind cut edges of tile abutting trim, finish, or built-in items. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
- E. Lay out tile wainscots to next full tile beyond dimensions indicated.
- F. Expansion Joints: Locate expansion joints and other sealant-filled joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Locate joints in tile surfaces directly above joints in concrete substrates.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- G. Grout tile to comply with requirements of ANSI A108.10, unless otherwise indicated.
- H. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.
 - 1. Tile floors in wet areas.
- I. Install tile on floors with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).
- J. Install tile on walls with the following joint widths:
 - 1. Glazed Wall Tile: 1/16 inch (1.6 mm).
- K. Apply grout sealer to grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

END OF SECTION 09310

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

SECTION 09911 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.

1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Samples: For each type of finish-coat material indicated.

1.3 QUALITY ASSURANCE

- A. Benchmark Samples: Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5.
 - 1. Wall Surfaces: Provide samples on at least 1 sq. ft. .
 - 2. Final approval of colors will be from benchmark samples.

1.4 PROJECT CONDITIONS

- A. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain storage containers in a clean condition, free of foreign materials and residue.
- B. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F (10 and 32 deg C).
- C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.5 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
 - 1. Quantity: 5 percent, but not less than 1 gal. (3.8 L) or 1 case, as appropriate, of each material and color applied.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

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, products listed in other Part 2 articles.
- B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

- 1. Benjamin Moore & Co. (Benjamin Moore).
- 2. Kelly-Moore Paint Co. (Kelly-Moore).
- 3. PPG Industries, Inc. (Pittsburgh Paints).
- 4. Sherwin-Williams Co. (Sherwin-Williams).

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
- C. Colors: As selected from manufacturer's full range.
- D. Paint exposed surfaces whether or not colors are designated in the schedule or in the documents, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from manufacturers full range of colors.
- E. Painting is not required on pre-finished items, finished metal surfaces, concealed surfaces, operating parts and lables.

PART F. - EXECUTION

A. APPLICATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

- C. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - A. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- D. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - A. Provide barrier coats over incompatible primers or remove and reprime.
- B.Cementitious Materials: Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
- C.Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
 - A. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
- B.Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
 - D. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- E. Material Preparation:
 - A. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - B. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
- F. Exposed Surfaces: Include areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
 - A. Paint surfaces behind movable equipment the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment with prime coat only.
 - B. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 - C. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
- G. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - A. Omit primer over metal surfaces that have been shop primed and touchup painted.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

- B. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.
- H. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
- I. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.
- J. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- K. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

B. CLEANING AND PROTECTING

- A. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
- B. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- C. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
 - A. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

C. PAINT SCHEDULE (paint

- A. Aluminum:
 - 1. Acrylic: High gloss.
 - a.. 2 coats DTM Acrylic Primer/Finish: SW B66W1.
Apply at 2.5-5.0 mil dft/ct
- B. Steel and Iron:(including doors and door frames)
 - 1. Acrylic Epoxy: High Gloss
 - a. 1 coat water based catalyzed epoxy primer:
Apply at 3.0 -5.0 mils dft.
 - b. 2 coats water based catalyzed epoxy: SW B70-200 series.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

Apply at 2.5-3.0 mils dft/ct

C. Masonry:

1. Acrylic Water based Epoxy Finish: High Gloss
 - a. 1 coat heavy duty block filler: SW B42W46
 - b.. 2 coats Water based catalyzed epoxy:SW B70-200 Series
Apply at 3.0 mils dft/ct per coat.

D. Gypsum Wallboard:

1. Latex Systems; Semi Gloss
 - a. 1 coat S-W PrepRite 200 Latex Primer. B28W200
 - b.. 2 coats S-W ProClassic waterborne Acrylic Semi-Gloss B31 Series
Apply at 4 mils wet, 1.3 mils dry per coat.

