

**ANNE ARUNDEL COUNTY, MARYLAND
DEPARTMENT OF PUBLIC WORKS**

BROAD CREEK II WATER TREATMENT PLANT NEW OPERATOR BUILDING

**Project Number W804000
Contract Number W804010**

PROJECT MANUAL



PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND,
LICENSE NO. 20566, EXPIRATION DATE: 09/06/2024

**Prepared By:
RK&K
700 East Pratt Street
Suite 500
Baltimore, MD 21202**

**Bureau of Engineering
January 2024**

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ANNE ARUNDEL COUNTY

***BROAD CREEK II WATER TREATMENT PLANT
NEW OPERATOR BUILDING***

Proposal No.: W804010

Project No.: W804000

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NOTICE TO CONTRACTORS

Prevailing Wage or Local Hiring Compliant Capital Improvement Contract

BROAD CREEK II WATER TREATMENT PLANT NEW OPERATOR BUILDING

Bid No.: W804010

Project No.: W804000

Sealed bids, addressed to Anne Arundel County, Bid No. W804010, for **BROAD CREEK II WATER TREATMENT PLANT NEW OPERATOR BUILDING** for the Department of Public Works will be received until 1:30 P.M. local time, Tuesday, April 2, 2024, electronically through the County's PORT system, after which they will be opened and publicly read via ZOOM.com. You may join the Zoom meeting for the date and time set on the solicitation. However, the reading of bids will begin approximately 15 minutes after the deadline for submitting them to give staff enough time to assemble the bid responses. Please join the bid opening using the credentials listed below:

Join URL: <https://zoom.us/j/172858269>

Meeting ID: 172 858 269

Password: 0

Dial by your location

+1 312 626 6799 US

+1 301 715 8592 US

+1 669 219 2599 US

+1 669 900 6833 US

888 475 4499 US Toll-free

877 853 5257 US Toll-free

The Work includes the following major items:

Construction of a new Operator Building and related work at the Broad Creek II Water Treatment Plant.

The Work is subject to the prevailing wage or local hiring laws of Anne Arundel County as more specifically set forth by law and by County policy. The Contractor and any subcontractor must submit the appropriate Wage Requirements Law and Local Hiring forms found at: <https://www.google.com/url?q=https://www.aacounty.org/departments/central-services/purchasing/prevailing-wage-law/index.html> Failure to submit and complete the required material information on the form(s) may cause the offeror's proposal and bid to be unacceptable under County law, and the bid may be rejected.

On or after January 29, 2024 Plans and Specifications may be downloaded from the Anne Arundel County Purchasing website <https://www.aacounty.org/PORT>. Plans will only be distributed via the web site.

To all contractors, the Anne Arundel County Purchasing Office now has bid results for Capital Construction Projects on the County's web page. Contractors can access it by entering the following web address: <https://www.aacounty.org/departments/central-services/purchasing/bid-results/index.html>

This Contract will be constructed under the provisions of the Anne Arundel County Government January, 2001 "Standard Details and Specifications for Construction" and any subsequent revisions thereto.

The cost range for the Project is: \$500,000 - \$1,000,000

PREVAILING WAGE

The County's prevailing wage and local hiring laws, as found at §8-2-115 and 8-2-116, as amended of the County Code, and the State of Maryland's prevailing wage laws, apply to certain capital improvement contracts and capital projects. See also Anne Arundel County Council Bill 72-21, as amended. To the extent applicable, the County's prevailing wage requirements are enumerated in the "Prevailing Wage Requirements for Capital Improvement Contracts Addendum to the General Conditions of Contract between County and Contractor" and apply to the Work. If applicable to this Contract, the Addendum will be attached to the contract, and will be incorporated herein by reference, and made a part thereof. The Contractor and its subcontractors must comply with all of the auditing, reporting requirements of the law on an ongoing basis or will be subject to penalties, including, but not limited to liquidated damages claims from both improperly paid employees of the Contractor and its subcontractors and the County.

EQUAL OPPORTUNITY

It is the policy of Anne Arundel County, Maryland, to ensure equal employment opportunity for all persons, and to ensure that minority and women-owned business enterprises have the maximum opportunity to participate in the performance of all county contracts for supplies and services.

NON-DISCRIMINATION IN EMPLOYMENT

THE CONTRACTOR OR ANY SUBCONTRACTOR MAY NOT DISCRIMINATE IN ITS EMPLOYMENT PRACTICES AGAINST ANY EMPLOYEE OR APPLICANT FOR EMPLOYMENT BECAUSE OF RACE, COLOR, RELIGION, SEX, NATIONAL ORIGIN, ANCESTRY, HANDICAP, AGE OR MARITAL STATUS.

On February 12, 2024 at 10:00 A.M. local time, a Pre-Bid conference will be held at the Department of Public Works, Heritage Office Complex, 2662 Riva Road, Annapolis, MD 21401. ALL VISITORS must check in with the first floor security guard for the meeting location. Anyone who plans to attend the Pre-Bid conference must provide their name, and their Company's name, to the County's Project Manager in advance, in order to be permitted access to the building. The intent of this conference is to clarify the Plans and Specifications advertised and intended for bidding purposes. All potential bidders are requested to attend this conference. However, attendance is not a requirement of the Contract.

FOR ADA ACCESSIBILITY ASSISTANCE ONLY: Anyone needing special ADA accommodations for the Pre-Bid conference must contact Joelle Ridgeway at [410-222-4383](tel:410-222-4383), or by email to agridg24@aacounty.org, at least seven days in advance of the event. TTY users, please call via Maryland Relay 7-1-1. All materials are available in an alternative format upon request.

Questions regarding this Project should be directed to the PROJECT MANAGER, Ms. Maribel Moore at 410-222-7565.

ANNE ARUNDEL COUNTY
Catrice Parsons
Purchasing Agent

**ANNE ARUNDEL COUNTY, MARYLAND
PREVAILING WAGE AND/OR LOCAL HIRING
CAPITAL IMPROVEMENT AGREEMENT**

***BROAD CREEK II WATER TREATMENT PLANT
NEW OPERATOR BUILDING***

Proposal No.: W804010

Project No.: W804000

INFORMATION TO BIDDERS

Sealed bids, addressed to the Purchasing Agent, Anne Arundel County, Maryland, for construction of the **BROAD CREEK II WATER TREATMENT PLANT NEW OPERATOR BUILDING** as shown on drawings on file in the Office of the Department of Public Works, Heritage Office Complex, 2662 Riva Road, Annapolis, Maryland 21401 will be received electronically through the County's PORT system until Tuesday, April 2, 2024 at 1:30 p.m. after which they will be opened and publicly read via ZOOM.com You may join the ZOOM meeting for the date and time set on the solicitation. However, the reading of bids will begin approximately 15 minutes after the deadline for submitting them to give staff sufficient time to assemble the bid responses. Please join the bid opening using the credentials listed below:

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877 853 5257 US Toll-free

TTY users, please call via Maryland Relay 7-1-1. All materials are available in an alternative format upon request.

THE RIGHT IS HEREBY RESERVED TO REJECT ANY OR ALL BIDS AND TO WAIVE INFORMALITIES, AS THE INTERESTS OF THE COUNTY MAY REQUIRE.

All work to be performed under this Project shall be done under strict compliance with the Anne Arundel County Government January 2001 "Standard Details and Specifications for Construction" and any subsequent revisions thereto. Copies of Standard Specifications for Construction and Standard Details may be obtained by accessing the Anne Arundel County Department of Public Works website, <http://www.aacounty.org/departments/public-works/engineering/design-manual/index.html>. The Standard Specifications and Details for Construction will only be available via the web site, and it shall be the duty of the Bidder to be familiar with these documents.

In addition, on May 18, 1990, the Commissioner of Labor and Industry adopted, through incorporation by reference to the Maryland Occupational Safety and Health Standards under COMAR 09.12.31 Maryland Occupational Safety and Health Act, amendments and revisions relating to Excavations as published in 54

Federal Register No. 209 (October 31, 1989) pages 45948-45991 and codified in Sub Part 29 CFR 1926.650-1926.652 and Appendices A-F, together with certain amendments. The amendments are found at Maryland Register, Volume 17, issue 6 (Friday, March 23, 1990), pages 746-748. The Commissioner's action is effective May 28, 1990. All holders of the Anne Arundel County Standard Specification and Details for Construction should familiarize themselves with these regulations and be guided accordingly.

PREVAILING WAGE AND LOCAL HIRING

Under County law, a bid for a contractor to provide certain capital project and capital improvement services may be subject to the Anne Arundel County Code and purchasing regulations regarding compliance with certain wage requirements payable to the Contractor's employees and hiring practices regarding residents of Anne Arundel County. If the awarded contract and/or work to be performed and services to be provided are subject to the prevailing wage law and/or local hiring requirements, the Contractor and all of its subcontractors must comply with the provisions of Anne Arundel County Code §8-2-115 and 8-2-116 and must not retaliate against a covered employee who discloses an illegal or improper action described therein. See Anne Arundel County Bill 72-21, as amended.

An aggrieved covered employee under the prevailing wage and local hiring law is a third-party beneficiary under any applicable capital improvement contract awarded pursuant to this solicitation or that falls under the County's prevailing wage law. An awarded contractor or subcontractor's employee may by civil action recover compensatory damages including interest and reasonable attorney's fees, from the contractor or one of its subcontractors for retaliation if the Contractor or their subcontractor violates the County's prevailing wage laws. The Contractor by submission of their proposal incorporates into any award those required clauses as set forth in the law.

The County will monitor the awarded bidder's compliance with the local hiring and prevailing wage requirements of state and local law. The bidder must submit all documentation necessary to comply with the wage and hiring laws. The awarded bidder will be subject to audits and ongoing reporting requirements, and authorizes the County by submission of their bid to give direction to the contractor to submit required documentation, monitor and inspect the contractor's performance in regards to prevailing wage laws and local hiring requirements to ensure compliance, to receive records upon demand, to prepare required reports and to approve or reject invoices for payment if the awarded bidder does not comply with prevailing wage and local hiring laws, as applicable.

Bids made other than on the attached forms will not be considered. Changes in the phraseology of the bid, additions, or limiting provisions will render the bid irregular and may cause its rejection.

All bids shall include the following forms:

- (1) Anti-collusion and non-bribery affidavit
- (2) Proposal form
- (3) Bid Bond (Bonding Companies must be licensed to do business in the State of Maryland and have complied with the law and the regulations of the U.S. Department of the Treasury and be approved as A Certified Companies or A Certified Reinsurer Companies.)
- (4) List of subcontractors and Equipment Suppliers; and
- (5) Sales tax affidavit (*To be completed and submitted in duplicate only for water/wastewater treatment facilities.*)

(6) *Prevailing Wage and Local Hiring Affidavit*

Failure to complete and submit these forms shall render the proposal irregular and may be cause for rejection of the bid.

The Proposal form shall include the price, in figures, for each item of the proposed work and must be signed on behalf of the bidder. The bidder must examine the drawings, standard specifications, standard details and contract specifications carefully and should make a personal examination of the location and nature of the proposed work. In case doubt shall arise as to the meaning or intent of anything shown on the drawings or comprised in the Standard Specifications, Standard Details and Contract Specifications, inquiry should be made of the project engineer of the Department of Public Works before the bid is submitted. Submission of the bid shall indicate that the bidder thoroughly understands the drawings and the terms of the specifications. Bidders are especially directed to fill out the "Total Price" column and total their bids, so that the results of the bidding, barring possible arithmetical errors, will be at once known. Any errors in computation will be corrected by the engineer when the bids are canvassed. The County reserves the right to accept alternatives in any order, to award on any bid item or combination of bid items. And to reject all bids if, in the sole determination of the County, it is advantageous to the County to do so. Any errors in computation or math will not invalidate the bid. In case of any discrepancy between the total figure and the correct total of the line items on the bid, the correct total of all line items shall govern and shall become the bid price.

Each bid must be accompanied by a certified check or bid bond acceptable to the County for five percent (5%) of the amount of the bid, payable to Anne Arundel County, Maryland; and unless so accompanied, the bid will not be considered. The check or bid bond will be forfeited to the County as liquidated damages in case the contract, performance bond, and labor and materials bonds are not executed within ten (10) days after receiving the contract for execution.

The list of subcontractors and equipment suppliers to be submitted with the bid need only show certified small business, minority business and women business enterprises, which the bidder intends to use. In the event that the bidder cannot participate, the bidder shall include with the bid a notarized affidavit showing the evidence of the effort made to achieve this goal. Failure to submit the list of subcontractors and equipment suppliers delineating SBE, MBE, and WBE participation and/or the good faith documentation at the time the bid is submitted shall render the bid irregular and may be cause for rejection of the bid. The complete list of subcontractors and suppliers will be required from the apparent low bidder within (10) days of a request by the County.

The experience and equipment certification is to be submitted to the county by the apparent low bidder within ten (10) calendar days after request from the County.

Each bid must include a signed and notarized affidavit concerning sales and use tax. It is the bidder's responsibility to contact the State of Maryland, Comptroller of the Treasury, Retail Sales Tax Division, to determine if any portion of the project is exempt from sales use tax.

THE APPARENT LOW BIDDER MAY NOT WITHDRAW ITS BID WITHIN NINETY (90) DAYS AFTER BID OPENING.

If the bidder, to whom an award is made, shall fail to execute the contract and bonds, the award may be annulled and the contract awarded to the second lowest responsible bidder, and such bidder shall fulfill every stipulation embraced herein, as if the bidder were the original party to whom the award was made; or the county may reject all of the bids, as its interests may require.

The County will hold the checks and/or bid bonds submitted by all bidders with their bids, until the execution and delivery of the contract and bonds whereupon they shall be returned.

As required by the Maryland Law, all foreign corporations doing business within the State of Maryland are required to be registered with the State Department of Assessments and Taxation as a condition precedent to the award of a contract.

If the contractor is a corporation, the contract shall be accompanied by a copy of the corporate resolution authorizing the officer of said corporation, whose name appears on the contract, to execute the contract. If a person other than an officer is designated, it must be stated under oath that the person is the agent of the corporation and is duly authorized to act on behalf of the corporation.

The Bidder must perform at least 51 percent (51 %) of the work with his own forces.

Bidders are further reminded of State Finance and Procurement Article, Section 17-106 Annotated Code of Maryland, which provides:

Before a contractor receives a progress or final payment under a contract covered by payment security, the contractor shall certify, in writing that, in accordance with contractual agreements, suppliers, and subcontractors:

- (1) Have been paid from the proceeds of previous progress payments; and
- (2) Will be paid in a timely manner from the proceeds of the progress or final payment currently due.

The contractor shall make available, at anytime to the County, the contractor's records for the purpose of auditing and/or verifying the contractor's costs in connection with negotiated contracts, change order, or other amendments to the contract.

Non-Discrimination Clauses:

Contractor shall comply with Executive Order 11246 entitled "Equal Employment Opportunity" as amended by Executive Order 11375, and as supplemented in U.S. Department of Labor Regulations 41 CFR Part 60.

The Contractor agrees not to discriminate in any manner against any employee or applicant for employment because of race, creed, color, or national origin; and, is obligated to include a similar requirement in all subcontracts, except subcontracts for standard commercial supplies or raw materials. In addition, the contractor and all subcontractors shall agree to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of the non-discrimination clause.

Where the Contractor willfully fails to comply with the non-discrimination provisions, the County may, where the Contract is still executory in part, compel continued performance of the Contract, but the County shall be liable only for the reasonable value of services performed and materials supplied from the date that the breach of contract was discovered, and any sums previously paid by the County under the Contract shall be set off against the sums to become due as the Contract is performed.

If any subcontractor willfully fails to comply with the non-discrimination provisions, the Contractor may void the subcontract and shall be liable only for the reasonable value of the services performed and materials supplied to the date of the voiding of the subcontract.

As to all contracts for materials, supplies, maintenance, services or other procurements except building construction services, the vendor agrees not to discriminate in any manner against any employee or applicant for employment because of race, creed, color, national origin, or sex. Any Contract with the County requiring subcontracts shall include similar requirements in each subcontract. The Contractor further agrees to comply with all applicable federal, state, and local laws and executive orders relating to equal employment opportunity.

Equal Opportunity Clause:

It is the policy of Anne Arundel County, Maryland, to ensure Equal Employment Opportunity for all persons, and to ensure that Minority and Women-Owned Business Enterprises have the maximum opportunity to participate in the performance of all County Contracts for supplies and services.

ANNE ARUNDEL COUNTY, MARYLAND
SOLICITATION CHECKLIST

Proposal No.:_W804010

Project No.:_W804000

THIS CHECKLIST IS PROVIDED FOR YOUR CONVENIENCE

_____ Bid Response/Proposal shall be delivered to the County Purchasing Department via PORT no later than the date and time shown in the Solicitation. Did you visit our website at (<https://www.aacounty.org/PORT>) for any addenda, which may have been posted to our website.

_____ Did an authorized company representative sign the Bid Response Form?

_____ Did an authorized company representative sign and notarize the Affidavit form(s)?

_____ Did you include the required signature authority documents, if required?

_____ If you are an entity (limited liability partnerships, corporations, limited partnerships, limited liability companies, limited liability limited partnerships, business trusts, real estate investment trust and trade name filings), is the legal name of your company listed with the State of Maryland Department of Assessments and Taxation and in good standing? You may check by going to www.dat.maryland.gov.

_____ If this Solicitation requires a Bid/Proposal bond, did you include one?

_____ Did you include Page B7-1 listing the minority subcontractors and equipment suppliers you intend to use, or a notarized affidavit showing the evidence of the effort made to include SBE, MBE and/or WBE participation in your bid?

_____ Did you read the prevailing wage and local hiring laws and County guidelines?

_____ Did an authorized signatory sign and agree to the Prevailing Wage and Local Hiring Affidavit?

MANDATORY REQUIREMENTS

The following item(s) are **MANDATORY** and shall be submitted, in fully executed format, with Bid Response/Proposal in order to be considered for an award. If the following item(s) are not submitted with the Bid Response/Proposal, the Bid/Response/Proposal shall be considered null and void, and therefore, will be rejected.

- (A) Bid Bond or Certified Check (5%)
- (B) County's Bid Response/Proposal Form

**ANNE ARUNDEL COUNTY
PREVAILING WAGE AND LOCAL HIRING**

AFFIDAVIT

***BROAD CREEK II WATER TREATMENT PLANT
NEW OPERATOR BUILDING***

Proposal No.: W804010

Project No.: W804000

On behalf of _____, I do solemnly declare and affirm,
(Contractor)
under penalty of perjury, that to the best of my knowledge, information, and belief:

1. I have submitted all documentation in accordance with Anne Arundel County Code 8-2-115 and 8-2-116 regarding the prevailing wage laws and requirements of the Prevailing Wage guidelines located at <https://www.aacounty.org/departments/central-services/purchasing/prevailing-wage-law/>, and that I have read and agree to all provisions of said law, as amended, and have a continuing obligation to be compliant with any changes to the law.

2. _____ shall not knowingly provide any false information relating to payroll documentation and or hiring of local employees for capital improvement contracts that are subject to the prevailing wage and/or local hiring laws of Anne Arundel County. I further attest and certify that all documentation relating to the same will be accurate and complete and will remain accurate and complete on an ongoing basis, and will reflect the payroll and/or local hiring status of contractors, subcontractors, apprentices, and independent contractors performing work for the Contract (contract number _____). I acknowledge that I have been informed and am aware of the foregoing requirements and that I am authorized to make this certification on behalf of myself and all subcontractors and parties performing work pursuant to this Contract.

3. I certify and attest that I am an officer or agent of the Contractor or subcontractor who supervises the payment of employees. I understand and agree that all documentation related to prevailing wages and/or local hiring required by law shall be submitted to Anne Arundel County's Prevailing Wage Director or their designee before any surety is released or final payment due under the terms of the Contract is made.

4. I further certify and attest that I will have personal knowledge of the wages paid to all employees of _____ for work performed on the Contract and of all of the hours worked, and that I am an authorized agent of the Contractor and assume responsibility for my actions.

5. I further certify and attest that _____ will comply with prevailing wage rates set by the State of Maryland as the same apply to the Contract and are a part of the bid documents

and Contract, and that _____ will comply with applicable local hiring requirements.

6. I attest and certify that, if the Contract is subject to the local hiring requirement under 8-2-116 of the Anne Arundel County Code, _____ will make best efforts to ensure that residents of Anne Arundel County constitute 51% of the new hires made for the Contract, subject to all exceptions allowable by law and regulation.

7. I certify and attest that, if the contract is subject to prevailing wage requirements, no rebates or deductions will be made, directly or indirectly, from any wages paid in connection with the Contract, other than those provided for by law.

8. I certify and attest that, if awarded the Contract and if the Contract is subject to prevailing wage law, I will submit certified payroll to the County through its Prevailing Wage software in accordance with Anne Arundel County Code 8-2-115.

Contractor/Bidder/Offeror

By

Printed Name

Printed Title

Date

Phone

Email

License Number

ANNE ARUNDEL COUNTY

***BROAD CREEK II WATER TREATMENT PLANT
NEW OPERATOR BUILDING***

Proposal No.: W804010

Project No.: W804000

AFFIDAVIT CONCERNING SALES AND USE TAX

**APPLICABLE TO THE CONSTRUCTION OF
WATER AND WASTEWATER TREATMENT FACILITIES**

I DO SOLEMNLY DECLARE AND AFFIRM, under the penalties of perjury, the following:

1. That I am aware of the following:
 - a. Water and wastewater treatment facilities consist of both real and tangible personal property.
 - b. As a general rule, all of the inter-connected machinery and equipment for processing and treating water or wastewater at a treatment facility is considered tangible personal property. This would include, for example, all of the tanks, pumps, pipes, valves, electrical systems, and chemical handling equipment.
 - c. Buildings and the systems serving the buildings, such as HVAC systems, plumbing and electrical service, as well as roadways, pavements, and fencing at treatment facilities are improvements to the realty. Off-site pipes and pumping equipment which transport water or wastewater to or from a treatment facility are normally real property improvements.
 - d. However, if significant processing occurs at a wastewater pumping station, the equipment will be considered tangible personal property.

2. That I am further aware of the following:

a. That a contractor who furnishes materials and is responsible for their installation as real property is responsible for paying sales and use tax on the purchase of materials so installed.

b. That a contractor who furnishes and installs any machinery or equipment which remains tangible personal property may buy it tax-free by issuing a resale certificate to the vendor.

c. That the resale of the tangible personal property included in a water or wastewater treatment facility to a local government unit is exempt.

3. That in submitting a bid, the contractor has afforded Anne Arundel County, Maryland the benefit of any exemption.

4. That the contractor will refund to Anne Arundel County, Maryland any refund of sales or use tax received by the contractor as a result of the County's exemption.

Signature

Name and Title of Signer

Company

Date

SUBSCRIBED TO AND SWORN TO BEFORE ME, A Notary Public of the State of _____,
County or City of _____ this year and date first above written.

Notary Public

My Commission Expires:

PROPOSAL

TO ANNE ARUNDEL COUNTY, MARYLAND

***BROAD CREEK II WATER TREATMENT PLANT
NEW OPERATOR BUILDING***

Proposal No.: W804010

Project No.: W804000

Made this _____ day of _____, 2024,

by _____

Business Address: _____

We/I the undersigned Bidder declare that the only person, firm, or corporation, or persons, firms, or corporations, that has or have any interest in this Proposal, or in the Contracts proposed to be taken, is or are the undersigned; that this Proposal is made without any connection or collusion with any other person, firm, or corporation making a Proposal for the same work; the undersigned further certifies that they have received Drawings, Specifications, Addenda (if any), and copy of this Proposal and that they constitute all instruments for bidding this contract, and that the Specifications, form of contract and the Drawings, therein referred to, have been carefully examined and are understood; that as careful an examination has been made of the worksite as is necessary to become informed as to the character and extent of the work required; and that is proposed and agreed, if the Proposal is accepted, to Contract with Anne Arundel County, Maryland, in the form of contract hereto attached, to do the required work in the manner set forth in the Specifications and as shown by the Drawings.