END OF SECTION 09911

DIVISION 10 – SPECIALTIES

SECTION 10155 – TOILET COMPARTMENTS

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

SECTION 10155 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes baked-enamel units as follows:
 - 1. Toilet Enclosures: Overhead braced, Floor anchored
 - 2. Urinal Screens: Wall hung.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

PART 2 - PRODUCTS

2.1 METAL UNITS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Accurate Partitions Corporation.
 - 2. All American Metal Corp.
 - 3. Ampco.
 - 4. Bradley Corporation; Mills Partitions.
 - 5. Hadrian Inc.
 - 6. Lambaton Universal.
- B. Baked-Enamel Units: Facing sheets and closures fabricated from ASTM A 591/A 591M, 80Z (24G) (electrolytically zinc-coated) or ASTM A 653/A 653M (hot-dip galvanized or galvanized), commercial steel sheet for exposed applications, that is mill phosphatized, and selected for smoothness.
 - 1. Finish: Manufacturer's standard pigmented, organic coating.
 - a. Color: One color in each room as selected by Architect from manufacturer's full range of colors.
- C. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets are pressure laminated to core material. Units have continuous, interlocking molding strip or lapped and formed edge closures. Exposed surfaces are free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections. Corners are sealed by welding . Exposed welds are ground smooth.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch (25 mm) for doors and panels and 1-1/4 inches (32 mm) for pilasters.
 2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units.
 3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.
4. Urinal-Screen Construction: Matching panels with integral full-height flanges for wall attachment.
- D. Pilaster Shoes and Sleeves (Caps): Stainless steel, ASTM A 666, Type 302 or 304.
 - E. Brackets (Fittings): Manufacturers standard.

2.2 ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.
 - B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
 - C. Floor-and-Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies complete with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
 - D. Doors: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments indicated to be accessible to people with disabilities.
 1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
2. Latch and Keeper: Manufacturer's standard recessed latch unit designed for emergency access and with combination rubber-faced door strike and keeper.

HYRUM STATE PARK RESTROOM REPLACEMENT
#09198510

Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.

3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch (13 mm).
 - b. Panels and Walls: 1 inch (25 mm).

3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10155

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

DIVISION 16 - ELECTRICAL

16050	Common Work Results For Electrical
16060	Grounding And Bonding For Electrical Systems
16071	Hangers And Supports For Electrical Systems
16072	Vibration And Seismic Controls For Electrical Systems
16075	Identification For Electrical Systems
16120	Low-voltage Electrical Power Conductors And Cables
16130	Raceway And Boxes For Electrical Systems
16140	Wiring Devices
16145	Lighting Control Devices
16211	Electricity Metering
16442	Panelboards
16511	Interior Lighting

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

SECTION 16050 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves for raceways and cables.
2. Sleeve seals.
3. Grout.
4. Common electrical installation requirements.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel.
 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 1. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 2. Pressure Plates: Plastic. Include two for each sealing element.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating or Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- J. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- L. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 16050

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

SECTION 16060 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 4. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors, Rods, and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid or stranded conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- C. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeder and branch circuits., in addition to those required by NFPA 70:

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

D. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

END OF SECTION 16060

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

SECTION 16071 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Hangers and supports for electrical equipment and systems.

1.2 PERFORMANCE REQUIREMENTS

- A. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- B. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.3 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 1. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 2. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt or single bolt conduit clamps.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

END OF SECTION 16071

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

SECTION 16072 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Channel support systems.
2. Restraint cables.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: D.
2. Assigned Seismic Use Group or Building Category as Defined in the IBC: III.
 - a. Component Importance Factor:
 - 1) General: 1.0.
 - 2) Life Safety: 1.5
 - b. Component Response Modification Factor:
 - 1) Fixtures: 1.5
 - 2) Equipment: 2.5
 - 3) Conduit and Cables: 5.0.
 - c. Component Amplification Factor: 2.5.
3. Design Spectral Response Acceleration at Short Periods (0.2 Second): 173%.
4. Design Spectral Response Acceleration at 1.0-Second Period: 76%.

1.3 QUALITY ASSURANCE

- A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

- D. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SEISMIC-RESTRAINT DEVICES

- A. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
 - 1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- B. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.
- C. Restraint Cables: ASTM A 603 galvanized or ASTM A 492 stainless-steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.
- D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices.
- E. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.
- F. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.2 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Equipment and Hanger Restraints:
 - 1. Install restrained isolators on electrical equipment.
 - 2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- D. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 - 5. Set anchors to manufacturer's recommended torque, using a torque wrench.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

END OF SECTION 16072

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

SECTION 16075 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Identification for conductors.
2. Underground-line warning tape.
3. Equipment identification labels.
4. Miscellaneous identification products.