If this Proposal shall be accepted by Anne Arundel County, Maryland and the undersigned shall refuse or neglect, within ten (10) days after receiving the Contract for execution, to execute the same and to give the stipulated Bond, then said County may, at its option, determine that the Bidder has abandoned the Contract, and thereupon the Proposal and the acceptance thereof shall be null and void, and the deposit accompanying the Proposal shall be forfeited and paid as liquidated damages to the County. The base bid, unit prices and alternatives on the attached and signed Proposal Form are to include and cover the furnishing of all necessary machinery, tools, apparatus and means for performing the work, and the doing of all the above mentioned work, in the manner set forth, described and shown in the Specifications and on the Contract Drawings within the prescribed number of consecutive calendar days after service of written notice from the Owner to proceed with the work.

The successful Bidder shall be required to submit a list containing all parties to which he intends to subcontract any portion of the work. The list shall contain the subcontractor's name, address, work to be sublet and business telephone number.

A4-1

(NOTE: The Bidder or Bidders must sign here and the address of each must be given. In the case of firms, the firm name must be signed and subscribed to by at least one member. In the case of corporations, the corporate name must be signed by some authorized officer or agent thereof, who shall also subscribe his name and office. The seal of the corporation shall be affixed. Telephone number to be listed).

The names and addresses of all members of a firm or the names, addresses and titles of every officer of a corporation, or duly authorized agent, as the case may be, must be given here by the member of the firm or by the officer or agent of the corporation who signs the Proposal.

We/I will submit within ten (10) days of request by the county, the Experience and Equipment Certification specified and further understand and are/am aware that the work will be awarded to an approved organization which is properly constituted in experience, capital and equipment.

Prior to, or following, the award of this Contract, the Owner or Engineer may request that We/I supply him with whatever information is needed by him in order to become better familiarized with any of the subcontractors and/or equipment suppliers. It is further stipulated that no change in the names of those persons or organizations will be made unless written application is made with justification and prior approval is granted. It is further agreed that the apparent low bidder will submit within 10 days of a request by the county a detailed list of all subcontractors and equipment suppliers including anticipated dollar values.

We/I agree to accept as full compensation the unit prices stipulated for the contingent construction items that are incorporated into the work by direction of the Engineer in the field.

**ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS
ANNAPOLIS, MARYLAND**

***BROAD CREEK II WATER TREATMENT PLANT
NEW OPERATOR BUILDING***

Proposal No.: W804010

Project No.: W804000

DATE: _____

This is to certify that _____ has received Addendum No. _____ through _____ and this bid reflects the changes created by these addenda.

THE CONTRACTOR OR ANY SUBCONTRACTOR ON THIS WORK WILL BE REQUESTED TO COMPLY WITH EXECUTIVE ORDER 11246, ENTITLED "EQUAL EMPLOYMENT OPPORTUNITY" AS AMENDED BY EXECUTIVE ORDER 11375, AND AS SUPPLEMENTED IN U.S. DEPT. OF LABOR REGULATIONS (41 CRF PART 60).

Bidder's Names: _____

Bidder's Signature: _____

Bidder's Address: _____

Telephone Number: _____

Bidder's Email Address: _____

BASE BID UNIT PRICES

Item	Description	Unit Size	Estimated Quantity	Unit Price Dols / Cts	Total Price Dols / Cts
A-1	Mobilization	1	LS		
A-2	New Operations Building	1	LS		
A-3	Interior Furnishings	1	Allowance	35,000.00	35,000.00

TOTAL BASE BID: _____
\$ _____

CONTINGENCY UNIT PRICES

Item	Description	Unit Size	Estimated Quantity	Unit Price Dols/Cents	Total Price Dol/Cents
1	Reinforced Silt Fence.	LF	300	\$6.50	\$1,950
2	Temporary Seed & Mulch.	SY	300	.70	210
3	Earth Dike.	LF	50	2.25	112.50
4	Excelsior Matting.	SY	50	2.00	100.00
5	Stone #2 for Sediment Control on Filter Cloth, Including Removal After Completion of Construction.	CY	12	65.00	780.00
6	Class 3 Excavation w/ Stone Refill/ Offsite Disposal of Unsuitable Material.	CY	12	90.00	1080.00
7	Select Backfill / Offsite Disposal of Unsuitable Material.	CY	12	65.00	780.00
8	Borrow Backfill / Offsite Disposal of Unsuitable Material.	CY	12	50.00	600.00
9	Calcium Chloride.	Ton	0	650.00	0.00
10	Test Pit Excavation. a) Test Pit in County Road 1) First CY 2) Each Additional CY b) Test Pit Outside of Road (0-3 CY) c) Test Pit Outside of Road (>) 3 d) Test Pit (Includes Traffic Control) Non Destructive	CY CY CY CY EA	3 3 3 3 1	350.00 250.00 200.00 125.00 650.00	1,050.00 750.00 600.00 375.00 650.00
11	Flowable Fill.			Not Applicable – Not Used	0.00
12	Sheeting and Shoring as Directed by the Engineer – Ordered Left in Place.	MBM	0	950.00	0.00
13	Miscellaneous Concrete.	CY	5	325.00	1,625.00

TOTAL BID CONTENGENCY ITEMS: Ten Thousand Six Hundred Sixty-Two Dollars and fifty cents \$ 10,662.50

TOTAL BID (BASE + CONTINGENCY ITEMS):

\$ _____

BID PRICE MUST BE WRITTEN AND SHOWN IN NUMBERS, IN CASE OF DISCREPANCY THE WRITTEN AMOUNT WILL SUPERSEDE.

Total time for completion, 270 consecutive calendar days.
Liquidated damages shall be, 500 dollars per calendar day.

Basis of Award

The award of the Contract shall be in accordance with Section GP 3.0 of the Anne Arundel County Government January 2001 "Standard Details and Specifications for Construction" and any subsequent revisions thereto and based on lowest Total Bid (Base + Contingency Items) .

(Bidder)

By:

(Title)

In accordance with the County Code, Article 8-2-117(a)7, please list any affiliation with a County employee(s) or official(s) (Write "none" if there are no affiliations.):

CAPITAL IMPROVEMENT CONTRACT
BROAD CREEK II WATER TREATMENT PLANT
NEW OPERATOR BUILDING
Proposal No.: W804010
Project No.: W804000

THIS CONTRACT, made this _____ day of _____ the year _____, by and between hereinafter called the CONTRACTOR, and ANNE ARUNDEL COUNTY, MARYLAND, a body corporate and politic of the State of Maryland, hereinafter called the COUNTY.

WHEREAS, the Contract for constructing the **BROAD CREEK II WATER TREATMENT PLANT NEW OPERATOR BUILDING** shown on Drawings, marked Proposal W804010 on file in the Office of the Department of Public Works, subject to all the conditions, covenants, stipulations, terms and provisions contained in the Special provisions, attached hereto, and the "Anne Arundel County Standard Specifications for Construction" and "Standard Details" issued January 2001, and any revisions thereto, as adopted by the Department of Public Works, said Standard Specifications and Standard Details being in all respect made a part hereof by reference as full and with the same effect as if the same had been set forth in full herein, has recently been awarded to the Contractor by the County at and for the sum equal to the aggregate cost of the work, labor, materials and supplies done or furnished, at the prices and rates respectively named therefore in the bid attached hereto.

[WHEREAS, the Contract is subject to the prevailing wage and/or local hiring requirements of the Anne Arundel County Code pursuant to County Council Bill 72-21, as amended, and County Code sections 8-2-115 and 8-2-116, and the State of Maryland as applicable.]

AND WHEREAS, it was one of the conditions of said Award that a formal Contract should be executed by and between the contractor and the County evidencing the terms of said Award.

NOW THEREFORE, THIS CONTRACT WITNESSETH, that the Contractor does hereby covenant and agree with the County that he will well and faithfully construct _____ in accordance with each and every one of the conditions, covenants, stipulations, terms and provisions contained in the above-mentioned Specifications, and as shown on said Drawings, at and for a sum equal to the aggregate cost of the work, labor, materials and supplies done and furnished at the prices and rates respectively named therefore in the Proposal attached hereto, that sum being \$_____ (excluding change orders), and will well and faithfully comply with and perform each and every obligation imposed upon him by said Specifications, or the terms of said Award. (*Basis of Award – Total Base Bid (Items _____) and Contingent Bid (Items _____)*).

"The contractor does hereby agree that it will comply with the following:

The Contractor agrees to comply with the requirements of Attachment A hereto entitled "Prevailing Wage and Local Hiring Requirements for Capital Improvement Construction Contracts Addendum to the General Conditions of Contract between County and Contractor". The Contractor agrees to provide a prevailing wage payment bond and to provide all reporting required by either the prevailing wage law or local hiring law as required by statute in such form and

substance as may be required therein. The parties agree and understand that in addition to the damages set forth below, the Contractor may be liable for default for failure to abide by the requirements of the prevailing wage and local hiring laws of the State of Maryland and Anne Arundel County. Remedies for default include, but are not limited to liquidated damages in the amount of three times the wages owed to a specific employee or apprentice, a payment withholding for failure to abide by the County's prevailing wage laws, and/or disqualification from future contracts for a period of time for failure to abide by the County's local hiring laws set forth in County Code 8-2-115 and 8-2-116, as amended and Anne Arundel County Bill 72-21, as amended. They are in addition to, separate from, and not in lieu of any and all other remedies set forth in this Contract for other defaults and breaches including termination in whole or part, or withholding of final payment in the County's discretion. For the purposes of defining the scope of the prevailing wage and local hiring laws of Anne Arundel County, the parties expressly agree that it includes all promulgated rules, regulations and guidelines relating to the prevailing wage program that are published online or that have been provided to the Contractor as of the date of this Contract. The Contractor agrees to provide ongoing wage certifications and reports in the form required by the County's Prevailing Wage program and to permit auditing access. The Contractor further agrees that they have read the prevailing wage and/or local hiring law and the guidance and documentation posted by the County at <https://www.aacounty.org/departments/central-services/purchasing/prevailing-wage-law/index.html>, and agree to comply with all requirements therein.

The Contractor understands and agrees that an aggrieved employee or apprentice as a third party beneficiary, may by a civil action against the Contractor, recover the difference between the prevailing wage for the type of work performed and the amount actually received, with interest and reasonable attorney's fees, as applicable.

The Contractor agrees that for each and every calendar day that the Contractor is in default in completing the work to be done under this Contract, the Contractor shall pay to the County the sum of \$500.00 which sum is hereby agreed upon as liquidated damages as set forth in the Standard Specifications.

And the County does hereby covenant and agree with the Contractor that it will pay to the Contractor, when due and payable under the terms of said Specifications and of said Award, the above mentioned sum; and it will well and faithfully comply with and perform each and every obligation imposed upon it by said Specifications or the terms of said Award.

And the Contractor and the County do hereby agree that this Contract constitutes a contract under seal and that they intend the twelve year statute of limitations period to apply, as set forth in Courts & Judicial Proceedings Article, '5-102, Annotated Code of Maryland.

SERVICE OF PROCESS IN THE EVENT OF SUIT

The Contractor does hereby nominate and appoint _____, who actually resides at _____, who will accept service both before and after completion of the Contract and under no circumstances, is the Contractor to have the right to withdraw or revoke the agency without the prior written permission of the County.

IN WITNESS WHEREOF, Said _____ the Contractor, has hereunto set (his) (its) hand and

ATTACHMENT A

Prevailing Wage and Local Hiring Requirements for Capital Improvement Construction Contracts Addendum to the General Conditions of Contract between County and Contractor

The Contractor and all Subcontractors must comply with the Prevailing Wage Law and Local Hiring Requirements contained in Chapters 8-2-115 and 8-2-116 of the Anne Arundel County Code. Prevailing wage means the wage rate paid by employers that is determined by a governmental authority, based upon a particular geographic area, for a given class of labor and type of project. This rate means the basic hourly rate and fringe benefit rate established annually by the State of Maryland Commissioner of Labor and Industry for state funded construction contracts in the County at the time of award of the capital improvement contract. Apprentices must be paid at least the rate that the state's apprenticeship and training council sets for an apprentice in the trade involved, based on a percentage of the prevailing wage rate in that trade.

For the purposes of these requirements, employee means an apprentice, laborer or mechanic employed by a contractor on a capital improvement project, including any subcontractors, with a value of over \$250,000, or a capital project with a value over \$5,000,000. For local hiring requirements set forth in law, they will apply once the threshold of \$1,000,000 is met for capital improvement projects.

In the event of a conflict between this addendum, and any other document of the County or understanding between the parties, including but not limited to any capital improvement or capital project contract document and/or solicitation executed or solicited after July 1, 2022, the general conditions or standard specifications of the Department of Public Works including, but not limited to, the design manual and any procurement documents and guidelines relating to capital improvement projects or capital projects, the Purchasing Regulations of the County, and this Addendum-THIS PREVAILING WAGE AND LOCAL HIRING CONTRACT ADDENDUM SHALL CONTROL.

This capital improvement and/or capital project does not include blanket order or open end agreements in which the individual purchase order does not have a value over \$250,000, or capital improvement projects subject to a federal or state prevailing wage law, awarded without competition; it is not with another governmental entity; the contractor is not precluded from compliance by the terms of any federal or state law, contract or grant; it is not entered into pursuant to Anne Arundel County Code Section 8-1-107(B); entered into as a joint or cooperative purchase, or entered into as an emergency purchase.

The purpose of a prevailing wage is to ensure that contractors institute local hiring practices for capital improvement contracts under certain circumstances as required by law, and that the Contractor's employees who work on capital improvement contracts are paid the going rate for their services. The prevailing wage rates are established by the State of Maryland and apply to all of the Contractor's employees and any and all Subcontractors. The Contractor and all Subcontractors must comply with all of the requirements of the Prevailing Wage Law including, but not limited to, the following:

1. Pay employees the prescribed rate as annually established by the State of Maryland Commissioner of Labor and Industry; the prevailing wage rates in effect on the date a solicitation is issued will apply throughout the term of a contract resulting from that solicitation. These rates must be set forth in a cost estimate at the time of award and/or prior to contract execution as a condition precedent to any agreement with the County qualifying for the prevailing wage law. Cost estimates may also be required along with reporting requirements for local hiring when applicable. Prevailing wage means the wage rate paid by employers that is determined by a governmental authority, based upon a particular geographic area, for a given class of labor and type of project. This rate means the basic hourly rate and fringe benefit rate established annually by the State of Maryland Commissioner of Labor and Industry for state funded construction contracts in the County at the time of award of the capital improvement contract. Apprentices must be paid at least the rate that the state's apprenticeship and training council sets for an apprentice in the trade involved, based on a percentage of the prevailing wage rate in that trade. Wage deductions must be fair and reasonable and may only be made when (1) required by law; (2) authorized in a written agreement between the employee and contractor signed at the beginning of employment that concern food, sleeping quarters, or similar items; and are submitted by the contractor to the Director of the County's Prevailing Wage Program; or are required or allowed by a collective bargaining agreement between a bonafide labor organization and a contractor. Contractors may NOT split or subdivide a capital improvement contract or a subcontract awarded pursuant to the capital improvement contract, pay an employee through a third party, treat the employee as a subcontractor or independent contractor to avoid any requirement of the County's prevailing wage or local hiring laws; or employ an individual classified as a helper or trainee to perform direct and measurable work under a capital improvement contract.
2. Pay employees at a rate equal to or more than the regular prevailing wage rate for overtime for the type of work performed for each hour that the employee performs direct and measurable work (I) more than eight hours in any single calendar day; (II) more than 40 hours in a work week; or (III) on a Sunday or a legal holiday.
3. Classify employees in their proper work classification in conformance with the schedule established by the State of Maryland Commissioner of Labor and Industry;

4. The Contractor may only deduct wages fairly and reasonably when (1) required by law; (2) authorized in a written agreement between the employee and contractor signed at the beginning of employment that concern food, sleeping quarters, or similar items; and are submitted by the contractor to the Director of the County's Prevailing Wage Program; or are required or allowed by a collective bargaining agreement between a bonafide labor organization and a contractor.
5. Electronically submit payroll records through (pending procurement), within 14 days after the end of each payroll period, to verify that Prevailing Wage rates have been paid to employees. A contractor must submit a certified complete copy of its payroll records for a capital improvement contract covered by the County's Prevailing Wage or local hiring laws within 14 days after the end of each payroll period.
6. Contractors must retain records for a period of five years after the work is completed and must permit the Director of the Department that administers the Prevailing Wage program, or their designee, to inspect the payroll records at a reasonable time and as often as necessary.
7. The Contractor's payroll records shall contain a statement signed by the contractor attesting and certifying that the payroll records are complete and correct; the wage rates are not less than required by the County Code and Purchasing Regulations; and the rate of pay and classification for each employee accurately reflects the work the employee(s) performed.
8. All payroll records shall include the name, address, telephone number and email of the contractor; the name and location of the job; and each employee's name, current address unless previously reported; specific work classification; daily basic time and overtime hours; total basis time and overtime hours for the payroll period; rate of pay; fringe benefits by type and amount; and gross wages.
9. The County may in their sole discretion perform random or regular audits and investigate any complaint of a violation of the County's prevailing wage and local hiring laws and requirements. If a Contractor or any Subcontractors are late in submitting copies of any payroll records required to be submitted under the Prevailing Wage Law, the County may deem Contractor's invoice(s) submitted to the County for payment unacceptable until the Contractor and Subcontractors provide the required records; and, the County may postpone processing payments otherwise due under the Contract or under an agreement to finance the Contract;
10. A Contractor must make best efforts to fill at least 51% of new jobs required to complete the capital improvement contract or capital project with Anne Arundel County residents. Further, the Contractor will submit quarterly reports relating to local hiring with respect to a capital project or capital improvement project meeting the necessary requirements that lists the number of new hires needed for the contract during the reporting period, the number of County residents hired during the reporting period, the number of all employees hired during the reporting period. The local hiring reporting will include a description of the best efforts made to fill open positions with County residents. New hires reported must list their name, the last four digits of their social security number, the job title, the hire date, the address and the referral source.
11. Any and all disputes will be handled as set forth in the County's prevailing wage and local hiring law. The Contractor agrees to this method of resolving disputes and waives any right of appeal or claims beyond that set forth in the prevailing wage and local hiring law as a condition of award.
12. In the event the County determines that a provision of the Prevailing Wage Law has been violated, the County may withhold payment to the Contractor in an amount sufficient to pay each employee of the Contractor or any Subcontractors the full amount of wages due under the Prevailing Wage Law, and an amount sufficient to satisfy a liability of a Contractor or any Subcontractors for liquidated damages as provided under the Prevailing Wage Law, pending a final decision on the violation by the County;. Contractor may appeal a written decision of the Director of Central Services, that the Contractor violated a provision of the Prevailing Wage Law to the Purchasing Agent, within ten (10) days after receiving a copy of the decision. If they do not appeal, the decision of the Director or their designee is final. Within a reasonable time of receipt of a timely appeal, the purchasing agent may investigate, request written testimony, or conduct a hearing as they deem necessary for the review of appeal. The parties agree that the decision of the Purchasing Agent is final and binding and not subject to appeal. The Contractor will cooperate and provide testimony upon request. A Contractor who is found to have violated the provisions of the local hiring law intentionally, may not be awarded a county contract or work on any county contract for a period of one year from the date of the final decision.
13. If a party is found late in submitting copies of payroll records deemed required under the County's prevailing wage and local hiring laws and regulations, the County may deem the invoices deficient until the Contractor provides the required records and may postpone processing payments until the Contractor provides the required records and may postpone processing payments under the contract or agreement with the County.
14. Contractor and all Subcontractors must not discharge, or otherwise retaliate against, an employee for asserting any right under the Prevailing Wage Law or for filing a complaint of a violation.
15. An aggrieved employee is a third-party beneficiary of this Contract and the employee may by civil action recover the difference

between the prevailing wage for the type of work performed and the amount actually received, with interest and a reasonable attorney's fee in the amount of three times the wages owed to a specific employee or apprentice, this right is incorporated into the Contract.

16. Each Contract subject to the Prevailing Wage Law may specify the payment of liquidated damages to the County by the Contractor and any Subcontractors for any noncompliance with the Prevailing Wage Law. Liquidated damages are:

- (a) \$10 for each calendar day that the payroll records are late; \$10 per day for each day that an employee is misclassified; and \$10 per violation of the requirement to post the prevailing wage rates at the work site.
- (b) Liquidated damages as set forth in Section 15 for the benefit of the third party employee; and
- (c) Liquidated damages as set forth for delays in performance or work under the Contract in B1-2 are separate from prevailing wage and/or local hiring.

These liquidated damages are solely related to prevailing wage and local hiring compliance and do not negate any other remedies available or set forth in the Contract, including delay damages or actual damages. These remedies are separate, in addition to, and not in lieu of any remedies available and set forth in the Contract for other breaches or defaults under the Contract.

17. Where the initial Contract Sum is below the monetary threshold, but it is subsequently increased and exceeds the monetary threshold due to an approved Contract Modification, the amount of any such Contract Modification that causes the Contract Sum to exceed the monetary threshold is subject to the Prevailing Wage Law and local hiring requirements.

18. The County also reserves the right to withhold payment pending receipt of payroll records or local hiring reports until such time as they are accurately provided in the County's sole and exclusive discretion.

19. The Contractor and all Subcontractors must post a clearly legible statement of each prevailing wage rate in a prominent and easily accessible place at the Work Site during the entire time Work is being performed, in English and any other language that is primarily spoken by the employees, at the Work Site.

20. Contractors and all Subcontractors and employees, including apprentices, as defined within the law must provide reporting for local hiring as required by the law on such forms and in such substance as may be required by the County. Failure to provide local hiring reporting may result in a finding of non compliance.

ANNE ARUNDEL COUNTY, MARYLAND

***BROAD CREEK II WATER TREATMENT PLANT
NEW OPERATOR BUILDING***

Proposal No.: W804010

Project No.: W804000

CONTRACTOR'S PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That _____,
as Principal, hereinafter called Principal, and _____, as
Surety, hereinafter called Surety, are held and firmly bound unto the Anne Arundel County, Maryland,
a body corporate and politic of the State of Maryland, hereinafter called the County, in the amount of
_____ Dollars (\$_____) (*amount to be
100% of Contract Amount*), for the payment whereof Principal and Surety bind themselves, their heirs,
executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a Written Contract dated _____
with the County for Project No.: W804000 Contract No.: W804010 which contract is by reference
made a part hereof and hereinafter referred to as the Contract.

NOW, THEREFORE, the condition of this obligation is such, that if the Principal
shall well, truly and properly perform and fulfill all the undertakings, covenants, terms, conditions and
agreements of said Contract and of all such alterations and modifications thereof as may hereafter be
made therein, in the manner and to the extent which said Contract provides for such alterations and
modifications, during the original term of said Contract and any extensions thereof which may be
granted by the County and agreed upon by the Principal; and if the Principal shall

indemnify and save harmless the County from all loss, cost or damage arising out of a default

hereunder or under said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety expressly waives any right to receive NOTICE of extensions of time, or alterations or modifications of the Contract, which are provided for and made pursuant to the terms of, said contract.

PROVIDED, HOWEVER, no right of action shall accrue on this bond to or for the use of any person, firm or corporation whatever other than the County named herein, or its successors in office.

Signed and sealed this _____ day of _____, _____.

In the Presence of:

(Contractor)

WITNESS:

Signature of Principal/Corporate Officer (SEAL)

Title (SEAL)

Surety

By: _____ (SEAL)

Bond No.

ANNE ARUNDEL COUNTY, MARYLAND

**BROAD CREEK II WATER TREATMENT PLANT
NEW OPERATOR BUILDING**

Proposal No.: W804010

Project No.: W804000

CONTRACTOR'S PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS:

That _____, as Principal, hereinafter called Principal, and _____, as Surety, hereinafter called Surety, are held and firmly bound unto the Anne Arundel County, Maryland, a body corporate and politic of the State of Maryland, hereinafter called the County, for the use and benefit of Claimant, as herein below defined, in the amount of _____ Dollars (\$ _____) (*amount of bond to be 50% of Contract Amount*), for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a Written Contract dated _____ with the County for Project No.: W804000 Contract No.: W804010 which contract is by reference made a part hereof and hereinafter referred to as the Contract.

NOW, THEREFORE, the condition of this obligation is such, that if the principal shall promptly make payment to each and every Claimant, as hereinafter, defined, for all labor, materials, supplies and rental of equipment reasonably required and used or consumed in the performance of the Contract and of all such alterations and modifications of said Contract provides for such

alterations and modifications, during the original term of said Contract and any extensions thereof which may be granted by the County and agreed upon by the Principal, then this obligation shall be null and void; otherwise it shall be and remain in full force and effect.

The Surety expressly waives any right to receive notice of extensions of time, or alterations or modifications of the Contract, which are provided for and made pursuant to the terms of, said Contract.

PROVIDED, HOWEVER, anything in said Contract to the contrary notwithstanding, this bond is executed upon and subject to the express conditions and limitations of State Finance and Procurement Article, Section 17-108 and 17-109, Annotated Code of Maryland, as of the date of this contract wherein it is set forth in pertinent part as follows:

Action on security.

(a) *In general.* -- Subject to subsection (b) of this section, a supplier may sue on payment security if the supplier:

(1) Supplied labor or materials in the prosecution of work provided for in a contract subject to this subtitle; and

(2) Has not been paid in full for the labor or materials within 90 days after the day that the person last supplied labor or materials for which the claim is made.

(b) *Payment owed by subcontractor.* –

(1) A supplier who has a direct contractual relationship with a subcontractor or sub-subcontractor of a contractor who has provided payment security but no contractual relationship with the contractor may sue on the security if the supplier gives written notice to the contractor within 90 days after the labor or materials for which the claim is made were last supplied in prosecution of work covered by the security.

(2) A notice under this subsection:

(i) Shall state with substantial accuracy the amount claimed and the person to whom the labor or material was supplied; and

(ii) Shall be sent by certified mail to the contractor at the contractor's

residence or a place where the contractor has an office or does business.

Venue; limitations; costs.

(a) *Venue.* -- An action on a payment bond required by this subtitle shall be filed in the appropriate court of the county where:

- (1) The contract was executed and performed; or
- (2) The contractor has its principal place of business.

(b) *Limitations period.* -- An action on a payment bond required by this subtitle shall be filed within 1 year after the public body finally accepts the work performed under the contract.

Signed and sealed this _____ day of _____, _____.

In the Presence of:

WITNESS:

(Contractor)

Signature of Principal/Corporate Officer (SEAL)

Title (SEAL)

Surety

By: _____

Bond No.

ANNE ARUNDEL COUNTY, MARYLAND

***BROAD CREEK II WATER TREATMENT PLANT
NEW OPERATOR BUILDING***

Proposal No.: W804010

Project No.: W804000

CORPORATE RESOLUTION

RESOLVED, that _____ be, and it is hereby authorized to do business and enter into contracts and agreements with Anne Arundel County, Maryland,

RESOLVED, that _____ and _____ who are respectfully the _____ and _____, or its duly authorized agent(s) of the _____ are authorized to file and sign contracts on behalf of the said Corporation.

AND IT IS FURTHER RESOLVED, that the authority to said officer(s) or agent(s) conferred by this Resolution shall remain open and good until revoked by a formal action of the Board of Directors of the Corporation and due notice of such revocation delivered to the Anne Arundel County, Maryland in writing under the signature of the Secretary or Assistant Secretary of this Corporation, and this authority shall apply to any present or future incumbent of the aforesaid office.

I HEREBY CERTIFY that the above is a true copy of the Resolution of the Board of Directors of _____, passed at a meeting of said Board duly called and held on the day of _____, _____, at which meeting a quorum of said Board of Directors was present and voted.

Secretary

SEAL

*NOTE: THIS FORM MUST BE ACCOMPANIED BY A VALID POWER OF ATTORNEY.

ANNE ARUNDEL COUNTY, MARYLAND

***BROAD CREEK II WATER TREATMENT PLANT
NEW OPERATOR BUILDING***

Proposal No.: W804010

Project No.: W804000

BID BOND

KNOW ALL MEN BY THESE PRESENT, that we

_____ hereinafter called the "Principal" and

Company Name

Surety

as Surety ("Surety"), are held and firmly bound unto Anne Arundel County, Maryland, hereinafter called the "Owner" in the penal sum of _____ Dollars (\$_____) lawful money of the United States, for the payment of which sum well and truly make, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the accompanying bid dated _____ for the **Broad Creek II Water Treatment Plant New Operator Building**, Anne Arundel County, Maryland.

(Name of Project)

NOW THEREFORE, if the Principal shall not withdraw said bid within the period specified therein after the opening of the same, or, if no period is specified, within ninety (90) days after said opening; and within ten (10) days after the prescribed forms are presented to him for signature, enter into a written contract with the Owner, in accordance with the bid as accepted and give Bond with good and sufficient surety or sureties, as may be required for the faithful performance and proper fulfillment of such contract; or in the event of the withdrawal of said bid within the period specified or the failure to enter into such contract and give such bond within the time specified if the principal shall pay the Owner the difference between the amount specified in said bid and the amount for which the Owner may procure the required work or supplies, or both, if the latter amount be in excess of the former, then the above obligation shall be void, and of no effect, otherwise to remain in full force and effect.

*NOTE: THIS FORM MUST BE ACCOMPANIED BY A VALID POWER OF ATTORNEY.

IN WITNESS WHEREOF, the above bonded parties have executed this instrument under their several seals this _____ day of _____, _____, 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.

In the Presence of:

(Contractor)

WITNESS:

(SEAL)
Signature of Principal/Corporate Officer

(SEAL)

Title

Surety

By: _____

Bond No.

**NOTE: THIS FORM TO BE SUBMITTED BY APPARENT LOW BIDDER
WITHIN TEN DAYS OF REQUEST BY THE COUNTY**

ANNE ARUNDEL COUNTY

***BROAD CREEK II WATER TREATMENT PLANT
NEW OPERATOR BUILDING***

Proposal No.: W804010

Project No.: W804000

EXPERIENCE AND EQUIPMENT CERTIFICATION

I. General

a. Legal Title, Address and Phone Number of Organization

b. Maryland Representative's Name, Title and Address.

c. (Check one) Corporation _____ Co-Partnership _____ Individual _____

**NOTE: THIS FORM TO BE SUBMITTED BY APPARENT LOW BIDDER
WITHIN TEN DAYS OF REQUEST BY THE COUNTY**

II. Experience

- a. Indicate type of contracting undertaken by your organization and years experience.

General _____ Sub _____ Type _____
 Years Years Years
 Type _____
 Years
 Type _____
 Years

- b. State construction experience of principal members of your organization.

Construction Experience

NAME	TITLE (As Pres., Mgr, etc.)	CONSTRUCTION EXPERIENCE YEARS	TYPE OF WORK (Sewer, Hwy, Bridges, Paving, etc.)	IN WHAT CAPACITY (Supt, Foreman)

- c. Give any special qualifications of firm members
(Registered Engineer, Surveyors, etc.)

**NOTE: THIS FORM TO BE SUBMITTED BY APPARENT LOW BIDDER
WITHIN TEN DAYS OF REQUEST BY THE COUNTY**

d. List Principal projects completed by your organization.

Description	Gen. or Sub (If sub, what type of work)	Your Contract Amount	Year	Reference

e. Have you ever failed to complete any work awarded to you? _____
 If so, where and why? _____

f. Has your firm been assessed liquidated damages within the last three years? If so, explain circumstances. (*Attach separate sheet*)

**NOTE: THIS FORM TO BE SUBMITTED BY APPARENT LOW BIDDER
WITHIN TEN DAYS OF REQUEST BY THE COUNTY**

explain circumstances. (*Attach separate sheet*)

III. Financial Capability

The following financial data shall be provided upon request of the County. If the Bidder is a subsidiary of another firm, then the information requested should be provided for both the Bidder and the parent organization, as it may be applicable to the Bid.

- a. The Bidder's most recent Form 10-K, as filed with the U.S. Securities and Exchange Commission ("SEC") and all Form 100's since the last 10-K,
- b. All Bidders not filing a Form 10K with the SEC should submit the following information:
 1. Federal Tax Returns for the last three (3) years;
 2. Audited financial statements for the past three (3) fiscal years to include, at a minimum, income statement, balance sheet, and statement of changes in financial position;
 3. Copies of quarterly financial reports since the last audited statement;
 4. Any material changes in the mode of conducting business, bankruptcy proceedings, and mergers or acquisitions for the past three years, as well as any disclosure of any potential mergers or acquisitions; and
 5. Any and all lawsuits filed against the Bidder since January 1, 1988 and a statement as to the outcome or current status of each such lawsuit.
- c. A full and complete description of the legal and financial relationships among all entities which will be bound by the terms and conditions of the Contract including any entities which will guarantee the obligations of, or provide financial support to,
any such parties.

IV. Bidder Certification

The above statements are certified to be true and accurate and we have the equipment, labor, supervision and financial capacity to perform this Contract, either with our organization, or with subcontractors.

**NOTE: THIS FORM TO BE SUBMITTED BY APPARENT LOW BIDDER
WITHIN TEN DAYS OF REQUEST BY THE COUNTY**

Dated at _____ this _____ day of _____,

.

By:

(Title of Person Signing)

(Name of Organization)

State of _____

County of _____

_____ Being duly sworn states that
he/she

Name

is _____ of _____
(Office) (Name of Organization)

and that the answers to the foregoing questions and all statements therein contained are true and correct.

Sworn to before me this _____ day of _____,

.

Notary Public

My Commission Expires

B6-5

NOTE: THIS FORM IS TO BE SUBMITTED BY THE APPARENT LOW BIDDER WITHIN TEN DAYS OF REQUEST BY THE COUNTY. (please type or print information clearly)

ANNE ARUNDEL COUNTY

BROAD CREEK II WATER TREATMENT PLANT NEW OPERATOR BUILDING

Proposal No.: W804010

Project No.: W804000

LIST OF SUBCONTRACTORS AND EQUIPMENT SUPPLIERS

NAME OF GENERAL/PRIME CONTRACTOR: _____

Subcontractor's Type of Work or Supplier's Type of Equipment	Name	Address	Percent of Total Contract	Value of Sub-Contract	MBE SBE or WBE

NOTE: THIS FORM IS TO BE SUBMITTED BY THE APPARENT LOW BIDDER WITHIN TEN DAYS OF REQUEST BY THE COUNTY. (please type or print information clearly)

Subcontractor's Type of Work or Supplier's Type of Equipment	Name	Address	Percent of Total Contract	Value of Sub-Contract	MBE SBE or WBE

ANNE ARUNDEL COUNTY

***BROAD CREEK II WATER TREATMENT PLANT
NEW OPERATOR BUILDING***

Proposal No.: W804010

Project No.: W804000

APPENDIX "A"

CONTRACTOR CUSTOMER SERVICE PROGRAM

Customer Relations Requirements

All consultants, contractors, subcontractors, suppliers and etc., are required to assume their part in the County's Customer Oriented Programs. A description of the Department's policy and its action items are as follows:

"The Department of Public Works has a customer oriented philosophy that requires all employees, consultants, contractors, etc., to adhere to the five dimensions of quality service."

The Five Dimensions of Quality Service Are:

1. Reliability: Is what was promised provided dependably and accurately?
 - a. Scheduling
 - b. Proper notification
 - c. Traffic control
 - d. Sediment control
 - e. Quality of work

2. Assurance: Are the employees knowledgeable and courteous, and can they express trust and confidence?
 - a. Citizen interaction - knowledgeable
 - b. Concerns remedied

3. Empathy: Are caring and individual attention provided?
 - a. Citizen interaction - polite, courteous
 - b. Callbacks will be treated as part of the construction effort

4. Responsiveness: Is there a willingness to help customers and provide proper service?

- a. Response to citizen concern within two days. If required work is anticipated to exceed two days, a schedule must be provided indicating when work will be completed.
 - b. Additionally, follow-up must be accomplished. Whether the work is complete or not, the follow-up must be done.
5. Tangibles: Are the physical facilities and equipment customer friendly?
- a. Traffic control
 - b. Sediment control
 - c. Safe driving - includes control of speed of vehicles
 - d. Sanitary facilities provided for manpower

As a means of ensuring the contractor's participation, each contractor must provide a customer plan and a team composition responsible for adhering to the "Five Dimensions of Customer Service" given previously. Additionally, the plan and the team composition are to be submitted within fourteen (14) calendar days of NTP or concurrent with the contractor's on-site mobilization. The team leader is required to oversee the entire program and be available to assist in resolution of concerns. The other members of the team will provide courteous and prompt assistance to concerns. Any contractor's employee(s) not performing in accordance with the above will be subject to removal from further participation in the project upon written order from the County representative. Failure to participate or respond as required shall be cause for termination of the contract for non-performance.

ANNE ARUNDEL COUNTY

***BROAD CREEK II WATER TREATMENT PLANT
NEW OPERATOR BUILDING***

Proposal No.: W804010

Project No.: W804000

APPENDIX “B”

CONTRACTOR SECURITY PROGRAM

This appendix describes measures to be taken by the contractor to reduce the risk of vulnerability to Anne Arundel County Department of Public Works (DPW) Utility Operations facilities for each of the Homeland Security Threat Advisory Levels. Utility Operations personnel may take measures based on the Department of Public Works Policy and Procedures Manual that will impact the contractor’s work. Consultants, contractors, subcontractors, suppliers, etc. are required to perform their part in this program.

The following measures shall be implemented based on the security threat level declared by Utility Operations.

Standard Practice & Measures

- 1 Carry identification while on Utility Operations property. Minimum identification may consist of a printed or hand written business card or paper bearing the hiring company’s name, the individual’s name and the signature of the hiring company foreman, supervisor or other representative.
- 2 Challenge unknown visitors. Request identification and purpose of visit.
- 3 Review security procedures with personnel.
- 4 Report suspicious activity (carrying suitcases / containers, photographing, noting or asking questions about operations, pumping or pipeline operations or security measures) to supervision. Supervision determines whether to contact law enforcement and chain of command.
- 5 Report unidentified vehicles parked or operated in a suspicious manner on or in Utility Operations facilities, equipment or rights-of-way. Notify supervision of infractions. Supervision determines whether to contact law enforcement and chain of command.

Elevated Threat Advisory Level – No Specific Information on Timing or Location

- 1 Remind personnel to:
 - a. Carry identification while on Utility Operations property. Minimum identification may consist of a printed or hand written business card or paper bearing the hiring company’s name, the individual’s name and the signature of the hiring company foreman, supervisor or other representative.
 - b. Challenge unknown visitors.

- c. Request identification and purpose of visit.
- 2 Cease public tours.
- 3 If directed by Utility Operations:
 - a. Remove vehicles and objects (e.g. dumpsters) parked within 25 yards of specified facilities.
 - b. Park vehicles outside facilities. Implement centralized parking and shuttle service.
 - c. Report suspicious vehicles or objects to Utility Operations supervision.
 - d. Verify the identity of individuals entering specified facilities.
 - e. Facility gates and entrances will be locked, except when passing through. Limit access to essential employees and contractors. Verify the identity of individuals entering facilities. Issue visitor badges to visitors.
 - f. Inspect buildings, rooms and storage areas not in regular use, daily.
 - g. Inspect the interior and exterior of buildings for suspicious activities or packages. Check for signs of tampering or indications of unauthorized entry.
- 4 Utility Operations may:
 - a. Erect barriers to control the direction of traffic flow and parking.
 - b. Consult with law enforcement to close public roads and facilities.

Imminent Threat Advisory Level – Threat at Location Impending or Very Soon

- 1 Remind personnel to:
 - a. Display identification while on Utility Operations property. Minimum identification may consist of a printed or hand written business card or paper bearing the hiring company's name, the individual's name and the signature of the hiring company foreman, supervisor or other representative.
 - b. Challenge unknown visitors.
 - c. Request identification of anyone not displaying it and ask the purpose of his or her visit.
- 2 Limit access to facilities and activities to personnel with legitimate and verifiable need to enter.
 - a. Cease Public Tours
- 3 Buildings, rooms, and storage areas will be locked. Inspect baggage, briefcases, and packages brought to the facility.
- 4 If directed by Utility Operations:
 - a. Remove vehicles and objects (e.g. dumpsters) parked within 25 yards of specified facilities. Identify owners of vehicles on Utility Operation property. Have unidentified vehicles inspected by law enforcement personnel and, if appropriate, removed.
 - b. Park vehicles outside facilities. Implement centralized parking and shuttle service.

- c. Inspect delivery vehicles and containers entering the facility. Require advance delivery notification and validate credentials of the driver.
 - d. Implement daily inspections of specified buildings and grounds.
 - e. Take steps to control access to specified facilities.
 - f. Facility gates and entrances will be locked, except when passing through. Limit access to essential employees and contractors. Verify the identity of individuals entering facilities. Issue visitor badges to visitors.
 - g. Inspect buildings, rooms and storage areas not in regular use daily.
 - h. Inspect the interior and exterior of buildings for suspicious activities or packages. Check for signs of tampering or indications of unauthorized entry.
 - i. Implement mailroom procedures. Have mail and packages sent to a central, secure location and inspected before distribution.
- 5 Utility Operations may:
- a. Restrict access to specific facilities.
 - b. Request closure of public roads and facilities in the vicinity of specified facilities.
 - c. Stop work in part or in total.
 - d. Erect barriers to control the direction of traffic flow and parking.
 - e. Consult with law enforcement to close public roads and facilities.
 - f. Post guards.

APPENDIX C
PREVAILING WAGE AND LOCAL HIRING
MANDATORY REQUIREMENTS

The Contractor and all Subcontractors must comply with the Prevailing Wage Law and Local Hiring Requirements contained in Chapters 8-2-115 and 8-2-116 of the Anne Arundel County Code and Anne Arundel County Bill 72-21, as amended. Prevailing wage means the wage rate paid by employers that is determined by a governmental authority, based upon a particular geographic area, for a given class of labor and type of project. The County will use the State of Maryland Commissioner of Labor and Industry rates for state funded construction contracts for Wage Determinations in the County at the time of award of the capital improvement contract, these rates include the basic hourly rate and fringe benefits. Apprentices must be paid at least the rate that the state's apprenticeship and training council sets for an apprentice in the trade involved, based on a percentage of the prevailing wage rate in that trade. Any Contractor that is subject to the prevailing wage or local hiring law will be required to agree to the below provision:

For the purposes of these requirements, an employee means an apprentice, laborer or mechanic employed by a contractor on a capital improvement project, including any subcontractors, with a value of over \$250,000, or a capital project with a value over \$5,000,000.

Capital Improvement Project does not include blanket order or open end agreements, or capital improvement projects subject to a federal or state prevailing wage law, awarded without competition; with another governmental entity; to the extent the contractor is precluded from compliance by the terms of any federal or state law, contract or grant; entered into pursuant to Anne Arundel County Code Section 8-1-107(B); entered into as a joint or cooperative purchase or entered into as an emergency purchase.

The purpose of a prevailing wage is to ensure that contractors institute local hiring practices for capital improvement contracts under certain circumstances as required by law, and that the Contractor's employees who work on capital improvement contracts are paid the going rate for their services. The prevailing wage rates are established by the State of Maryland and apply to all of the Contractor's employees and any and all Subcontractors. The Contractor and all Subcontractors must comply with all of the requirements of the Prevailing Wage Law including, but not limited to, the following:

1. Pay employees the prescribed rate as annually established by the State of Maryland Commissioner of Labor and Industry; the prevailing wage rates in effect on the date a solicitation is issued will apply throughout the term of a contract resulting from that solicitation. Prevailing wage means the wage rate paid by employers that is determined by a governmental authority, based upon a particular geographic area, for a given class of labor and type of project. This rate means the basic hourly rate and fringe benefit rate established annually by the State of Maryland Commissioner of Labor and Industry for state funded construction contracts in the County at the time of award of the capital improvement contract. Apprentices must be paid at least the rate that the state's apprenticeship and training council sets for an apprentice in the trade involved, based on a percentage of the prevailing wage rate in that trade. Wage deductions must be fair and reasonable and may only be made when (1)

required by law; (2) authorized in a written agreement between the employee and contractor signed at the beginning of employment that concern food, sleeping quarters, or similar items; and are submitted by the contractor to the Director of the County's Prevailing Wage Program; or are required or allowed by a collective bargaining agreement between a bonafide labor organization and a contractor. Contractors may NOT split or subdivide a capital improvement contract or a subcontract awarded pursuant to the capital improvement contract, pay an employee through a third party, treat the employee as a subcontractor or independent contractor to avoid any requirement of the County's prevailing wage or local hiring laws; or employ an individual classified as a helper or trainee to perform direct and measurable work under a capital improvement contract.