1.2 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 - PRODUCTS

2.1 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.2 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE,.

2.3 EQUIPMENT IDENTIFICATION LABELS

- A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.4 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

- F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
- G. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Neutral: White.
 - 4) Ground: Green or bare.
 - c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
 - B. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
 - C. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
 - 1. Install underground-line warning tape for both direct-buried cables and cables in raceway.
 - D. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

- E. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
1. Comply with 29 CFR 1910.145.
 2. Identify system voltage with black letters on an orange background.
 3. Apply to exterior of door, cover, or other access.
- F. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION 16075

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

SECTION 16120 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Copper Conductors: Comply with NEMA WC 70.
- B. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.
- C. Multiconductor Cable: Comply with NEMA WC 70 for Type SO with ground wire.

2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AFC Cable Systems, Inc.
 2. Hubbell Power Systems, Inc.
 3. O-Z/Gedney; EGS Electrical Group LLC.
 4. 3M; Electrical Products Division.
 5. Tyco Electronics Corp.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid or stranded for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid or stranded for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Feeders: Type THHN-THWN, single conductors in raceway.
- C. Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- E. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- F. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

- E. Support cables according to Division 16 Sections "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 16 Section "Identification for Electrical Systems."
- G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- I. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

END OF SECTION 16120

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

SECTION 16130 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. EMT: ANSI C80.3.
- C. FMC: Zinc-coated steel.
- D. LFMC: Flexible steel conduit with PVC jacket.
- E. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Fittings for EMT: Steel or die-cast, set-screw or compression type.

2.2 NONMETALLIC CONDUIT AND TUBING

- A. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- B. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

2.3 METAL WIREWAYS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman.
 - 3. Square D; Schneider Electric.
- B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 3R, unless otherwise indicated.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Flanged-and-gasketed type.
- E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- D. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum or galvanized, cast iron with gasketed cover.
- E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic.
- F. Cabinets:
 - 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit.
2. Concealed Conduit, Aboveground: Rigid steel conduit.
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed and Subject to Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
 - a. Mechanical rooms.
3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
5. Damp or Wet Locations: Rigid steel conduit.
6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

- D. Support raceways as specified in Division 16 Section "Hangers and Supports for Electrical Systems."
 - E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
 - F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
 - G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
 - H. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Change from RNC, Type EPC-40-PVC, rigid steel conduit before rising above the floor.
 - I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
 - J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
 - K. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
 - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
 - L. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.
- 3.3 INSTALLATION OF UNDERGROUND CONDUIT
- A. Direct-Buried Conduit:
 - 1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches in nominal diameter.
 - 2. Install backfill as specified in Division 31 Section "Earth Moving."

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
 - b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

END OF SECTION 16130

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

SECTION 16140 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Snap switches and wall-box dimmers.
3. Wall-switch occupancy sensors.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 3. Leviton Mfg. Company Inc. (Leviton).
 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 5351 (single), 5352 (duplex).
 - b. Hubbell; HBL5351 (single), CR5352 (duplex).
 - c. Leviton; 5891 (single), 5352 (duplex).

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

- d. Pass & Seymour; 5381 (single), 5352 (duplex).

2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; GF20.
 - b. Hubbell
 - c. Leviton
 - d. Pass & Seymour; 2084.

2.4 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
 - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
 - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
 - d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

2.5 OCCUPANCY SENSORS

- A. Wall-Switch Sensors:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper
 - b. Hubbell; AT120 for 120 V, AT277 for 277 V.
 - c. Leviton; ODS 15-ID.
 - d. Pass & Seymour

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

2. Description: Adaptive-technology type, 120/277 V, adjustable time delay up to 20 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft..

2.6 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces: Steel with white baked enamel, suitable for field painting.
 3. Material for Unfinished Spaces: Galvanized steel.
 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover.