2. Pay employees at a rate equal to or more than the regular prevailing wage rate for overtime for the type of work performed for each hour that the employee performs direct and measurable work (I) more than eight hours in any single calendar day; (II) more than 40 hours in a work week; or (III) on a Sunday or a legal holiday.;
3. Classify employees in their proper work classification in conformance with the schedule established by the State of Maryland Commissioner of Labor and Industry.
4. The Contractor may only deduct wages fairly and reasonably when (1) required by law; (2) authorized in a written agreement between the employee and contractor signed at the beginning of employment that concern food, sleeping quarters, or similar items; and are submitted by the contractor to the Director of the County's Prevailing Wage Program; or are required or allowed by a collective bargaining agreement between a bonafide labor organization and a contractor.
5. Electronically submit payroll records through (pending procurement), within 14 days after the end of each payroll period, to verify that Prevailing Wage rates have been paid to employees. A contractor must submit a certified complete copy of its payroll records for a capital improvement contract covered by the County's Prevailing Wage or local hiring laws within 14 days after the end of each payroll period.
6. Contractors must retain records for a period of five years after the work is completed and must permit the Director of the Department that administers the Prevailing Wage program, or their designee, to inspect the payroll records at a reasonable time and as often as necessary.
7. The Contractor's payroll records shall contain a statement signed by the contractor attesting and certifying that the payroll records are complete and correct; the wage rates are not less than required by the County Code and Purchasing Regulations; and the rate of pay and classification for each employee accurately reflects the work the employee(s) performed.
8. All payroll records shall include the name, address, telephone number and email of the contractor; the name and location of the job; and each employee's name, current address unless previously reported; current address unless previously reported; specific work classification; daily basic time and overtime hours; total basis time and overtime hours for the payroll period; rate of pay; fringe benefits by type and amount; and gross wages.
9. The County may in their sole discretion perform random or regular audits and investigate any complaint of a violation of the County's prevailing wage and local hiring laws and requirements If a Contractor or any Subcontractors are late in submitting copies of any payroll

records required to be submitted under the Prevailing Wage Law, the County may deem Contractor's invoice(s) submitted to the County for payment unacceptable until the Contractor and Subcontractors provide the required records; and, the County may postpone processing payments otherwise due under the Contract or under an agreement to finance the Contract;

10. A Contractor must make best efforts to fill at least 51% of new jobs required to complete the capital improvement contract or capital project with Anne Arundel County residents. Further, the Contractor will submit quarterly reports relating to local hiring with respect to a capital project or capital improvement project meeting the necessary requirements that lists the number of new hires needed for the contract during the reporting period, the number of County residents hired during the reporting period, the number of all employees hired during the reporting period. The local hiring reporting will include a description of the best efforts made to fill open positions with County residents. New hires reported must list their name, the last four digits of their social security number, the job title, the hire date, the address and the referral source.
11. Any and all disputes will be handled as set forth in the County's prevailing wage and local hiring law. The Contractor agrees to this method of resolving disputes and waives any right of appeal or claims beyond that set forth in the prevailing wage and local hiring law as a condition of award.
12. In the event the County determines that a provision of the Prevailing Wage Law has been violated, the County may withhold payment to the Contractor in an amount sufficient to pay each employee of the Contractor or any Subcontractors the full amount of wages due under the Prevailing Wage Law, and an amount sufficient to satisfy a liability of a Contractor or any Subcontractors for liquidated damages as provided under the Prevailing Wage Law, pending a final decision on the violation by the County;. Contractor may appeal a written decision of the Director of Central Services, that the Contractor violated a provision of the Prevailing Wage Law to the Purchasing Agent, within ten (10) days after receiving a copy of the decision. If they do not appeal, the decision of the Director or their designee is final. Within a reasonable time of receipt of a timely appeal, the purchasing agent may investigate, request written testimony, or conduct a hearing as they deem necessary for the review of appeal. The parties agree that the decision of the Purchasing Agent is final and binding and not subject to appeal. The Contractor will cooperate and provide testimony upon request. A Contractor who is found to have violated the provisions of the prevailing wage or local hiring law intentionally, may not be awarded a county contract or work on any county contract for a period of one year from the date of the final decision.
13. If a party is found late in submitting copies of payroll records deemed required under the County's prevailing wage and local hiring laws and regulations, the County may deem the invoices deficient until the Contractor provides the required records and may postpone processing payments until the Contractor provides the required records and may postpone processing payments under the contract or agreement with the County.
14. Contractor and all Subcontractors must not discharge, or otherwise retaliate against, an employee for asserting any right under the Prevailing Wage Law or for filing a complaint of a violation;

15. An aggrieved employee is a third-party beneficiary of this Contract and the employee may by civil action recover the difference between the prevailing wage for the type of work performed and the amount actually received, with interest and a reasonable attorney's fee;
16. Each Contract subject to the Prevailing Wage Law may specify the payment of liquidated damages to the County by the Contractor and any Subcontractors for any noncompliance with the Prevailing Wage Law. Liquidated damages are:
 - a. \$10 for each calendar day that the payroll records are late; \$10 per day for each day that an employee is misclassified; and \$10 per violation of the requirement to post the prevailing wage rates at the work site.
 - b. Liquidated damages as set forth in Section 15 for the benefit of the third party employee; and
 - c. Liquidated damages as set forth for delays in performance or work under the Contract in B1-2 are separate from prevailing wage and/or local hiring.

These liquidated damages are solely related to prevailing wage and local hiring compliance and do not negate any other remedies available or set forth in the Contract, including delay damages or actual damages. These remedies are separate, in addition to, and not in lieu of any remedies available and set forth in the Contract for other breaches or defaults under the Contract.

17. Where the initial Contract Sum is below the monetary threshold, but it is subsequently increased and exceeds the monetary threshold due to an approved Contract Modification, the amount of any such Contract Modification that causes the Contract Sum to exceed the monetary threshold is subject to the Prevailing Wage Law and local hiring requirements.
18. The Contractor and all Subcontractors must post a clearly legible statement of each prevailing wage rate in a prominent and easily accessible place at the Work Site during the entire time Work is being performed, in English and any other language that is primarily spoken by the employees, at the Work Site.
19. Local hiring requirements include quarterly reporting to Central Services and/or their designee on the form designated by the Purchasing Agent which contain the following with regards to qualifying capital improvement projects of \$1,000,000 or more and capital projects of \$5,000,000 of 1) the number of new hires needed for the contract reporting period, 2) the total number of Anne Arundel County residents during the reporting period, 3) the total number of all employees hired during the contract period, 4) best efforts made to fill the open positions with Anne Arundel County residents; and 5) for a new hire during the reporting period: name, last four digits of the social security number, job title, hire date, address and referral source.
20. If the Purchasing Agent finds that the Contractor violated the local hiring law and it is found that the violation was intentional the Director of Central Services may in their sole discretion find that the contractor, any of its principals, or any firm, corporation or partnership in which the Contractor has an interest, may not be awarded on any County contract for one year from the date of the final decision. If a Contractor is late in submitting local hiring reports required

to be submitted pursuant to the Anne Arundel County Code, the County may postpone processing payments due under the contract until the required reports are submitted.

21. In lieu of hearings, all appeals or determinations will be done through written testimony at the discretion of the Director of Central Services. Reasonable accommodations will be granted upon request. If the Director of Central Services determines that a Contractor has not made best efforts or reported as required for local hiring as required, the Director of Central Services shall issue a written decision detailing the basis for the determination. A Contractor may appeal a written decision of the Director that the Contractor violated a provision of this section to the Purchasing Agent within ten working days after receiving a copy of the decision. If the Contractor does not appeal the Director's decision within ten working days after receipt for either prevailing wage or local hiring, the Purchasing Agent's decision on the appeal is not subject to the appeal. The Purchasing Agent may investigate appeals provided prior to that time, request written testimony which must be provided to continue an appeal, or even conduct a hearing, as the Purchasing Agent deems necessary for the review of the appeal.

APPENDIX D – PREVAILING WAGE RATE TABLE

INFORMATIONAL WAGE RATES

The wage rates listed below are published by the State of Maryland, Division of Labor and Industry, Prevailing Wage Unit.

The wage rates posted on this site are provided for **informational** purposes ONLY.

The wage and fringe rates may change between the time of issuance of the wage determinations and the award of the public works contract. Therefore, prior to the award of the public works contract, verification must be made with the public body, to insure that the rates contained in this determination are still prevailing.

These **Informational Prevailing Wage Rates** may not be substituted for the requirements of pre-advertisement for bids or onsite job posting for a public work contract that exceeds \$250,000 in value and either of the following criteria are met: (1) the contracting body is a unit of State government or an instrumentality of the State and there is any State funding for the project; or (2) the contracting body is a political subdivision, agency, person or entity (such as a county) and the State funds 25% or more of the project.

ANNE ARUNDEL COUNTY	BUILDING CONSTRUCTION				Print Date Jan 17, 2024
CLASSIFICATION	MODIFICATION REASON	BASIC HOURLY RATE	BORROWED FROM	FRINGE BENEFIT PAYMENT	
BALANCING TECHNICIAN	AD	\$45.37		\$23.48	
BOILERMAKER	AD	\$43.37		\$25.67	
BRICKLAYER	AD	\$36.50		\$13.77	
CARPENTER	AD	\$33.21		\$14.03	
CARPENTER - SHORING SCAFFOLD BUILDER	AD	\$33.21		\$14.03	
CARPET LAYER	AD	\$33.34		\$14.40	
CEMENT MASON	AD	\$28.70		\$12.55	
COMMUNICATION INSTALLER TECHNICIAN	AD	\$27.98		\$11.30	
DRYWALL - SPACKLING, TAPING, & FINISHING	AD	\$33.21		\$14.03	
ELECTRICIAN	AD	\$45.06		\$19.56	
ELEVATOR MECHANIC	AD	\$54.02		\$44.39	
FIRESTOPPER	AD	\$29.41		\$9.48	
INSULATION WORKER	AD	\$39.27		\$19.42	
IRONWORKER - ORNAMENTAL	AD	\$34.85		\$25.17	
IRONWORKER - REINFORCING	AD	\$32.46		\$22.01	
IRONWORKER - STRUCTURAL	AD	\$36.10		\$25.63	
LABORER - AIR TOOL OPERATOR	AD	\$25.67		\$7.58	
LABORER - ASPHALT PAVER	AD	\$25.67		\$7.58	
LABORER - ASPHALT RAKER	AD	\$19.73		\$6.39	
LABORER - BLASTER - DYNAMITE	AD	\$25.67		\$7.58	
LABORER - BURNER	AD	\$25.67		\$7.58	
LABORER - COMMON	AD	\$19.73		\$6.39	
LABORER - CONCRETE PUDDLER	AD	\$19.73		\$6.39	
LABORER - CONCRETE SURFACER	AD	\$25.67		\$7.58	
LABORER - CONCRETE TENDER	AD	\$19.73		\$6.39	
LABORER - CONCRETE VIBRATOR	AD	\$19.73		\$6.39	
LABORER - DENSITY GAUGE	AD	\$19.73		\$6.39	
LABORER - FIREPROOFER - MIXER	AD	\$19.73		\$6.39	
LABORER - FLAGGER	AD	\$19.73		\$6.39	
LABORER - GRADE CHECKER	AD	\$19.73		\$6.39	
LABORER - HAND ROLLER	AD	\$19.73		\$6.39	

LABORER - HAZARDOUS MATERIAL HANDLER	AD	\$25.67		\$7.58
LABORER - JACKHAMMER	AD	\$19.73		\$6.39
LABORER - LANDSCAPING	AD	\$19.73		\$6.39
LABORER - LAYOUT	AD	\$19.73		\$6.39
LABORER - LUTEMAN	AD	\$19.73		\$6.39
LABORER - MASON TENDER	AD	\$25.67		\$7.58
LABORER - MORTAR MIXER	AD	\$19.73		\$6.39
LABORER - PIPELAYER	AD	\$25.67		\$7.58
LABORER - PLASTERER - HANDLER	AD	\$19.73		\$6.39
LABORER - SCAFFOLD BUILDER	AD	\$25.67		\$7.58
LABORER - TAMPER	AD	\$19.73		\$6.39
MECHANICAL SYSTEMS SERVICE TECH- HVAC SYSTEMS	AD	\$44.66	510	\$23.80
MECHANICAL SYSTEMS SERVICE TECH- PLUMBING SYSTEMS	AD	\$44.66	510	\$23.80
MILLWRIGHT	AD	\$37.33	005	\$16.60
PAINTER	AD	\$27.46		\$11.71
PAINTER-INDUSTRIAL	AD	\$34.30	510	\$14.78
PILEDRIVER	AD	\$35.62		\$17.01
PLUMBER	AD	\$44.66		\$23.80
POWER EQUIPMENT OPERATOR - BACKHOE	AD	\$33.38		\$13.92
POWER EQUIPMENT OPERATOR - BROOM / SWEEPER	AD	\$31.43		\$13.92
POWER EQUIPMENT OPERATOR - BULLDOZER	AD	\$33.38	510	\$13.92
POWER EQUIPMENT OPERATOR - CRANE	AD	\$40.00		\$17.10
POWER EQUIPMENT OPERATOR - CRANE - TOWER	AD	\$40.00	510	\$17.10
POWER EQUIPMENT OPERATOR - DRILL - RIG	AD	\$33.38		\$13.92
POWER EQUIPMENT OPERATOR - EXCAVATOR	AD	\$33.38		\$13.92
POWER EQUIPMENT OPERATOR - FORKLIFT	AD	\$33.38		\$13.92
POWER EQUIPMENT OPERATOR - GRADALL	AD	\$33.70		\$12.85
POWER EQUIPMENT OPERATOR - GRADER	AD	\$33.38	005	\$13.92
POWER EQUIPMENT OPERATOR - GUARD RAIL POST DRIVER	AD	\$23.50	005	\$5.07
POWER EQUIPMENT OPERATOR - LOADER	AD	\$33.38		\$13.92
POWER EQUIPMENT OPERATOR - MECHANIC	AD	\$35.44		\$13.92
POWER EQUIPMENT OPERATOR - PAVER	AD	\$31.30		\$12.85
POWER EQUIPMENT OPERATOR - ROLLER - ASPHALT	AD	\$31.30		\$12.85
POWER EQUIPMENT OPERATOR - ROLLER - EARTH	AD	\$27.80		\$13.92
POWER EQUIPMENT OPERATOR - SCREED	AD	\$30.00	005	\$11.80
POWER EQUIPMENT OPERATOR - SKID STEER (BOBCAT)	AD	\$31.43		\$13.92
POWER EQUIPMENT OPERATOR-VACUUM TRUCK	AD	\$36.30		\$14.05
RESILIENT FLOOR	AD	\$33.34		\$14.40
ROOFER/WATERPROOFER	AD	\$36.75	510	\$14.71
SHEETMETAL WORKER (INCLUDING METAL ROOFING)	AD	\$45.37		\$23.48
SPRINKLERFITTER	AD	\$40.46		\$25.47
STEAMFITTER/PIPEFITTER	AD	\$44.66		\$23.80
STONE MASON	AD	\$43.16		\$20.48
TILE & TERRAZZO FINISHER	AD	\$27.68		\$11.83
TILE & TERRAZZO MECHANIC	AD	\$33.41		\$12.87
TRUCK DRIVER - DUMP	AD	\$23.66	510	\$11.90
TRUCK DRIVER - DUMP - ARTICULATING	AD	\$27.97	005	\$0.79
TRUCK DRIVER - FLATBED	AD	\$24.99	005	\$7.63
TRUCK DRIVER - LOWBOY	AD	\$28.98		\$9.58
TRUCK DRIVER - TACK/TAR TRUCK	AD	\$28.69		\$9.58

Incidental Craft Data: Caulker, Man Lift Operator, Rigger, Scaffold Builder, and Welder receive the wage and fringe rates prescribed for the craft performing the operation to which welding, scaffold building, rigging, operating a Man Lift, or caulking is incidental.

These **Informational Prevailing Wage Rates** may not be substituted for the requirements of pre-advertisement for bids or onsite job posting for a public work contract that exceeds \$250,000 in value and either of the following criteria are met: (1) the contracting body is a unit of State government or an instrumentality of the State and there is any State funding for the project; or (2) the contracting body is a political subdivision, agency, person or entity (such as a county) and the State funds 25% or more of the project.

Modification Codes:

- (AD) 17-209 Annual Determination from Survey Wage Data Received
- (CH) 17-211 Commissioners' Hearing
- (CR) 17-208 Commissioners' Review
- (SR) 17-208 Survey Review by Staff

Each "Borrowed From" county is identified with the FIPS 3-digit county code unique for the specific jurisdiction in Maryland.

For additional information on the FIPS (Federal Information Processing Standard) code, see <http://www.census.gov/datamap/fipslist/AllSt.txt>

The Prevailing Wage rates appearing on this form were originally derived from Maryland's annual Wage Survey. The Commissioner of Labor & Industry encourages all contractors and interested groups to participate in the voluntary Wage Survey, detailing wage rates paid to workers on various types of construction throughout Maryland.

A mail list of both street and email addresses is maintained by the Prevailing Wage Unit to enable up-to-date prevailing wage information, including Wage Survey notices to be sent to contractors and other interested parties. If you would like to be included in the mailing list, please forward (1) your Name, (2) the name of your company (if applicable), (3) your complete postal mailing address, (4) your email address and (5) your telephone number to PWMAILINGLIST@dllr.state.md.us. Requests for inclusion can also be mailed to: Prevailing Wage, 1100 N. Eutaw Street - Room 607, Baltimore MD 21201-2201.

END OF REPORT

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**APPENDIX E -
GEOTECHNICAL
INVESTIGATIONS REPORT**

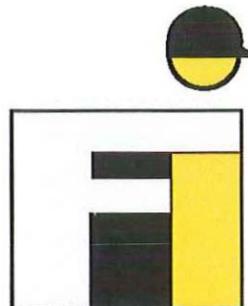
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GEOTECHNICAL INVESTIGATION REPORT
OPERATIONS BUILDING & SFBW TANK
BROAD CREEK WATER TREATMENT PLANT
ANNAPOLIS, MARYLAND
Findling Project No. 22-1020

Prepared for:

RK&K
1408 Bare Hills Road
Baltimore, Maryland 21209

August 04, 2022



FINDLING, INC.

Findling Inc.

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August 04, 2022

RK&K
1408 Bare Hills Road
Baltimore, MD 21209

Attention: Mr. John Moore, P.E.
Director, Water

Re: Geotechnical Investigation Report
Operations Building & SFBW Tank
Broad Creek Water Treatment Plant
165 Harry S. Truman Parkway,
Annapolis, MD 21401
Findling Project No. 22-1020

Dear Mr. Moore:

Findling, Inc. is pleased to submit this geotechnical report containing the results of the subsurface investigation for the proposed Operations Building and Spent Filter Backwash (SFBW) Tank at Broad Creek Water Treatment Plant, in Annapolis, Maryland (see Figure 1: Site Vicinity Map, in the Appendix). The work described within the report was performed in accordance with our proposal dated September 21, 2021.

We wish to advise you that we will store the soil samples obtained from the soil test borings for a period of thirty (30) days from the date of this letter, during which time they will be available for inspection. After that time the samples will be discarded unless another disposition is requested.

We appreciate the opportunity to be of service to you on this project. If you have any questions, please call us.

Sincerely,

FINDLING, INC.

Dipesh Tajhya
Geotechnical Engineer

M. Suri Surendra, Ph.D., P.E.
Chief Engineer





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GEOTECHNICAL INVESTIGATION REPORT
Operations Building & SFBW Tank
Broad Creek Water Treatment Plant
Annapolis, MD 21401
Findling Project No. 22-1020

1.0 INTRODUCTION

Findling, Inc. is pleased to submit this report containing the results of the geotechnical investigation conducted for the proposed Operations Building and Spent Filter Backwash (SFBW) Tank at Broad Creek Water Treatment Plant, in Annapolis, Maryland (see Figure 2: Project Location Map). This investigation was conducted in accordance with the proposal dated September 21, 2021.

2.0 PROJECT DESCRIPTION

The project consists of constructing a new Operations Building and a SFBW Tank at Broad Creek Water Treatment Plant, in Annapolis, MD. The proposed Operations Building will be a single-story block masonry building with a footprint of approximately 1,350 sq. ft. and finished floor elevation at about EL 77± ft. The proposed SFBW Tank will be buried deep with the floor elevation at EL 49± ft. and will have the exposed roof at an elevation of about EL 72± ft. The capacity of the tank will be about 110K Gallons. The combined effective volume from this new SFBW tank and existing Blend Tank will be about 137K Gallons and will be used as a part of the joint equalization system.

Within the vicinity of the proposed Operations Building, the site slopes upward at a relatively uniform slope from about EL 77 ft. on the south to about EL 82 ft. on the north. For SFBW Equalization Tank, the site slopes downward at a relatively uniform slope from about EL 69 ft. on the north to about EL 62 ft. on the south. At present, the areas of the proposed construction are grass-covered.

3.0 PURPOSE AND SCOPE

The purpose of this geotechnical investigation was to determine the subsurface conditions in the vicinity of the proposed construction and provide geotechnical-related design and construction considerations for the new Operations Building and SFBW Tank. The report is based on the information provided to us, the field investigation performed, available geological data, and our experience in the area.



Re: Geotechnical Investigation Report
Operations Building & SFBW Tank
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Two borings, B-1 and B-2, were drilled using an ATV-mounted drill rig, CME 45, to a depth ranging from 26.5 ft. to 51.5 ft. below the existing grade. The locations of these borings are shown in Figure 3: Boring Location Plan, in the Appendix. Following the completion of the fieldwork, the scope of work included conducting laboratory tests in order to classify and establish the engineering properties of the underlying materials.

The scope of this work does not include the environmental investigation at the site.

4.0 SUBSURFACE EXPLORATION

4.1 Utility Clearing

The borings were staked in the field by the representative of RK&K (see Figure 3: Boring Location Plan, in the Appendix). Prior to the drilling operation, the public utilities were marked and cleared by “Miss Utility”. A private utility locator was contracted to clear the on-site utilities that were not marked by Miss Utility.

4.2 Field Investigation

The field investigation included drilling two (2) soil borings (B-1 & B-2) to a depth ranging from 26.5 ft. to 51.5 ft. below the existing grade. A temporary well was installed at B-2 to monitor the 24 hours groundwater level. The test borings were monitored for groundwater level during the drilling operations and following the completion of drilling operations, and were backfilled upon completion. The boring data from the field investigation is summarized in Table 1 and included in the Appendix.

4.3 Soil Test Borings

The borings were drilled using an all-terrain vehicle (ATV) mounted drill rig using an Automatic hammer and hollow stem augers. Standard penetration tests (SPT) were conducted and split spoon samples were obtained at various intervals by driving a 1-3/8-inch ID (2-inch OD) split-spoon sampler in accordance with ASTM D-1586 specifications. The sampler was first seated about 6 inches to penetrate through the loose cuttings and then driven an additional 1 foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler through the second and third 6-inch increment (i.e., the summation of the second and third blow counts) is typically designated as the Standard Penetration Resistance (N) value. The penetration resistance is an index of the soil’s strength, density, and behavior under applied loads. The test borings were monitored for groundwater level during the drilling operations and were backfilled upon completion.

A representative portion of each sample was placed in an airtight glass jar and was appropriately marked. All samples were sent to our laboratory for further evaluation and testing. The recovered soil samples were inspected and classified by a Geotechnical Engineer using the Unified Soil Classification System (USCS). The descriptions of the



soils and conditions encountered at the test boring locations are presented on the Boring Logs and included in the Appendix.

4.4 Laboratory Testing

Soil samples recovered from the field explorations were transported to our soil laboratory and selected soil samples were subjected to various testing to determine additional engineering characteristics of the existing on-site soils.

The laboratory tests that were conducted on selected soil samples included the natural moisture content test (ASTM D2216), Atterberg limits (ASTM D4318), and sieve analysis (ASTM D422). Moisture vs. Density relation (ASTM D698/1557) tests were performed on bulk samples to evaluate the suitability of these materials for use as compacted fill. The results of these tests are summarized in Table 2 in the Appendix. All tests were performed in general accordance with the ASTM procedures.

5.0 SUBSURFACE CONDITIONS

The Boring Logs included in the Appendix contain details related to the subsurface conditions encountered at the test boring locations. It should be noted that stratification lines shown on the Boring Logs and the Generalized Subsurface Profile represent approximate transitions between material types. Strata changes can occur gradually or at different levels than those shown on the Boring Logs that depict conditions at the specific indicated locations and depths at the time of our subsurface exploration program. Groundwater levels are variable and are influenced by the existing soil conditions and seasonal and climatic changes.

5.1 Site Geology

Geologically, the site lies in the Western Shore Uplands Region of Coastal Plain Province. The soil in this area consists of unconsolidated sediments. Published geologic information indicates that the near-surface materials at the site belonged to the Aquia Formation. These soils typically consist of Sand with locally indurated shell beds. The geology of the site is shown in Figure 4: Site Geology Map, in the Appendix.