2.7 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
 1. Wiring Devices Connected to Normal Power System: White, unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

3.2 IDENTIFICATION

- A. Comply with Division 16 Section "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

- B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new, and retest as specified above.

END OF SECTION 16140

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

SECTION 16145 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following lighting control devices:
 - 1. Time switches.
 - 2. Outdoor photoelectric switches.
 - 3. Indoor occupancy sensors.
- B. See Division 26 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
- C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Intermatic, Inc.
 - 2. Leviton Mfg. Company Inc.
 - 3. Lightolier Controls; a Genlyte Company.
 - 4. Square D; Schneider Electric.
 - 5. TORK.
 - 6. Touch-Plate, Inc.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

7. Watt Stopper (The).
- B. Electronic Time Switches: Electronic, solid-state programmable units with alphanumeric display; complying with UL 917.
1. Contact Configuration: SPST.
 2. Contact Rating: 20-A ballast load, 120/240-V ac.
 3. Programs: Multi-channel; each channel shall be individually programmable with 8 on-off set points on a 24-hour schedule.
 4. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
 5. Astronomic Time: All channels.
 6. Battery Backup: For schedules and time clock.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Intermatic, Inc.
 2. Paragon Electric Co.; Invensys Climate Controls.
 3. Square D; Schneider Electric.
 4. TORK.
 5. Touch-Plate, Inc.
 6. Watt Stopper (The).
- B. Description: Solid state, with SPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.
1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
 2. Time Delay: 15-second minimum, to prevent false operation.
 3. Surge Protection: Metal-oxide varistor, complying with IEEE C62.41.1, IEEE C62.41.2, and IEEE 62.45 for Category A1 locations.
 4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

2.3 INDOOR OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hubbell Lighting.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

2. Leviton Mfg. Company Inc.
 3. Lithonia Lighting; Acuity Lighting Group, Inc.
 4. Novitas, Inc.
 5. Sensor Switch, Inc.
 6. TORK.
 7. Watt Stopper (The).
- B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.
1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
 3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
 4. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
 6. Bypass Switch: Override the on function in case of sensor failure.
 7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keep lighting off when selected lighting level is present.
- C. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

2.4 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 22 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 16 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
- B. When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

3.2 CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

- A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be 1/2 inch.
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 - 2. Operational Test: Verify operation of each lighting control device, and adjust time delays.
- B. Lighting control devices that fail tests and inspections are defective work.

END OF SECTION 16145

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

SECTION 16211 - ELECTRICITY METERING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes equipment for electricity metering by utility company.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Dimensioned plans and sections or elevation layouts and wiring diagrams.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 EQUIPMENT FOR ELECTRICITY METERING BY UTILITY COMPANY

- A. Meters will be furnished by utility company.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with equipment installation requirements in NECA 1.
- B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written requirements. Provide empty conduits for metering leads and extend grounding connections as required by utility company.
- C. Comply with requirements for identification specified in Division 16 Section "Identification for Electrical Systems."
 - 1. Series Combination Warning Label: Self-adhesive type, with text as required by NFPA 70.

END OF SECTION 16211

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

SECTION 16442 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Include evidence of NRTL listing for series rating of installed devices.
 - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 7. Include wiring diagrams for power, signal, and control wiring.
 - 8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.
- C. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 16 Section "Vibration and Seismic Controls for Electrical Systems."
- D. Field quality-control reports.
- E. Panelboard schedules for installation in panelboards.
- F. Operation and maintenance data.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 16 Section "Vibration and Seismic Controls for Electrical Systems."
- B. Enclosures: Flush- and surface-mounted cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
 - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 - 3. Directory Card: Inside panelboard door, mounted in transparent card holder.
- C. Incoming Mains Location: Top and bottom.
- D. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- E. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Mechanical type.
 - 3. Ground Lugs and Bus Configured Terminators: Mechanical type.
- F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: As indicated on drawings.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
- F. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
 - 3. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
 - 4. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Receive, inspect, handle, store and install panelboards and accessories according to NEMA PB 1.1.
- B. Comply with mounting and anchoring requirements specified in Division 16 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- E. Install overcurrent protective devices and controllers not already factory installed.
- F. Install filler plates in unused spaces.
- G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- H. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 16 Section "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 16 Section "Identification for Electrical Systems."