5.2 Soil Conditions

As indicated previously, details of subsurface conditions disclosed by the borings are contained on the individual Boring Logs. A generalized subsurface profile is presented in Figure 5, in the Appendix. Both borings were drilled on the grassy area and encountered about 2 inches of Topsoil. Beneath the surficial layer, the natural soil consisting of SAND with various percentages of Silt and Clay were encountered to the maximum depth explored. The standard penetration resistance (SPT) N-values ranged from 4 blows per foot (BPF) to 28 BPF.



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5.3 Groundwater

Groundwater was not encountered in boring B-1 within the depth explored (i.e., 26.5 ft. below the existing grade). However, groundwater was encountered in boring B-2 at a depth ranging from 19.2 ft. to 31.8 ft. below the existing grade during and following the completion of the drilling operations. Groundwater levels shown on exploration logs, if any, may not have stabilized, particularly in less permeable cohesive soil, prior to backfilling. Consequently, the indicated groundwater levels, or lack thereof, may not represent present or future groundwater levels.

In addition, fluctuations of the water table or the development of a perched water level at shallower depths above less permeable layers may occur depending upon the amount of precipitation and water runoff to the site from higher elevations during a wet season. Groundwater levels encountered during construction may differ from those encountered during our subsurface investigation, especially if construction is performed during a wet season of the year.

6.0 SEISMIC SITE CLASSIFICATION

The ASCE 7 Standard requires the use of Standard Penetration Test Resistance (test borings), Shear Wave Velocity (geophysical methods), and/or Undrained Shear Strength (soil laboratory testing) to categorize the Seismic Site Classification. Based on the explored soil properties in the test borings performed for this site, the Seismic Site Classification was determined to be Site Class D.



7.0 CONCLUSIONS AND RECOMMENDATIONS

The evaluations and recommendations presented herein were developed based on our understanding of the proposed construction and the general subsurface conditions indicated by the subsurface exploration program. Should the project characteristics be altered significantly from those discussed or should different subsurface conditions be encountered during construction, this office should be consulted, as the evaluations and recommendations presented herein may no longer be valid.

7.1 Operations Building

7.1.1 *Foundation Subgrade*

Based on the information available, the proposed single-story, block masonry Operations Building will measure about 42 ft. by 32 ft. in plan and will have a finish floor elevation at about EL 77± ft. Details regarding loads were not available at the time this report was being prepared. Based on our experience we have estimated the maximum column loads to be less than 35 kips per column, and the maximum wall loads to be less than 4 kips per lineal foot.

Based on the results of the test boring B-1, the foundation subgrade is expected to consist of Silty Clayey SAND. The test borings indicated that the existing subgrade is adequate for direct support of footings. However, the existing foundation subgrade must be inspected by an experienced Geotechnical Engineer, either using a Dynamic Cone Penetrometer (DCP) or other methods, in order to verify that the subgrade is capable of providing the recommended design bearing capacity of 2,000 psf. Where loose soils are encountered, the footings should be undercut to a suitable foundation subgrade. The undercut excavation should extend beyond the perimeter of the proposed foundations as shown in Figure 6: Limits of Undercutting in the Appendix. If there is no room for sloping the excavation, temporary excavation support may be required as discussed in the following report section.

All exterior shallow footings (and footing in un-heated areas) should be placed at least 30 inches below the final exterior grade for frost protection. In order to preclude punching type bearing capacity failures, wall footings shall have minimum widths of 24 inches, and any column footing shall have a minimum width of 36 inches.

Based on the boring data and the anticipated structural loads, we estimate that total settlements for the foundation should not exceed one inch with differential settlements expected to be less than half an inch. The magnitude of differential settlements will be influenced by the distribution of loads and the variability of underlying materials. These settlement values are based on our engineering experience of the soil and the anticipated structural loading and are to guide the structural engineer with his design. Quality control during construction is considered to be of extreme importance to ensure that subsequent settlements, following the construction process, are kept to a minimum.



7.1.2 Floor Slabs

The existing grade in the area of the proposed Operations Building is relatively uniformly sloped upward from about EL 77 ft. on the south to about EL 82 ft. on the north. Based on the information provided to us, the finish floor elevation for the proposed Operations Building will be at the elevation of about EL 77± ft. The floor slab subgrades are expected to consist of Silty Clayey Sand. The floor slab can be designed as a conventional slab-on-grade, supported on the existing subgrade. A modulus of subgrade reaction of 50 pci can be used in the design of the floor slab. Prior to the placement of the floor slabs, the suitability of the slab subgrades should be determined by proofrolling. Any loose or unsuitable soil found during proofrolling should be removed and replaced with compacted select fill.

Groundwater was noted at an elevation ranging from about EL 36 ft. to EL 49 ft. during our field investigation. Therefore, a special under-floor subdrainage system is not considered necessary. However, a layer of drainage fill, consisting of a minimum of four inches of washed gravel or open-graded crushed stone should be placed below all floor slabs as a capillary break. Prior to placing this granular drainage material, the floor subgrade should be free of standing water, mud, and frozen soil. A layer of polyethylene sheeting should be placed between the concrete and the drainage fill layer to prevent concrete intrusion and to serve as a vapor barrier.

Proper curing techniques should be followed in order to reduce the potential development of shrinkage cracks and curling of the slab. On most projects, there exists a significant lag time between the initial grading and the placement of the floor slab. Environmental conditions and construction traffic often disturb the soil subgrade during this lag time. The contractor should make provisions in the construction specifications for the restoration of the subgrade to a stable condition prior to the placement of the floor slab at no additional cost to the Owner.

7.2 SFBW Tank

7.2.1 Foundation Subgrade

Based on the information available, the proposed SFBW Equalization Tank will be approximately 20 ft. below the existing grade with the floor elevation at EL 49± ft. The tank will have an exposed roof at elevation of about EL 72± ft. The capacity of the tank will be about 110K Gallons. The combined effective volume from this new SFBW tank and existing Blend Tank will be about 137K Gallons and will be used as a part of the joint equalization system. Details regarding the proposed loads were not available at the time this report was prepared.

Based on information available, the foundation subgrade is expected to be consisting of medium dense SAND with various percentages of Silt and Clay. An allowable bearing pressure of 2,000 psf is recommended for the foundation when installed as described



herein. The existing foundation subgrade must be inspected by an experienced Geotechnical Engineer, either using a Dynamic Cone Penetrometer (DCP) or other methods, in order to verify that the subgrade is capable of supporting the proposed SFBW Tank. If loose soils are encountered at the exposed subgrade level, then those soils should be undercut and replaced with compacted select fill.

7.2.2 Floor Slabs

The floor elevation of the proposed SFBW Tank will be at about EL 49± ft. The floor slab subgrades are expected to be consisting of SAND. The floor slab can be designed as a conventional slab-on-grade, supported on the existing subgrade. A modulus of subgrade reaction of 70 pci can be used in the design of the floor slab. Prior to the placement of the floor slabs, the suitability of the slab subgrades should be determined by proofrolling. Any loose or unsuitable soil found during subgrade inspection should be removed and replaced with compacted select fill. The floor slab should be provided with adequate reinforcement, as determined by the Structural Engineer.

The temporary well installed at the location of boring B-2 recorded the 24-hour water level at EL 49 ft. However, depending on the seasonal variations, and the type of backfill material used behind the tank wall, water may be encountered at shallow depths. Therefore, we recommend that the floor slab be designed to resist hydrostatic uplift pressures when the tank is empty, with design groundwater near the elevation of about EL 54± ft.

Proper curing techniques should be followed in order to reduce the potential development of shrinkage cracks and curling of the slab. On most projects, there exists a significant lag time between the initial grading and the placement of the floor slab. Environmental conditions and construction traffic often disturb the soil subgrade during this lag time. The contractor should make provisions in the construction specifications for the restoration of the subgrade to a stable condition prior to the placement of the floor slab at no additional cost to the Owner.

7.2.3 Below-Grade Wall

Based on our understanding, the below-grade wall of the SFBW tank will be subjected to lateral (i.e., horizontal) loads. The walls will be non-yielding walls and should be designed for the at-rest condition of lateral earth pressure. For the walls that extend to depths below the designed high water level, the walls must also be designed for hydrostatic pressure.

The design illustration describing the lateral load distribution on the wall for the lateral earth pressure conditions is shown in Figure 7 in the Appendix.

Clayey soils should not be used as a backfill behind the wall. Backfill behind the below-grade walls should consist of Silty SAND (SM) or SAND (SP-SW).



For walls located above the high water table, an appropriate drainage media consisting of crushed stone aggregate (such as No. 57 gradation) containing less than 5 percent fines should be provided behind the walls. This drainage media should be connected to a lateral drain, which can remove the water from behind the wall.

8.0 GENERAL GRADING CONSIDERATIONS

8.1 Undercutting

Following the excavation to establish the proposed subgrade level of the structures, the exposed subgrade should be inspected and tested for adequate support conditions. As discussed previously, undercutting of soft or loose soils may be required in order to establish a suitable bearing surface. The depth of required undercutting will vary at different locations.

This temporary undercutting should be extended beyond the edge of the proposed structure by a distance equal to at least half the depth of the undercut. The limits of proposed undercutting are shown in Figure 6, Limits of Undercutting, in the Appendix.

8.2 Proofrolling

Following the removal of existing topsoil and any unsuitable materials the exposed subgrade should be thoroughly proofrolled under the observation of a qualified geotechnical engineer. Proofrolling should be performed with a heavily loaded, rubber-tired piece of construction equipment, such as a fully loaded tandem-axle dump truck, to detect any soft, loose, or otherwise unstable deposits. Any unstable soils should be removed and replaced with approved compacted fill.

The exposed subgrade should then be scarified, and moisture conditioned to within 2 percent of the soil's optimum moisture content and re-compacted. Excavations and low areas can then be raised to the proposed grades with compacted select fill that is approved, placed, and compacted in accordance with project specifications.

Site preparation, placement, and compaction of approved fill should be performed under engineering-controlled conditions in accordance with project specifications and approved by a qualified geotechnical engineer.

8.3 Fill Selection, Placement, and Compaction

All materials to be used as fill or backfill should be inspected, tested, and approved by the Geotechnical Engineer.

On-Site Materials:



The on-site fill materials (from above the water table) that are not excessively wet and those that do not contain any deleterious components can be reused for the compacted fill in establishing the proposed grades.

It should be noted that if construction activities are to take place during wet weather, the excavated materials might not be suitable for re-use because of excessive moisture in the stockpiled material. The contractor should protect the excavated material from becoming excessively wet and thus becoming unsuitable for immediate re-use. Importing new off-site borrow material that is not moisture sensitive will become necessary if the on-site materials are not protected from getting wet in the stockpile.

Borrow Material - Select Fill:

If imported fill is required, the materials should have a unified classification of SP or SM, with less than 10% passing No. 200 sieve. The Plasticity Index (PI) of the fines should be less than 6.

Fill Compaction:

Fill placement should commence at the toe of the proposed slopes and commence upwards as additional fill is placed in horizontal lifts. All fill-in structural and pavement areas (except for trench backfill) should be placed in 8-inch maximum loose lifts and compacted to at least 92 percent of the modified Proctor maximum dry density (AASHTO T 180, Method C). The top 1-foot of the floor slab subgrade should be compacted to 95 percent of modified Proctor maximum dry density.

In order to achieve 95% compaction, the soil will be required to have its moisture content within $\pm 2\%$ of optimum moisture content. Therefore, it is anticipated that moisture conditioning (i.e., wetting or drying) will be required to achieve the required compaction of the on-site soils.

All fill placement and compaction operations in critical areas (i.e., structural and pavement areas) should be monitored by an experienced Soils Inspector on a full-time basis to ensure that fill materials are being placed and compacted in compliance with the project specifications. Should any compaction problems develop during grading operations, the Geotechnical Engineer should be consulted for an evaluation of the problems.

8.4 Construction Dewatering

At the time of our field investigation, the groundwater was encountered at the elevation ranging from about EL 36 \pm ft. to EL 49 \pm ft. In addition, depending on the seasonal variations, water may be encountered at shallow depths. Therefore, dewatering during construction will be required and provisions should be made in the project specifications for dewatering.



The on-site soils could lose their in-situ strength with an increase in moisture content. Therefore, adequate drainage should be provided at the site to minimize any increase in the moisture content of the foundation soils. All pavement or parking areas should be sloped away from the structure to prevent ponding of water around the structures and paved areas. The site drainage should also be such that the run-off onto adjacent properties is controlled properly

8.5 Excavation Considerations

Temporary excavations deeper than 4 feet will require lateral support if the excavations cannot be laid back on a slope of 1½ horizontal to 1 vertical, in accordance with applicable OSHA regulations. The actual stability of the excavations should be evaluated by the contractor in accordance with OSHA regulations, and excavation supports system(s) will require design by a Professional Engineer.

The excavation can be performed using conventional earth-moving equipment. Prior to excavation, all adjacent structures (depending on the proximity to excavation, the depth of excavation, and the subsurface conditions) may have to be protected to minimize any disturbance to the foundation soils underneath the structures.

The test borings drilled at the site did not encounter cemented Sand layers within the anticipated depth of excavation. However, based on our experience, it is possible to encounter cemented Sand layers at isolated locations. Therefore, the contractor should be prepared to use intensive efforts, such as ram-hoe or jackhammer to excavate a localized layer of cemented Sand.

8.5.1 Temporary Excavation Support System

Excavations of depths greater than 4 feet will be required to reach the proposed bottom of structures. Excavations adjacent to the existing structure will require an excavation support system and/or underpinning of the existing adjacent structure. Precautions should be taken during construction to minimize any disturbance to the existing structure. Excavation support systems will also be required to protect the existing structures (such as building foundations, utilities, walkways, roadways, etc.) around the perimeter of the proposed excavation. In addition, the dewatering system used during the excavation process should be compatible with the excavation system that will be used at the site.

The type of retaining system should be based on the following factors:

Depth of Excavation: Excavation support systems can be designed and installed as freestanding cantilever walls generally to a support height of up to about 10 feet. Where depth and/or loads exceed the design limits, the cantilever-retaining system may not be possible. Anchors/tiebacks or struts will probably have to be installed with the retaining



system. If partial sloping is possible in certain areas, the cantilever-retaining system may be possible.

Proximity to Existing Structures and Utilities: The installation (vibration) of a certain retaining system may cause settlement and/or distress to the adjacent structures and utilities. Careful installation might avoid damage. The Contractor should take the location of the existing structure and utilities and the vibrations into consideration in selecting the earth retaining system(s). The use of pre-drilling or special installation techniques may be required in these areas.

Interference with Utilities and Structures: The installation of anchors/tiebacks, if selected, may interfere with the utilities and adjacent structure foundation system. The location, length, and angle of anchors/tiebacks may have to be adjusted to avoid the utilities and the structure foundation. In order to avoid interference with utilities and structure foundations, internal bracing (and struts) may be required (instead of anchors/tiebacks).

Method of Dewatering: The dewatering may affect the method of excavation and the type of retaining system. On the other hand, certain types of retaining systems may also affect the method of dewatering.

Method of Installation: The installation of certain earth retaining system(s), especially in the event of sheet piles, may encounter interference with existing active utilities at the site. The Contractor should consider this fact in selecting a system(s).

Migration or Loss of Soil: Installing certain earth retaining systems, such as soldier beam and lagging, may cause loss of soil over a period of time, depending on the method and quality of the construction. Loss of soil could cause damage to the utility lines and adjacent structures; therefore, the system must be designed to minimize soil loss.

The method of earth retaining system(s) should be left to the Contractor. However, the Contractor is advised to carefully analyze the pros and cons of each system along with a method of dewatering before selecting a system(s).

9.0 ENVIRONMENTAL CONSIDERATIONS

The scope of this work did not include an environmental investigation at the site. Health and Safety issues, if any, should be determined by others.



Re: Geotechnical Investigation Report
Operations Building & SFBW Tank
Broad Creek Water Treatment Plant
Annapolis, Maryland
Findling Project No. 22-1020

August 04, 2022

Page 12 of 12

10.0 REMARKS

This report has been prepared to aid in the evaluation of the site for the proposed Operations Building and SFBW Tank at Broad Creek Water Treatment Plant in Annapolis, MD. It is considered that adequate recommendations have been provided to serve as a basis for the design and preparation of plans and specifications. This report does not contain environmental considerations for the proposed construction. Additional recommendations can be provided as needed.

These analyses and recommendations are based on information made available to us at the time of our investigation and the actual conditions encountered at the test boring locations at that time. General assumptions have been made that the limited exploratory test borings represent the site conditions in relation to the aerial extent and depths of the borings. It should be noted, however, that the actual subsurface conditions between the test boring locations might vary from the conditions indicated on the appended test boring logs. Should the actual conditions encountered during construction differ significantly from those indicated by the test boring logs, we should be notified immediately so that the analyses and recommendations can be reviewed and/or revised as necessary.



APPENDIX

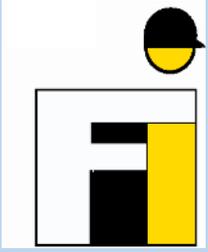
- Figure 1: Site Vicinity Map
Figure 2: Project Location Map
Figure 3: Boring Location Plan
Figure 4: Site Geology Map
Figure 5: Generalized Subsurface Profile
Figure 6: Limits of Undercutting
Figure 7: Lateral Pressure At-Rest Condition

- Table 1: Summary of Boring Data
Table 2: Summary of Laboratory Test Results

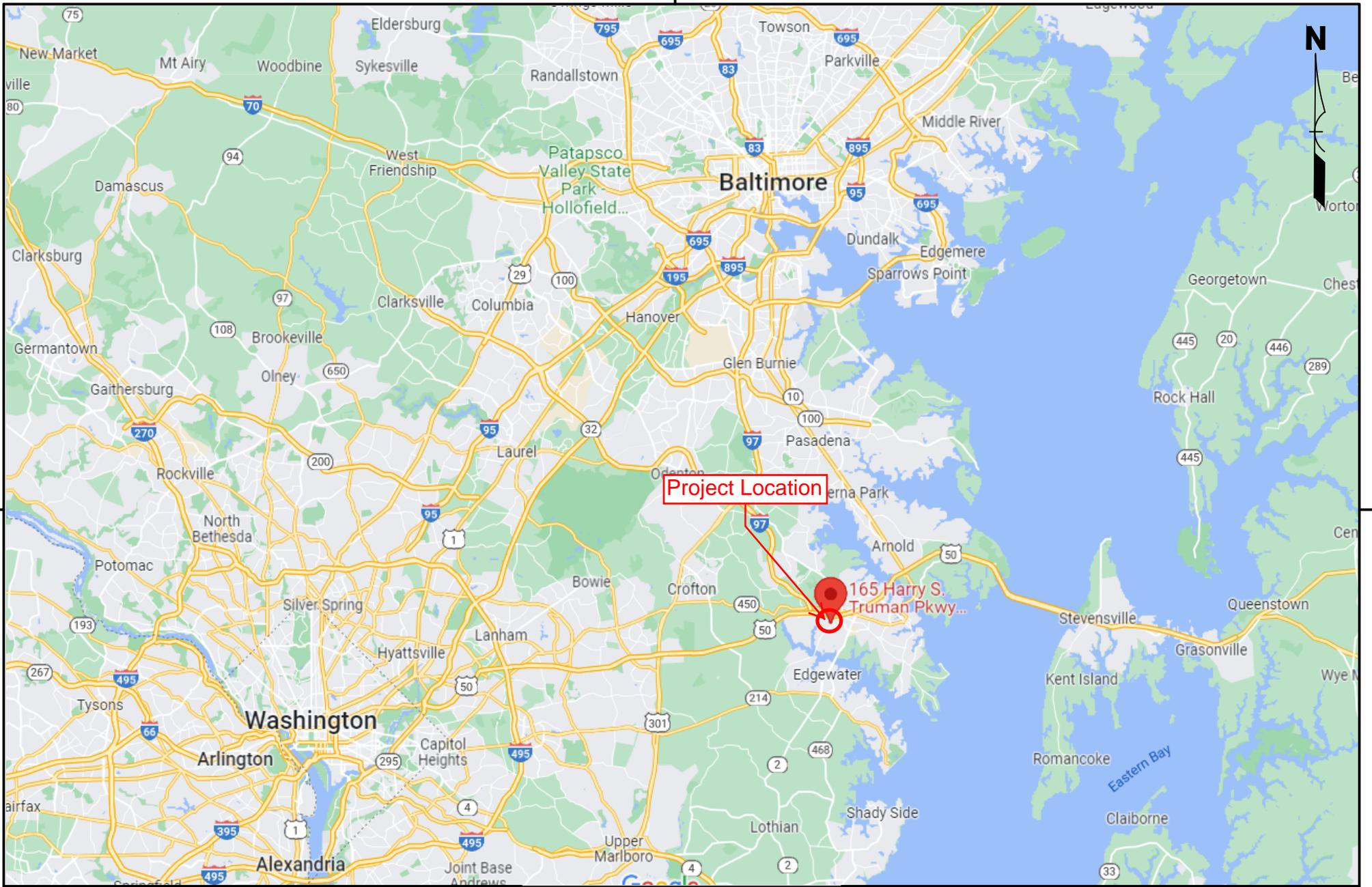
Grainsize Distribution Curves

Moisture-Density Test Results

Boring Logs



FIGURES



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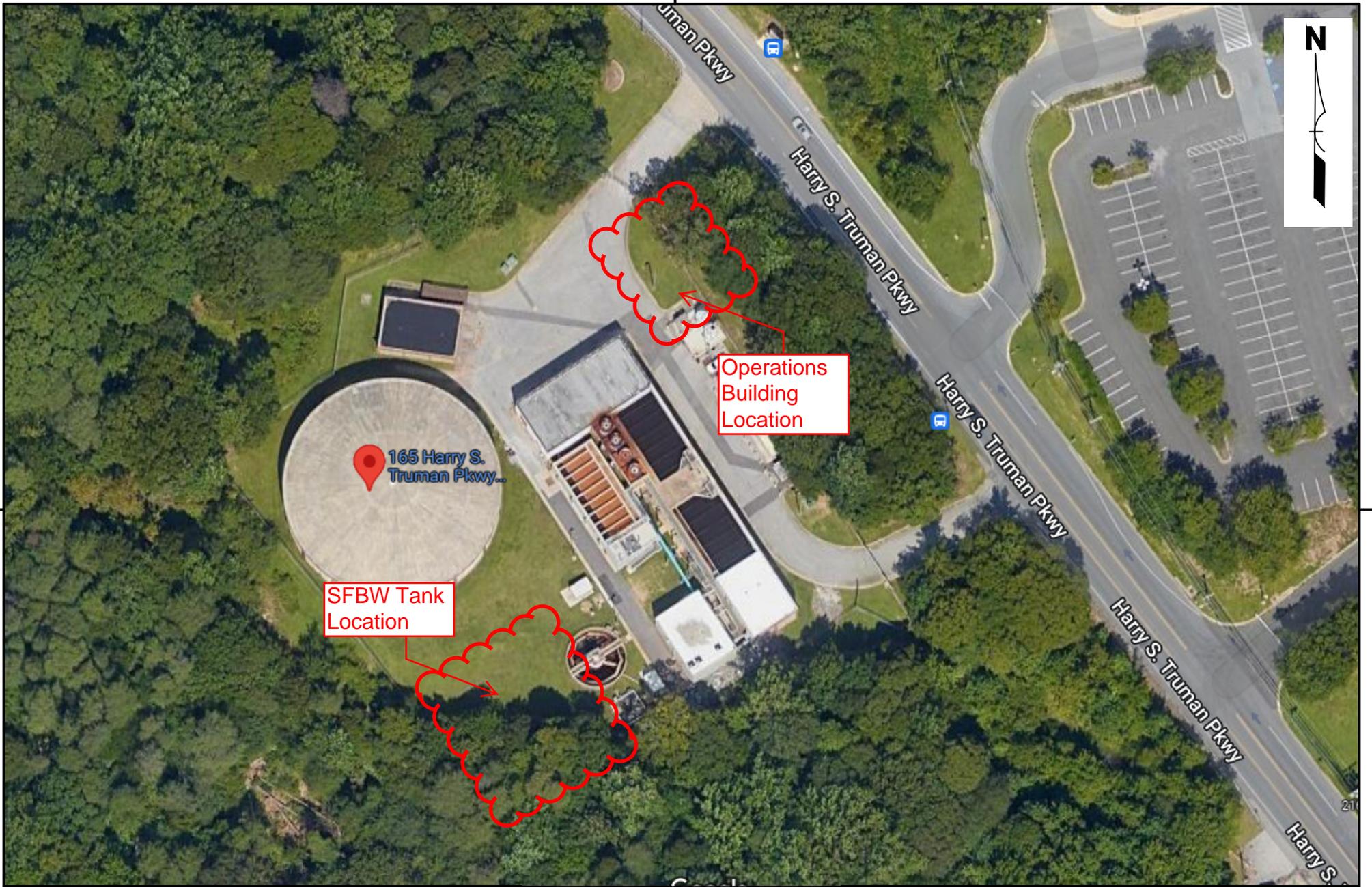
3401 CARLINS PARK DRIVE
BALTIMORE, MD 21215 • 410.367.1400

NOTE:
FOR ILLUSTRATION PURPOSES ONLY.