END OF SECTION 16442

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

SECTION 16511 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior lighting fixtures, lamps, and ballasts.
 - 2. Emergency lighting units.
- B. See Division 16 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.
- C. See Division 16 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.2 SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes.
- B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
- C. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, signed by product manufacturer.
- D. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In Interior Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
- C. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.
- D. Metal Parts: Free of burrs and sharp corners and edges.
- E. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- G. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
1. White Surfaces: 85 percent.
 2. Specular Surfaces: 83 percent.
 3. Diffusing Specular Surfaces: 75 percent.
 4. Laminated Silver Metallized Film: 90 percent.
- H. Plastic Diffusers, Covers, and Globes:
1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125 inch minimum unless different thickness is indicated.
 - b. UV stabilized.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

2. Glass: Annealed crystal glass, unless otherwise indicated.

2.3 BALLASTS

- A. Electronic Ballasts for Linear Fluorescent Lamps: Comply with ANSI C82.11; programmed-start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed for full light output unless dimmer or bi-level control is indicated.
 1. Sound Rating: A.
 2. Total Harmonic Distortion Rating: Less than 10 percent.
 3. Transient Voltage Protection: IEEE C62.41, Category A or better.
 4. Operating Frequency: 20 kHz or higher.
 5. Lamp Current Crest Factor: 1.7 or less.
 6. BF: 0.85 or higher.
 7. Power Factor: 0.95 or higher.

- B. Ballasts for Compact Fluorescent Lamps: Electronic programmed rapid-start type, complying with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
 1. Lamp end-of-life detection and shutdown circuit.
 2. Automatic lamp starting after lamp replacement.
 3. Sound Rating: A.
 4. Total Harmonic Distortion Rating: Less than 20 percent.
 5. Transient Voltage Protection: IEEE C62.41, Category A or better.
 6. Operating Frequency: 20 kHz or higher.
 7. Lamp Current Crest Factor: 1.7 or less.
 8. BF: 0.95 or higher, unless otherwise indicated.
 9. Power Factor: 0.95 or higher.

- C. Internal-Type Emergency Fluorescent Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.
 1. Emergency Connection: Operate 1 fluorescent lamp(s) continuously at an output of 700 lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
 2. Night-Light Connection: Operate one fluorescent lamp continuously.
 3. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
 - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

HYRUM STATE PARK RESTROOM REPLACEMENT
09198510

4. Battery: Sealed, maintenance-free, nickel-cadmium type.
 5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
- D. Electronic Ballast for Metal-Halide Lamps: Include the following features unless otherwise indicated:
1. Lamp end-of-life detection and shutdown circuit.
 2. Sound Rating: A.
 3. Total Harmonic Distortion Rating: Less than 15 percent.
 4. Transient Voltage Protection: IEEE C62.41, Category A or better.
 5. Lamp Current Crest Factor: 1.5 or less.
 6. Power Factor: .90 or higher.
 7. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
 8. Protection: Class P thermal cutout.

2.4 EMERGENCY LIGHTING UNITS

- A. Description: Self-contained units complying with UL 924.
1. Battery: Sealed, maintenance-free, lead-acid type.
 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.5 LAMPS

- A. Low-Mercury Fluorescent Lamps: Comply with EPA's toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.
- B. T8 Rapid-Start Fluorescent Lamps:
1. CRI 75 (minimum)
 2. Color temperature 3500 K
 3. Average rated life 20,000 hours.

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- C. Compact Fluorescent Lamps: 4-Pin, low mercury, CRI 80 (minimum), color temperature 3500 K, average rated life of 10,000 hours at 3 hours operation per start, unless otherwise indicated.
- D. Pulse-Start, Metal-Halide Lamps: Minimum CRI 65, and color temperature 4000 K.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 16 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Comply with NFPA 70 for minimum fixture supports.
- C. Adjust aimable lighting fixtures to provide required light intensities.
- D. Connect wiring according to Division 16 Section "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 16511