SITE VICINITY MAP

OPERATIONS BUILDING & SFBW TANK AT BROAD CREEK WTP
ANNAPOLIS, MARYLAND

PROJECT NUMBER:	22-1020	REVIEWED BY:	SS	SCALE:	NOT TO SCALE
DATE:	AUGUST 2022	DRAWN BY:	DT	FIGURE:	1



SFBW Tank Location

Operations Building Location

165 Harry S. Truman Pkwy...

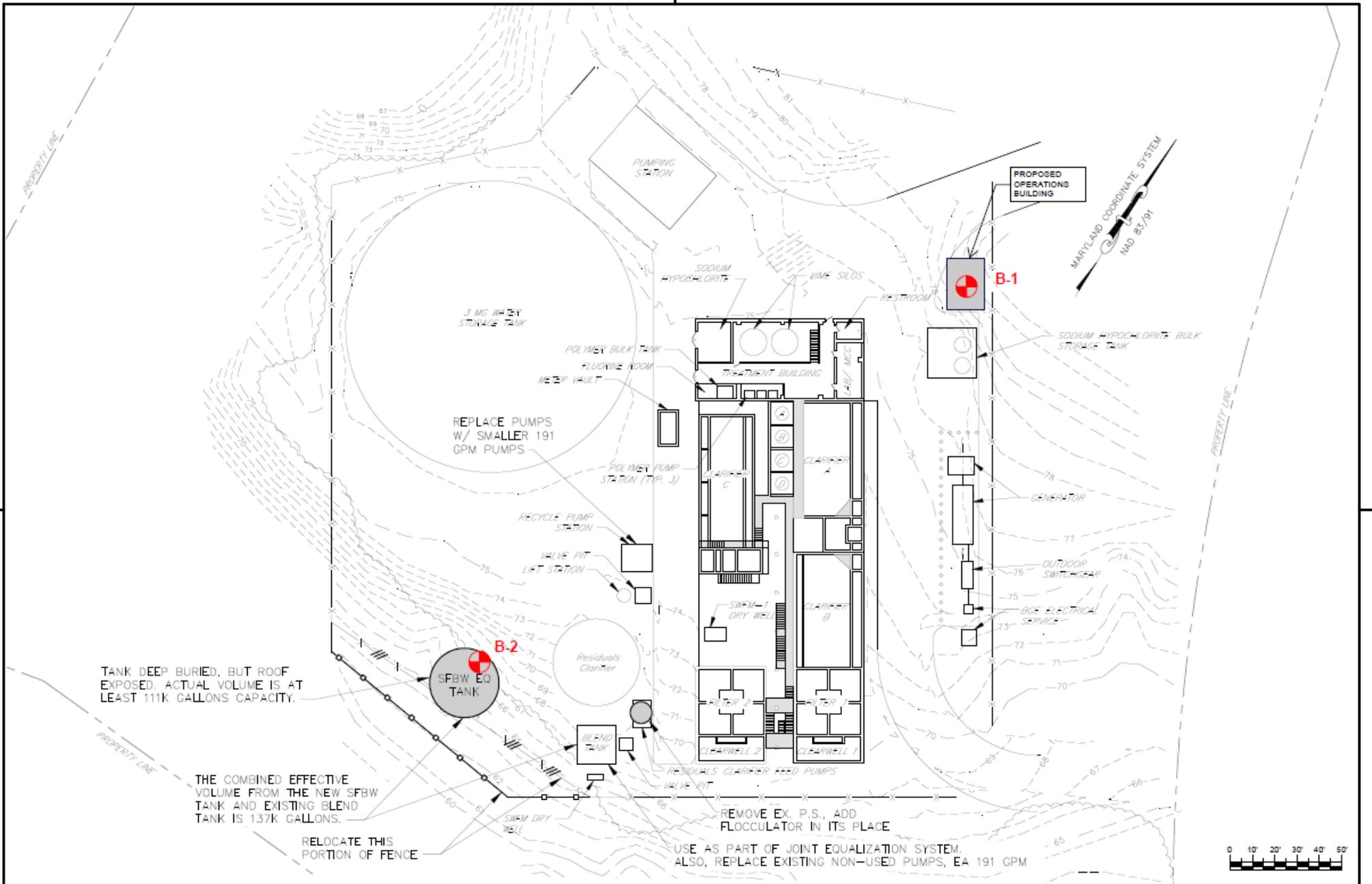
FILE =>



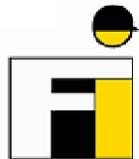
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NOTE:
 FOR ILLUSTRATION PURPOSES ONLY.

PROJECT LOCATION MAP		
OPERATIONS BUILDING & SFBW TANK AT BROAD CREEK WTP ANNAPOLIS, MARYLAND		
PROJECT NUMBER:	22-1020	REVIEWED BY: SS
DATE:	AUGUST 2022	DRAWN BY: DT
		SCALE: NOT TO SCALE
		FIGURE: 2



FILE =>



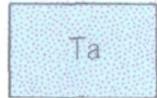
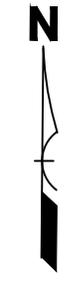
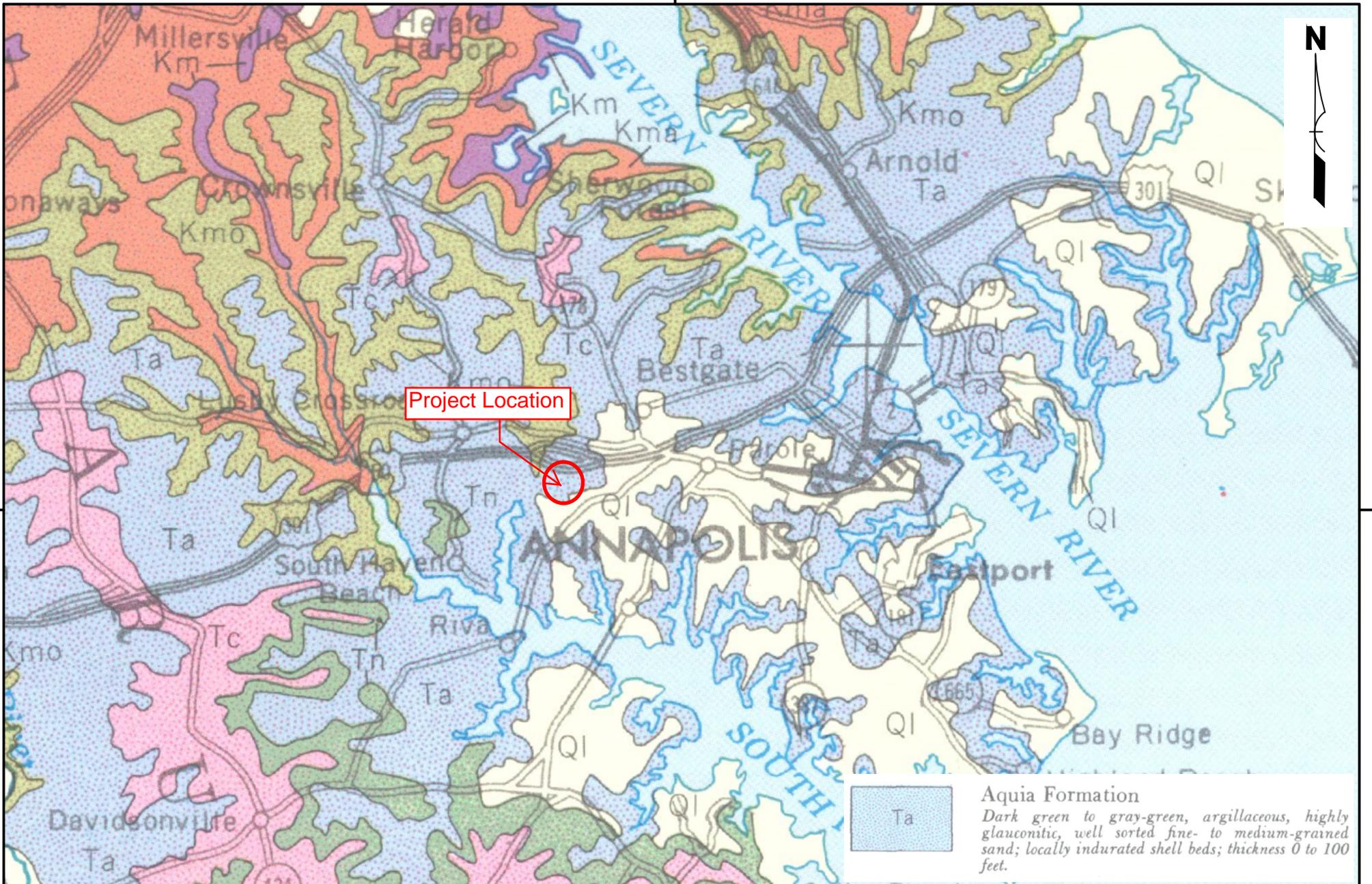
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NOTE:
FOR ILLUSTRATION PURPOSES ONLY.

BORING LOCATION PLAN
OPERATIONS BUILDING & SFBW TANK AT BROAD CREEK WTP
ANNAPOLIS, MARYLAND

PROJECT NUMBER:	22-1020	REVIEWED BY:	SS	SCALE:	NOT TO SCALE
DATE:	AUGUST 2022	DRAWN BY:	DT	FIGURE:	3



Aquia Formation
 Dark green to gray-green, argillaceous, highly glauconitic, well sorted fine- to medium-grained sand; locally indurated shell beds; thickness 0 to 100 feet.

FILE =>

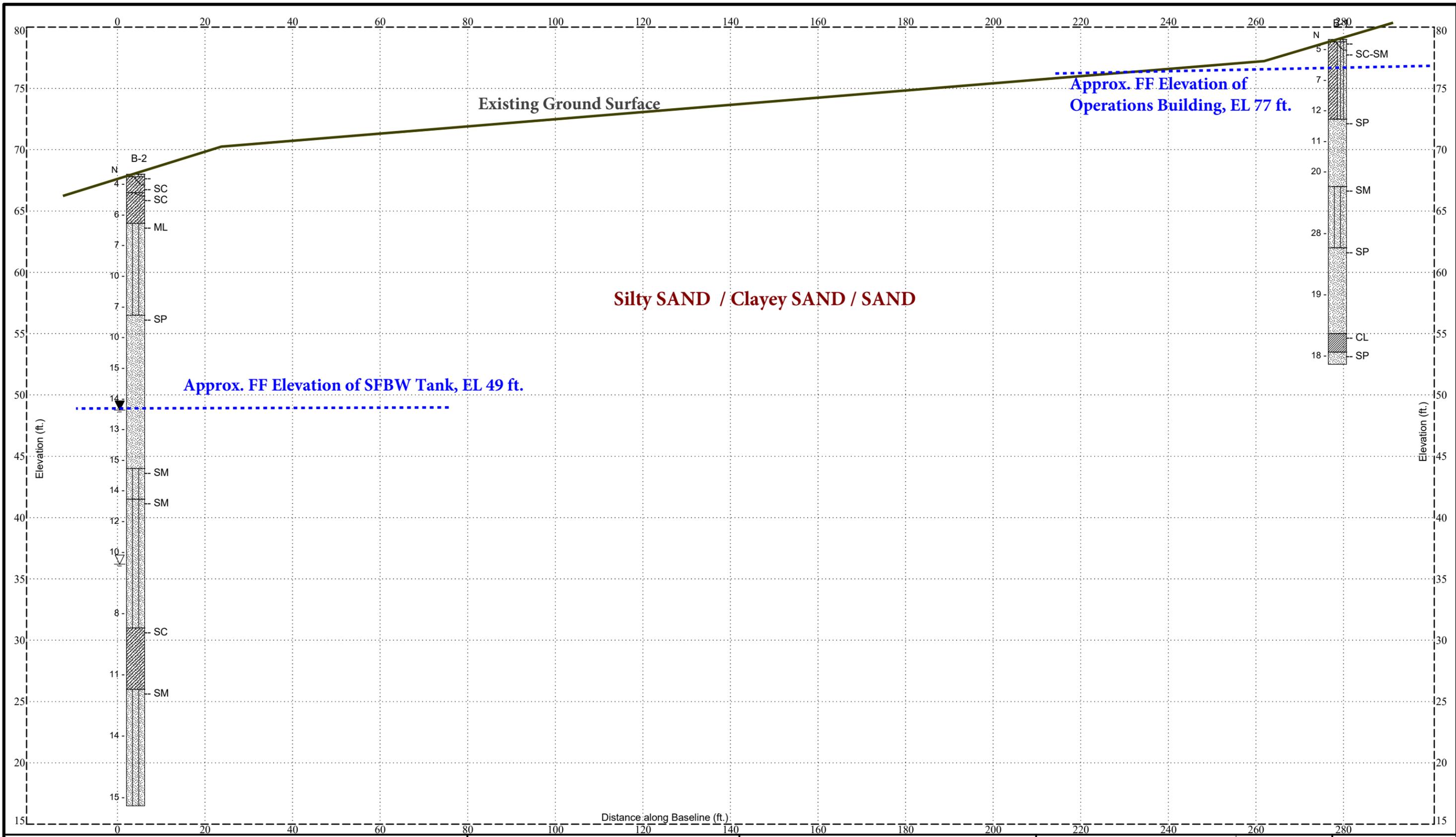


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NOTE:
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SITE GEOLOGY MAP
 OPERATIONS BUILDING & SFBW TANK AT BROAD CREEK WTP
 ANNAPOLIS, MARYLAND

PROJECT NUMBER:	22-1020	REVIEWED BY:	SS	SCALE:	NOT TO SCALE
DATE:	AUGUST 2022	DRAWN BY:	DT	FIGURE:	4



USCS SOIL KEY	
	GW
	GP
	GM
	GC
	SW
	SP
	SM
	SC
	ML
	MH
	CL
	CH
	OL
	OH
	FILL
	Rock



FINDLING, INC.
 Carlins Park Drive
 Baltimore, MD 21215
 Tel: 410-367-1400
 Fax: 410-466-6867

Generalized Subsurface Profile

Operations Building &
 SFBW Tank at Broad Creek
 WTP

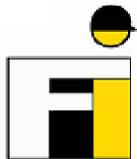
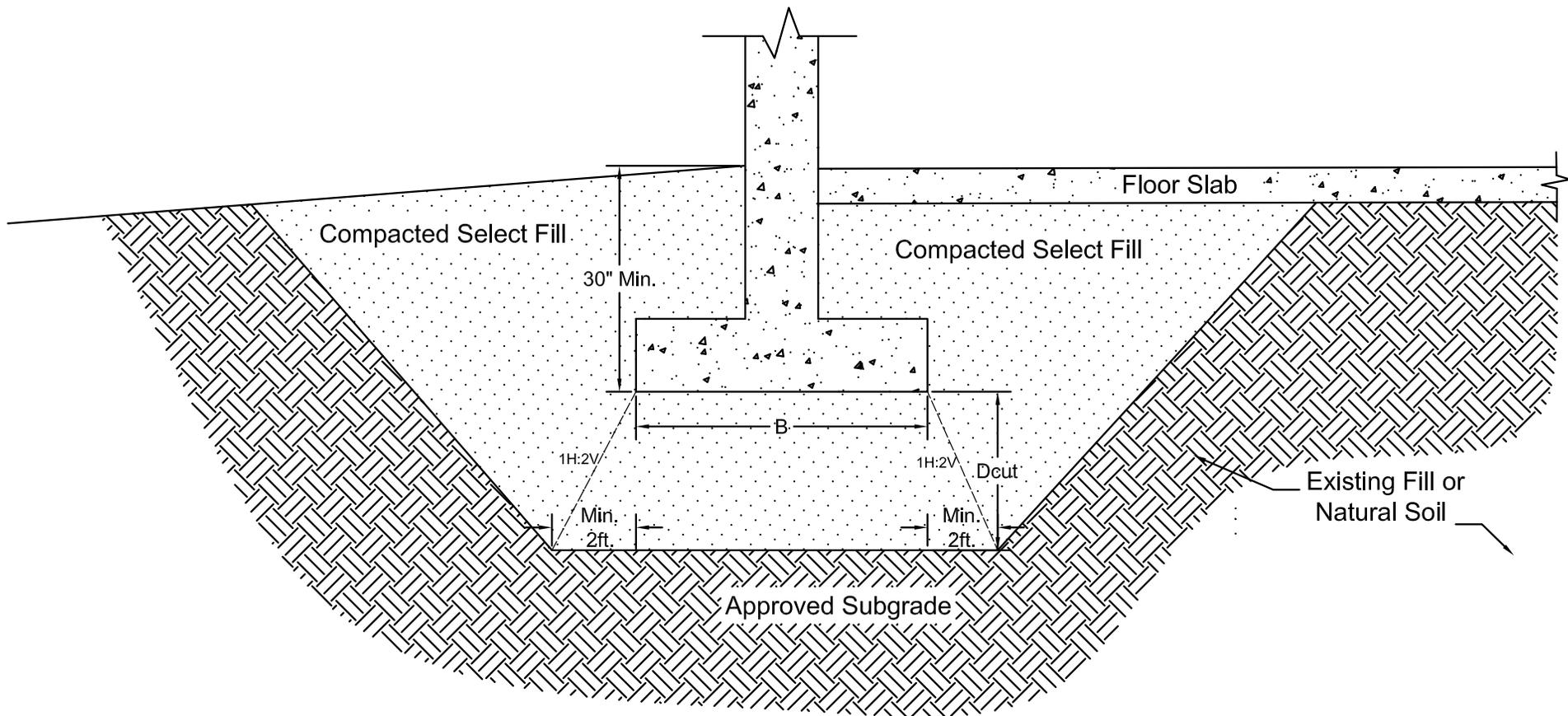
Drawn by:
 DT

Approved by:
 SS

Date:
 August 2022

Figure No.
 5

Contract No.
 22-1020



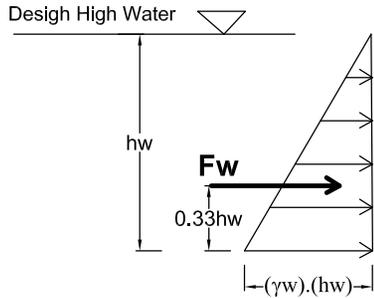
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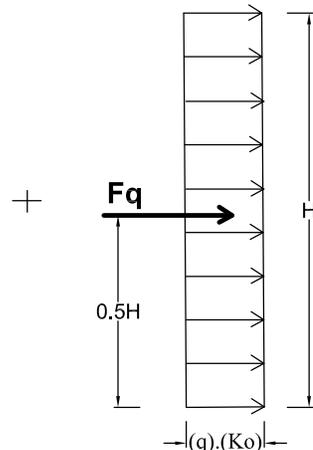
NOTE:
FOR ILLUSTRATION PURPOSES ONLY.

LIMITS OF UNDERCUTTING
OPERATIONS BUILDING & SFBW TANK AT BROAD CREEK WTP
ANNAPOLIS, MARYLAND

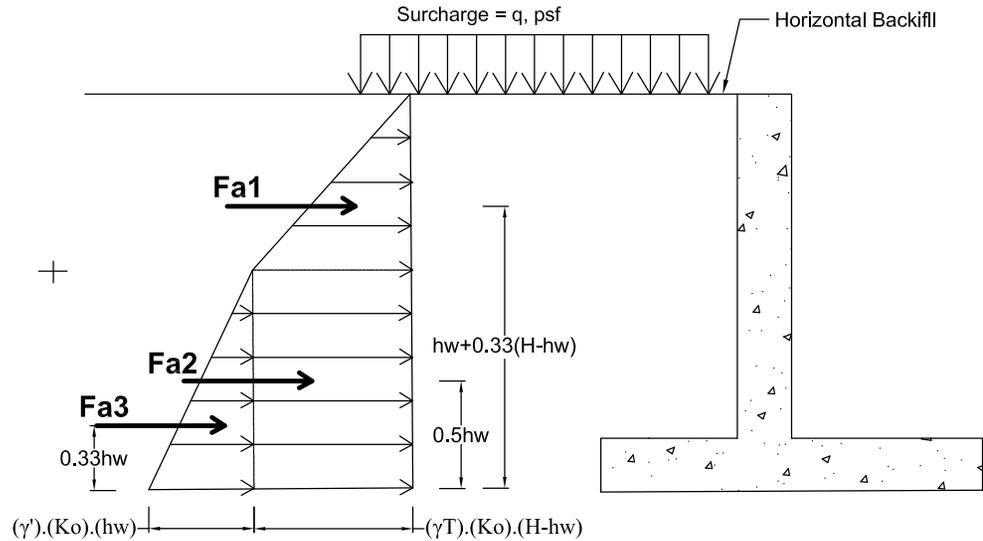
PROJECT NUMBER:	22-1020	REVIEWED BY:	SS	SCALE:	NOT TO SCALE
DATE:	AUGUST 2022	DRAWN BY:	DT	FIGURE:	6



F_w = Lateral Force from Water (Hydrostatic)
 $= (0.5)(\gamma_w)(hw)^2$, lbs/ft



F_q = Lateral Earth Force from Surcharge Load
 $= (q)(K_o)(H)$, lbs/ft



F_a = At-rest Lateral Earth Force
 $= F_{a1} + F_{a2} + F_{a3}$

$F_{a1} = (0.5)(\gamma_T).(K_o).(H-hw)^2$, lbs/ft
 $F_{a2} = (\gamma_T).(K_o).(H-hw)(hw)$, lbs/ft
 $F_{a3} = (0.5)(\gamma')).(K_o).(hw)^2$, lbs/ft

Total Static Force on the Wall = $F_w + F_q + F_a$

Note : This design illustration assumes that the backfill material consists of granular material

Recommended soil parameters for Design,

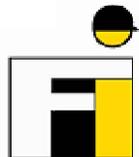
Total Unit Wt, $\gamma_T = 125$ pcf

Effective Unit Wt, $\gamma' = 62.6$ pcf

Coefficient of At-Rest Earth Pressure for Tank Walls, $K_o = (1 - \sin \phi) = 0.5$

Unit Wt of Water, $\gamma_w = 62.4$ pcf

Angle of Internal Friction, $\phi = 30^\circ$



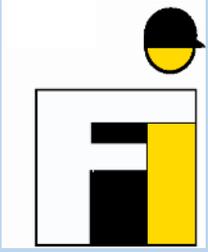
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NOTE:
 FOR ILLUSTRATION PURPOSES ONLY.

LATERAL PRESSURE AT-REST CONDITION
 OPERATIONS BUILDING & SFBW TANK AT BROAD CREEK WTP
 ANNAPOLIS, MARYLAND

PROJECT NUMBER:	22-1020	REVIEWED BY:	SS	SCALE:	NOT TO SCALE
DATE:	AUGUST 2022	DRAWN BY:	DT	FIGURE:	7



TABLES



Table 1: Summary of Boring Data

Operations Building and SFBW Tank
 Broad Creek Water Treatment Plant
 Annapolis, MD
 Findling Project No.: 22-1020

Boring Number	Approx. Ground Surface Elevation (ft) *	FILL		Groundwater Depth, ft **			Cave-in Depth, ft		Bottom of Boring	
		Depth to Bottom (ft)	Bottom of Fill (ft)	During Drilling, feet (El)	Completion of Drilling feet (El)	at 24 or 72 Hrs feet (El)	Completion of Drilling feet (El)	at 24 or 72 Hrs feet (El)	Depth (ft)	Elevation (ft)
B-1	79.00	NE	NE	NE	NE	NE	19.2 (59.8)	19.2 (59.8)	26.5	(52.5)
B-2	68.00	NE	NE	30.0 (38.0)	31.8 (36.2)	19.2 (48.8)	NA	NA	51.5	(16.5)

Note:

- * Ground Surface Elevation approximated from Google Earth
- ** Water table elevation could fluctuate due to seasonal conditions
- NE = Not Encountered
- NA = Not Applicable



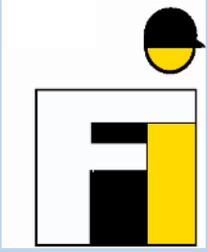
Table 2: Summary of Laboratory Test Results

Operations Building & SFBW Tank at Broad Creek WTP

Annapolis, MD

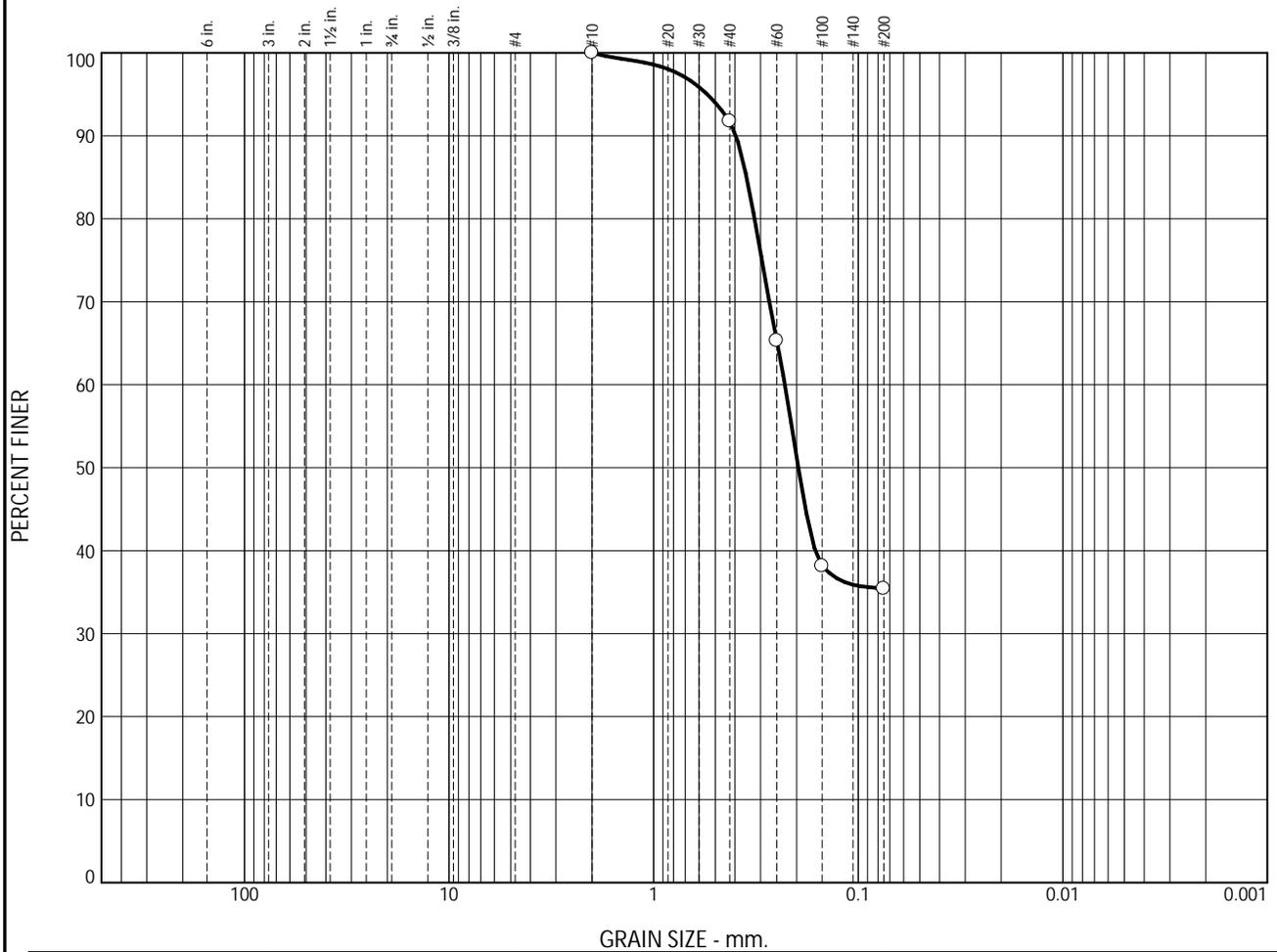
Finding Project No.: 22-1020

Sample ID	Sample Depth	Natural Moisture Content, %	Atterberg Limits			Grain Size Distribution			Modified Proctor Compaction Test (ASTM D1557)		USCS Classification	
			LL	PL	PI	GRAVEL (%)	SAND (%)	FINES (%)	Max Dry Density, pcf	Optimum Moisture Content, %		
B-1	Bulk	0.0 - 5.0	16.3	46	21	25	0	65	35	116.6	12.9	SC
	S-1	0.0 - 1.5	16.1									
	S-2	2.5 - 4.0	20.7									
	S-3	5.0 - 6.5	16.3									
	S-4	7.5 - 9.0	10.6									
	S-5	10.0 - 11.5	12.9									
	S-6	15.0 - 16.5	12.7	NV	NP	NP	0	78	22			SM
	S-7	20.0 - 21.5	17.3									
	S-8	25.0 - 26.5	11.8									
B-2	Bulk	0.0 - 5.0	17.5	28	16	12	0	54	46	123.0	10.3	SC
	S-1	0.0 - 1.5	19.7									
	S-2	2.5 - 4.0	18.1									
	S-3	5.0 - 6.5	19.9									
	S-4	7.5 - 9.0	20.4									
	S-5	10.0 - 11.5	23.3									
	S-6	12.5 - 14.0	25.8									
	S-7	15.0 - 16.5	22.6									
	S-8	17.5 - 19.0	23.1									
	S-9	20.0 - 21.5	19.9									
	S-10	22.5 - 24.0	17.0									
	S-11	25.0 - 26.5	22.8	NV	NP	NP	0	67	33			SM
	S-12	27.5 - 29.0	27.1									
	S-13	30.0 - 31.5	25.5	NV	NP	NP	3	71	26			SM
	S-14	35.0 - 36.5	32.4									
	S-15	40.0 - 41.5	27.2									
	S-16	45.0 - 46.5	25.6									
S-17	50.0 - 51.5	27.9										



LABORATORY TEST RESULTS

Particle Size Distribution Report

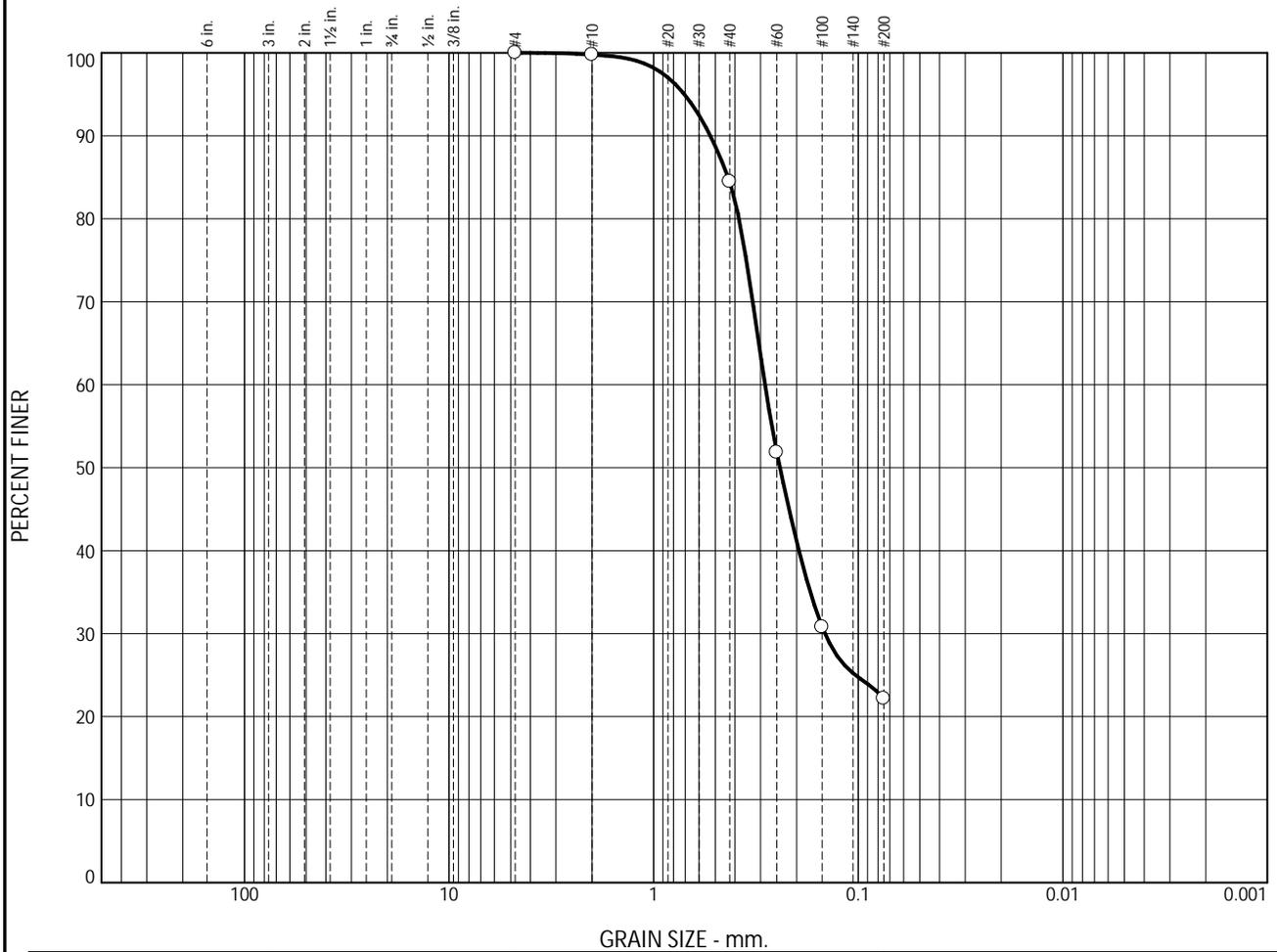


	% +3"	% Gravel		% Sand			% Fines				
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			
<input type="radio"/>	0.0	0.0	0.0	0.0	8.3	56.3	35.4				
<input checked="" type="checkbox"/>	Colloids	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
<input type="radio"/>		46	21	0.3513	0.2282	0.1961					

Material Description	USCS	AASHTO
<input type="radio"/> Dark brown, Clayey SAND	SC	A-2-7(3)

<p>Project No. 22-1020 Client: RK&K</p> <p>Project: Operations Building & SFBW Tank at Broad Creek WTP</p> <p><input type="radio"/> Source of Sample: B-1 Depth: 0.0'-5.0' Sample Number: Bulk</p> <p>Date: <input type="radio"/> 5/24/22</p> <p style="text-align: center;">Findling, Inc.</p> <p style="text-align: center;">Baltimore, Maryland</p>	<p>Remarks:</p> <p><input type="radio"/> Moisture content = 16.3%</p> <p style="text-align: right;">Figure</p>
---	--

Particle Size Distribution Report

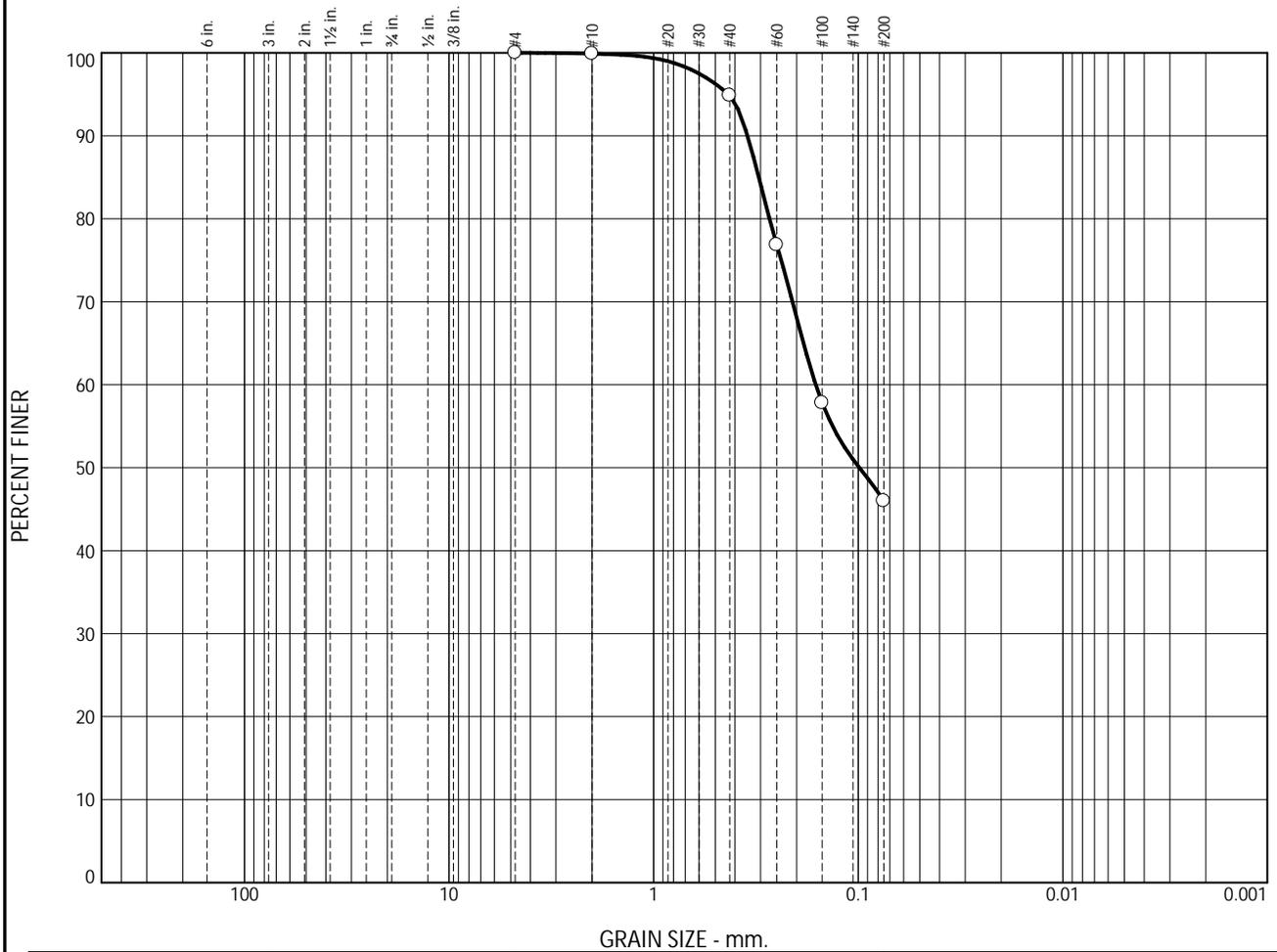


	% +3"	% Gravel		% Sand			% Fines				
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			
<input type="radio"/>	0.0	0.0	0.0	0.2	15.3	62.3	22.2				
<input checked="" type="checkbox"/>	Colloids	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
<input type="radio"/>		NV	NP	0.4326	0.2853	0.2412	0.1454				

Material Description	USCS	AASHTO
<input type="radio"/> Greenish brown, Silty SAND	SM	A-2-4(0)

<p>Project No. 22-1020 Client: RK&K</p> <p>Project: Operations Building & SFBW Tank at Broad Creek WTP</p> <p><input type="radio"/> Source of Sample: B-1 Depth: 15.0'-16.5' Sample Number: S-6</p> <p>Date: <input type="radio"/> 5/24/22</p> <p style="text-align: center;">Finding, Inc.</p> <p style="text-align: center;">Baltimore, Maryland</p>	<p>Remarks:</p> <p><input type="radio"/> Moisture content = 12.7%</p> <p style="text-align: right;">Figure</p>
---	--

Particle Size Distribution Report



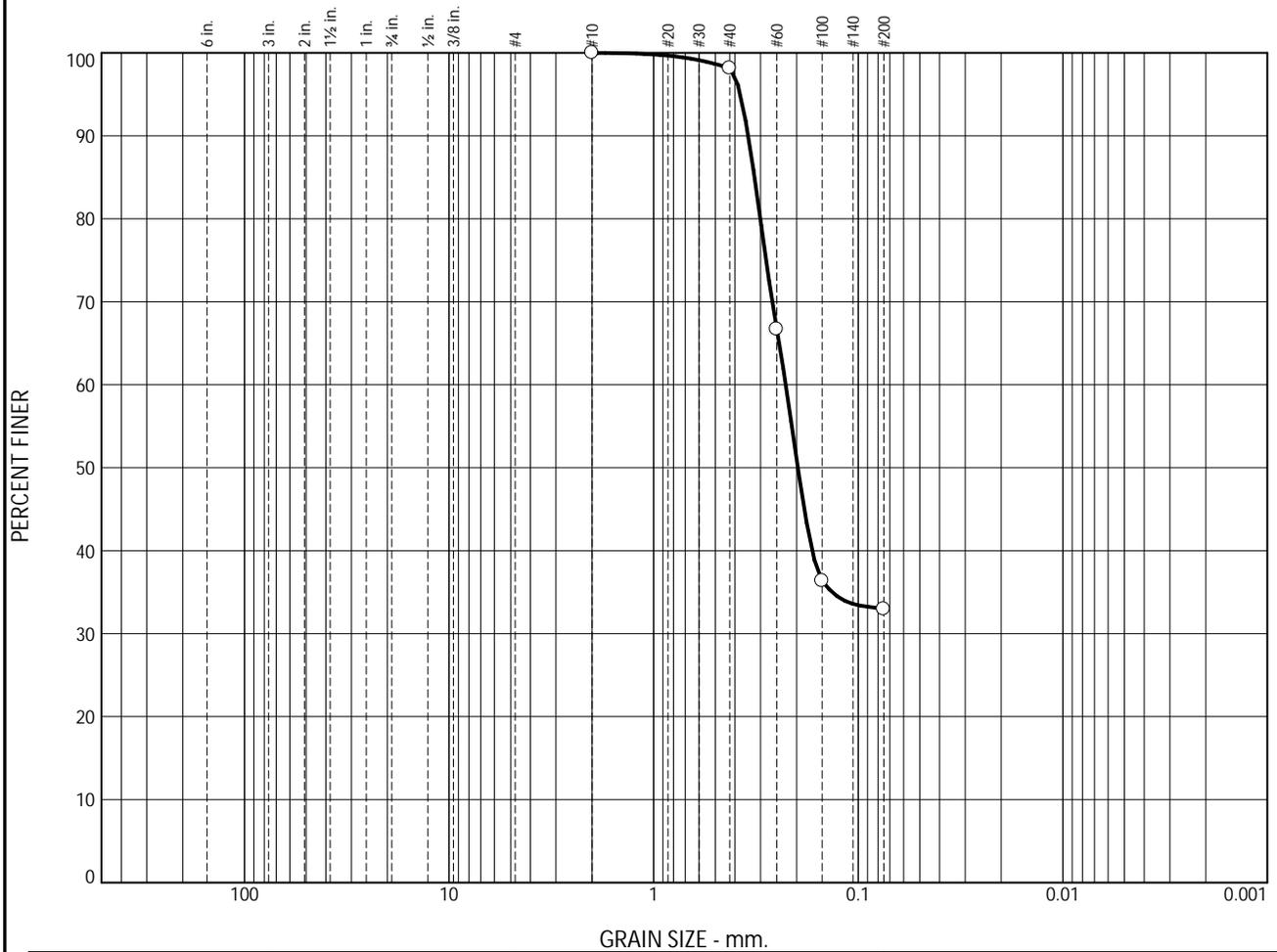
	% +3"	% Gravel		% Sand			% Fines				
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			
<input type="radio"/>	0.0	0.0	0.0	0.1	5.0	48.9	46.0				
<input checked="" type="checkbox"/>	Colloids	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
<input type="radio"/>		28	16	0.3060	0.1613	0.0987					

Material Description		USCS	AASHTO
<input type="radio"/> Light brown, Clayey SAND		SC	A-6(2)

<p>Project No. 22-1020 Client: RK&K</p> <p>Project: Operations Building & SFBW Tank at Broad Creek WTP</p> <p><input type="radio"/> Source of Sample: B-2 Depth: 0.0'-5.0' Sample Number: Bulk</p> <p>Date: <input type="radio"/> 5/24/22</p> <p style="text-align: center;">Findling, Inc.</p> <p style="text-align: center;">Baltimore, Maryland</p>	<p>Remarks:</p> <p><input type="radio"/> Moisture content = 17.5%</p>
---	---

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines				
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			
<input type="radio"/>	0.0	0.0	0.0	0.0	1.9	65.1	33.0				
<input checked="" type="checkbox"/>	Colloids	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
<input type="radio"/>		NV	NP	0.3211	0.2260	0.1973					

Material Description								USCS	AASHTO
<input type="radio"/> Dark brown, Silty SAND								SM	A-2-4(0)

Project No. 22-1020 Client: RK&K
 Project: Operations Building & SFBW Tank at Broad Creek WTP
 Source of Sample: B-2 Depth: 25.0'-26.5' Sample Number: S-11

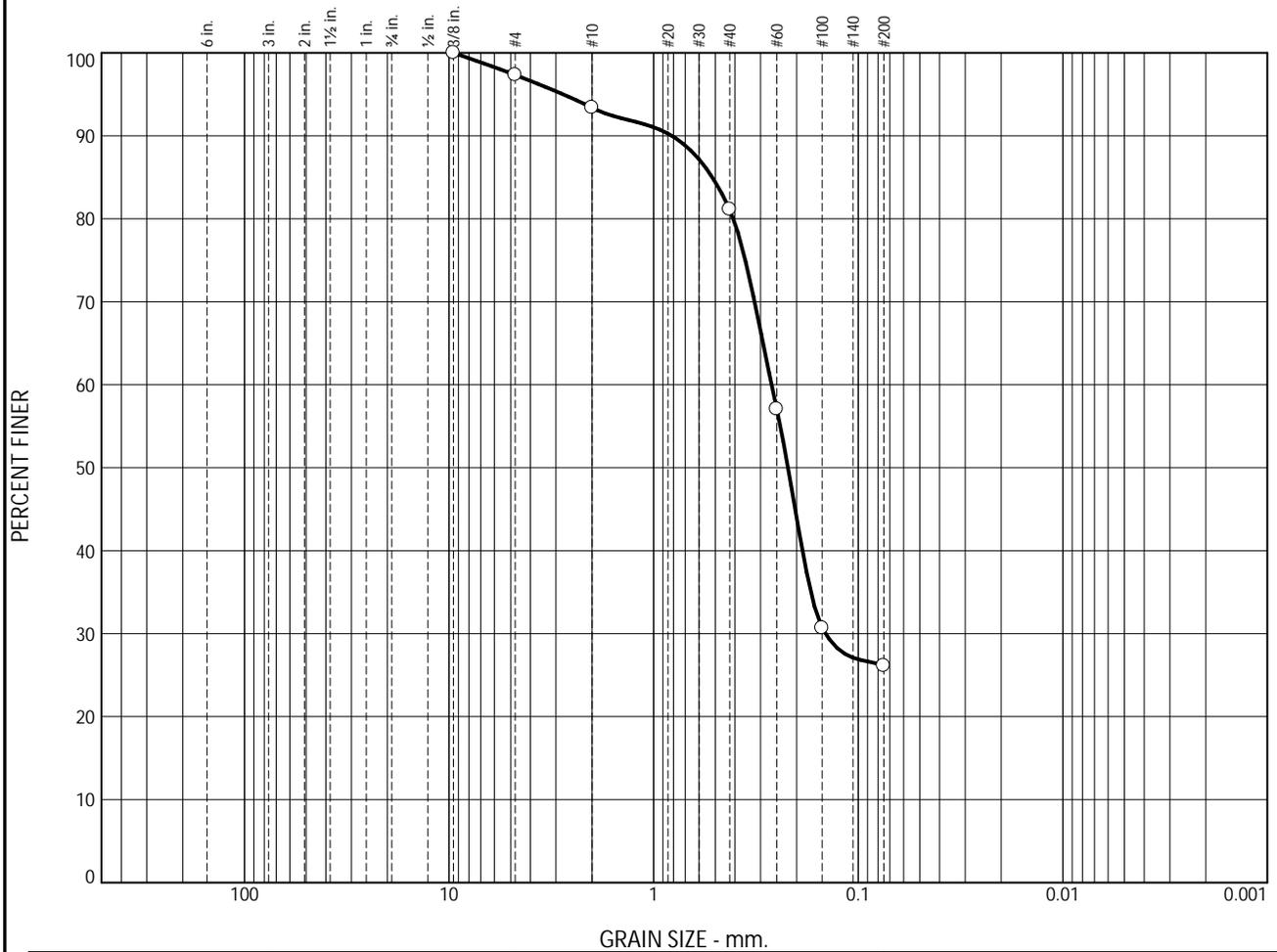
Date: 5/24/22

Findling, Inc.
Baltimore, Maryland

Remarks:
 Moisture content = 22.8%

Figure

Particle Size Distribution Report

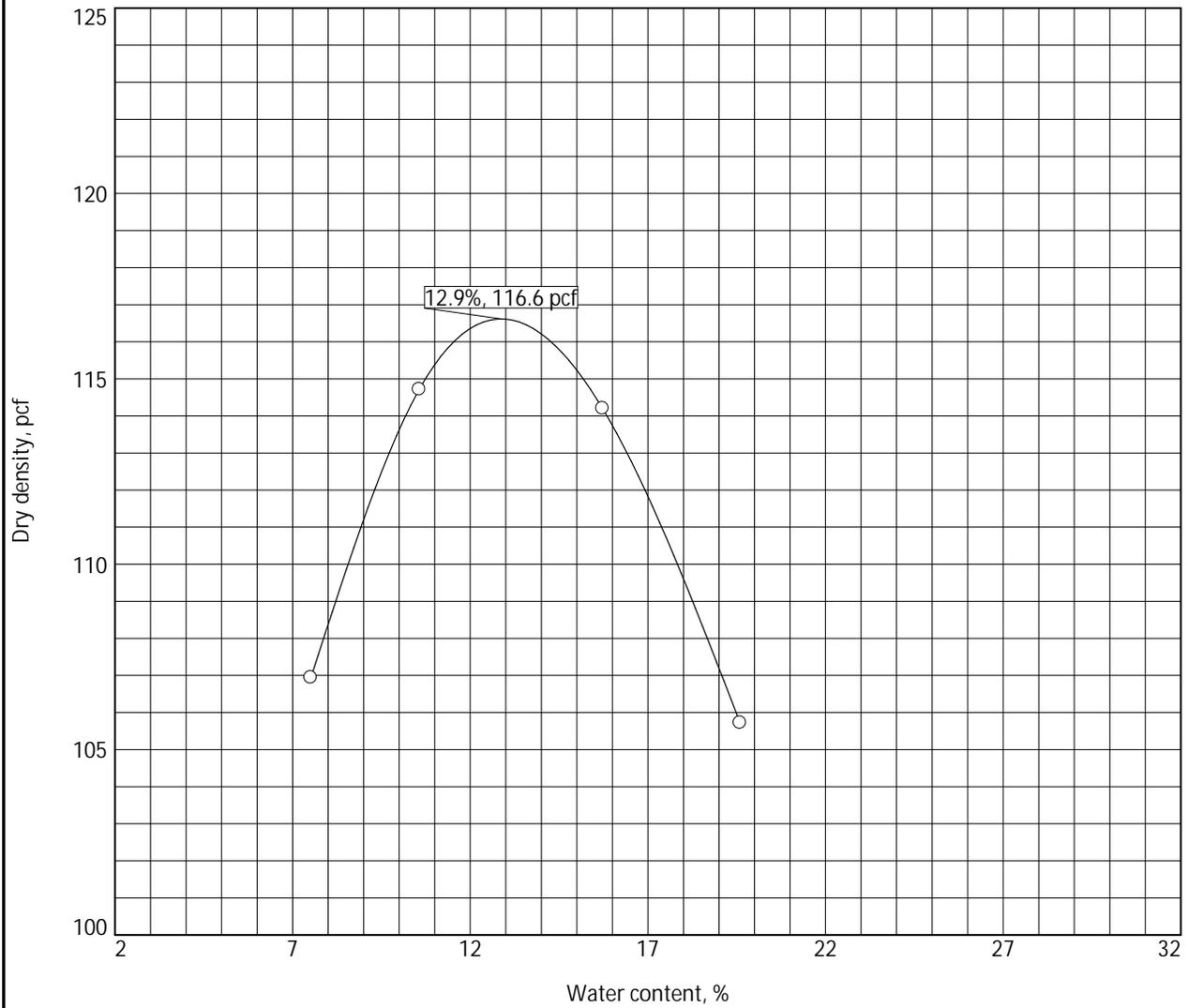


	% +3"	% Gravel		% Sand			% Fines				
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			
<input type="radio"/>	0.0	0.0	2.7	3.9	12.3	55.0	26.1				
<input checked="" type="checkbox"/>	Colloids	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
<input type="radio"/>		NV	NP	0.5168	0.2652	0.2204	0.1445				

Material Description	USCS	AASHTO
<input type="radio"/> Dark brown, Silty SAND	SM	A-2-4(0)

<p>Project No. 22-1020 Client: RK&K</p> <p>Project: Operations Building & SFBW Tank at Broad Creek WTP</p> <p><input type="radio"/> Source of Sample: B-2 Depth: 30.0'-31.5' Sample Number: S-13</p> <p>Date: <input type="radio"/> 5/24/22</p> <p style="text-align: center;">Finding, Inc.</p> <p style="text-align: center;">Baltimore, Maryland</p>	<p>Remarks:</p> <p><input type="radio"/> Moisture content = 25.5%</p> <p style="text-align: right;">Figure</p>
--	--

COMPACTION TEST REPORT



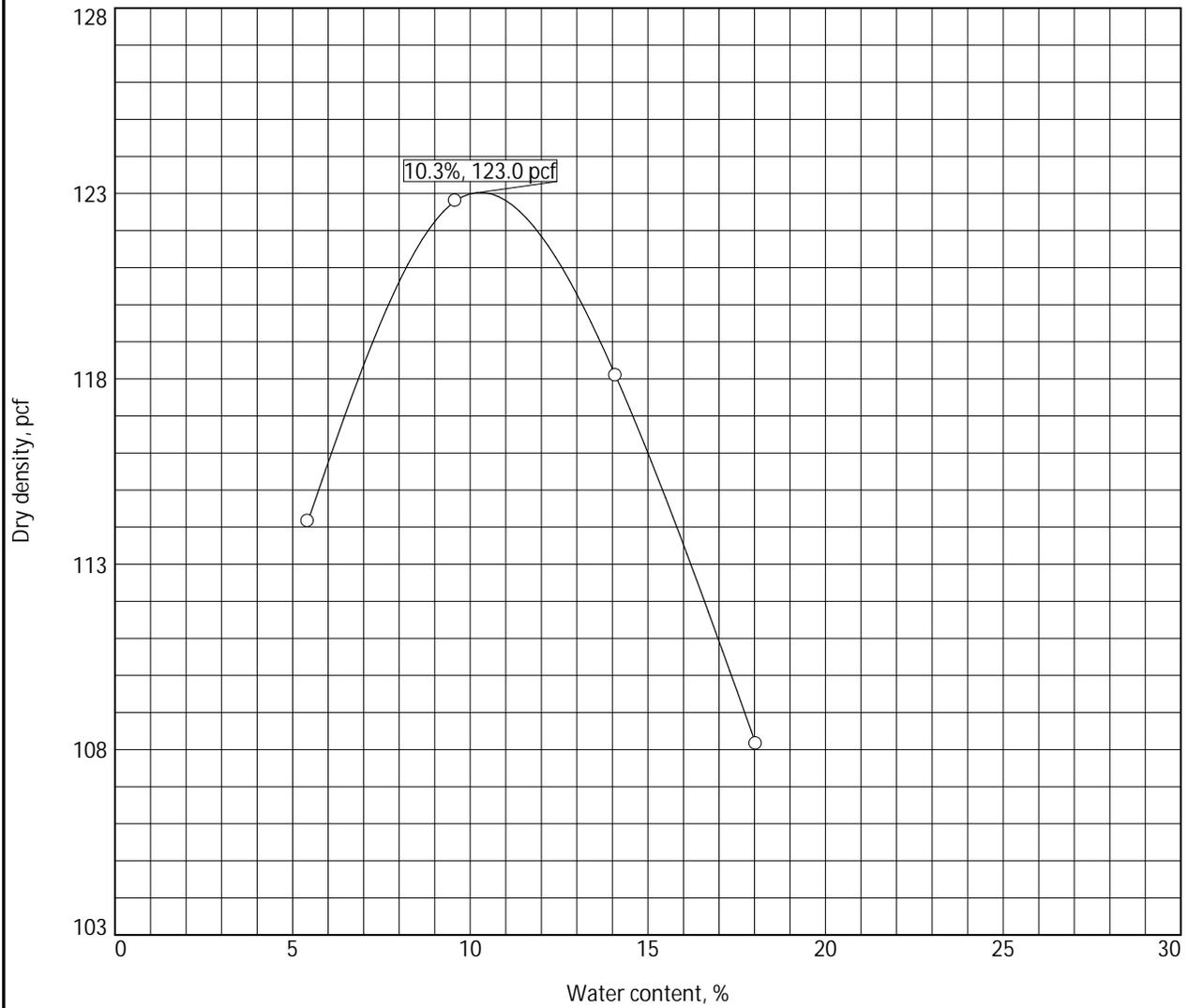
Test specification: ASTM D 1557-00 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
0.0'-5.0'	SC	A-2-7(3)	16.3%		46	25	0.0	35.4

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 116.6 pcf Optimum moisture = 12.9 %	Dark brown, Clayey SAND
Project No. 22-1020 Client: RK&K Project: Operations Building & SFBW Tank at Broad Creek WTP Date: 5/24/22 Source of Sample: B-1 Sample Number: Bulk Findling, Inc. Baltimore, Maryland	Remarks:

Figure

COMPACTION TEST REPORT

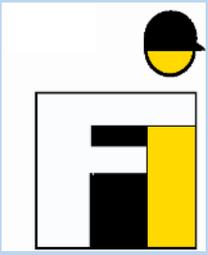


Test specification: ASTM D 1557-00 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
0.0'-5.0'	SC	A-6(2)	17.5%		28	12	0.0	46.0

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 123.0 pcf Optimum moisture = 10.3 %	Light brown, Clayey SAND
Project No. 22-1020 Client: RK&K Project: Operations Building & SFBW Tank at Broad Creek WTP Date: 5/24/22 ○ Source of Sample: B-2 Sample Number: Bulk Findling, Inc. Baltimore, Maryland	Remarks:

Figure



BORING LOGS



FINDLING, INC.

BORING LOG

Boring 1 of 2

Sheet 1 of 1

Contract No.: 22-1020 Project Description: Operations Building & SFBW Tank at Broad Creek WTP

Boring No. B-1 Station: , ' Ground Surface Elevation: 79.0 ft.

Easting: 1437549 Northing: 478695 Logged by: D. Tajhya

Date Started: 5/19/22 Date Completed: 5/19/22

Inspector: _____ Driller: D. Pryor

Rig Type	<u>ATV 45</u>
Rig No.	<u>R-3</u>
Drive Hammer Weight	<u>140</u> lbs.
Auger Size	<u>3-1/4</u> in.
Size of Core	_____ in.
Size of Bit OD	_____ in.
Hammer Energy Ratio	_____ %
Auger Depth	<u>26.5</u> ft.

WATER TABLE

Depth Below Surface		Time (hours)	Date
Depth (ft.)	Elev (ft.)		
▼		END	5/19/22
▽		24 hrs.	5/20/22
▼		On Rod	5/19/22

CAVE-IN TABLE

Depth Below Surface		Time (hours)	Date
Depth (ft.)	Elev (ft.)		
▣	19.2	59.8	END
▣	19.2	59.8	24 hrs.

DEPTH IN FEET	ELEV. IN FEET	MATL	MATERIAL DESCRIPTION	SPT SPOON/ROCK CORE			REC. SPT(in) or Core (%)	LAB. INDEX TESTS			REMARKS
				SAMPLE NO.	BLOWS/RQD	SAMPLE DEPTH		NMC (%)	LL (%)	PI (%)	
0.2	78.80		Topsoil = 2"	1	1-2-3	0.0 - 1.5	18	16.1	49	25	Bulk sample @ 0.0'-5.0'
			Dark olive brown, tan, moist, loose to medium dense, Silty Clayey SAND (SC-SM)	2	3-2-5	2.5 - 4.0	13	20.7			
6.5	72.50			3	3-6-6	5.0 - 6.5	12	16.3			Coordinates & Elevation are approximate
			Dark olive brown, tan, moist, medium dense SAND (SP); trace Silt	4	4-5-6	7.5 - 9.0	16	10.6			
12.0	67.00			5	8-11-9	10.0 - 11.5	17	12.9			
			Dark brown to red, moist, medium dense, Silty SAND (SM)	6	7-12-16	15.0 - 16.5	15	12.7	NV	NP	
17.0	62.00			7	7-9-10	20.0 - 21.5	18	17.3			
			Red, brown, moist, medium dense SAND (SP); trace Silt								
24.0	55.00										
25.5	53.50		Reddish brown, moist, very stiff CLAY (CL); little Sand								
26.5	52.50		Grey, white, moist, medium dense SAND (SP); trace Silt, Mica	8A/B	8-9-9	25.0 - 26.5	17	11.8			S-8, two jar samples taken
			Bottom of Boring @ 26.5'								

22-1020 RK&K BROAD CREEK WTP.GPJ-6/9/22

Legend: NMC - Natural Moisture Content PI - Plasticity Index REC - Recovery MATL - Material Graphics SPT - Standard Penetration Test
 RQD - Rock Quality Designation LL - Liquid Limit Elev - Elevation Geotech - Geotechnical OD - Outside Diameter

Boring and Sampling Conforms to ASTM/AASHTO:



FINDLING, INC.

BORING LOG

Boring 2 of 2

Sheet 1 of 2

Contract No.: 22-1020 Project Description: Operations Building & SFBW Tank at Broad Creek WTP

Boring No. B-2 Station: , ' Ground Surface Elevation: 68.0 ft.

Easting: 1437450 Northing: 478439 Logged by: D. Tajhya

Date Started: 5/19/22 Date Completed: 5/19/22

Inspector: _____ Driller: D. Pryor

Rig Type	<u>ATV 45</u>
Rig No.	<u>R-3</u>
Drive Hammer Weight	<u>140</u> lbs.
Auger Size	<u>3-1/4</u> in.
Size of Core	_____ in.
Size of Bit OD	_____ in.
Hammer Energy Ratio	_____ %
Auger Depth	<u>51.5</u> ft.

WATER TABLE

Depth Below Surface		Time (hours)	Date
Depth (ft.)	Elev. (ft.)		
<u>31.8</u>	<u>36.2</u>	<u>END</u>	<u>5/19/22</u>
<u>19.2</u>	<u>48.8</u>	<u>24 hrs.</u>	<u>5/20/22</u>
<u>30.0</u>	<u>38.0</u>	<u>On Rod</u>	<u>5/19/22</u>

CAVE-IN TABLE

Depth Below Surface		Time (hours)	Date
Depth (ft.)	Elev. (ft.)		
		<u>END</u>	<u>5/19/22</u>
			<u>5/20/22</u>

DEPTH IN FEET	ELEV. IN FEET	MATL	MATERIAL DESCRIPTION	SPT SPOON/ROCK CORE			REC. SPT(in) or Core (%)	LAB. INDEX TESTS			REMARKS
				SAMPLE NO.	BLOWS/RQD	SAMPLE DEPTH		NMC (%)	LL (%)	PI (%)	
0.2	67.80		Topsoil = 2"								Coordinates & Elevation are approximate
1.5	66.50		Brown, moist, very loose, Clayey SAND (SC)	1	1-1-3	0.0 - 1.5	18	19.7	28	12	
4.0	64.00		Grey, tan, damp, loose, Clayey SAND (SC); trace Silt	2	3-3-3	2.5 - 4.0	14	18.1			
			Tan to light grey, moist, medium stiff, Sandy SILT (ML); little Clay	3	3-3-4	5.0 - 6.5	18	19.9			
				4	2-4-6	7.5 - 9.0	18	20.4			
11.5	56.50			5	2-3-4	10.0 - 11.5	18	23.3			
			Brown, tan, moist, loose to medium dense SAND (SP); little Clay, Silt	6	3-4-6	12.5 - 14.0	16	25.8			
				7	3-6-9	15.0 - 16.5	15	22.6			
				8	4-6-8	17.5 - 19.0	18	23.1			
				9	4-5-8	20.0 - 21.5	13	19.9			
24.0	44.00			10	6-7-8	22.5 - 24.0	15	17.0			
26.5	41.50		Multi-brown, grey, moist, medium dense, Silty SAND (SM); trace Clay	11	4-6-8	25.0 - 26.5	18	22.8	NV	NP	
			Multi-brown, mottled, moist, to damp, medium dense to loose, Silty SAND (SM); trace Clay	12	3-5-7	27.5 - 29.0	16	27.1			
				13	8-5-5	30.0 - 31.5	18	25.5	NV	NP	
				14	2-2-6	35.0 - 36.5	18	32.4			

22-1020 RK&K BROAD CREEK WTP.GPJ-6/9/22

Legend: NMC - Natural Moisture Content PI - Plasticity Index REC - Recovery MATL - Material Graphics SPT - Standard Penetration Test
 RQD - Rock Quality Designation LL - Liquid Limit Elev - Elevation Geotech - Geotechnical OD - Outside Diameter

Boring and Sampling Conforms to ASTM/AASHTO:



FINDLING, INC.

BORING LOG

Boring 2 of 2

Sheet 2 of 2

Contract No.: 22-1020 Project Description: Operations Building & SFBW Tank at Broad Creek WTP

Boring No. B-2 Station: , ' Ground Surface Elevation: 68.0 ft.

Easting: 1437450 Northing: 478439

DEPTH IN FEET	ELEV. IN FEET	MATL	MATERIAL DESCRIPTION	SPT SPOON/ROCK CORE			REC. SPT(in) or Core (%)	LAB. INDEX TESTS			REMARKS
				SAMPLE NO.	BLOWS/ RQD	SAMPLE DEPTH		NMC (%)	LL (%)	PI (%)	
37.0	31.00		Red, brown, damp, medium dense, Clayey SAND (SC)								2" temporary well installed
42.0	26.00			15	2-5-6	40.0 - 41.5	18	27.2			
			Brown, tan, moist to damp, medium dense, Silty SAND (SM)								
				16	4-5-9	45.0 - 46.5	18	25.6			
51.5	16.50			17	6-6-9	50.0 - 51.5	16	27.9			
			Bottom of Boring @ 51.5'								

22-1020 RK&K BROAD CREEK WTP.GPJ-6/9/22

Legend: NMC - Natural Moisture Content PI - Plasticity Index REC - Recovery MATL - Material Graphics SPT - Standard Penetration Test
 RQD - Rock Quality Designation LL - Liquid Limit Elev - Elevation Geotech - Geotechnical OD - Outside Diameter

Boring and Sampling
 Conforms to ASTM/AASHTO:

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SECTION 01000

GENERAL REQUIREMENTS

PART 1 – GENERAL

1.01 USE OF GENERAL REQUIREMENTS

- A. These General Requirements of the Special Provisions are hereby made a part of the Contract.

1.02 DESCRIPTION OF WORK

A. WORK COVERED BY CONTRACT DOCUMENTS

1. The work to be done under this contract includes furnishing all labor, materials and equipment and performing all related work for construction of a new Operations Building as shown on the Contract Drawings and as specified herein.
2. The general categories of work required under this Contract generally includes, but is not limited to, the following:
 - a. New Operator Building and all interior furnishings and equipment
 - b. Erosion and sediment control
 - c. Grading and earthwork
 - d. Buried utilities and conduits (water, sanitary, communications)
 - e. Painting
 - f. Landscaping
 - g. Paving and Curb and Gutter repairs
 - h. All other work required to complete the improvements.

The work includes all requirements to provide fully finished and operable systems including miscellaneous items and operations as shall be indicated, shown, specified or required to complete the work in strict conformity with the Contract Documents. The work also includes all specified, indicated and shown demolition, bypass pumping, earthwork, paving, precast structures, cast-in-place concrete, masonry, metal fabrications, fiberglass products, coatings, mechanical and electrical equipment, instrumentation and controls, appurtenances, accessories, tests necessary and required for a completely operable installation satisfactory to the Engineer.

3. The Drawings and written Contract Documents are intended to indicate as clearly as practicable the work to be done. The Contractor must realize, however, that construction details cannot always be accurately anticipated and that in executing the work, field conditions may require reasonable modifications in the details of the Drawings and the work involved. Work under the Contract shall be carried out to meet these field conditions to the satisfaction of the Engineer and in strict conformance with his instructions, the Drawings, the Specifications, and conditions and covenants of the Contract Documents in accordance with their true intent and full meaning.
4. Construction sequence constraints are specified herein.

1.03 SUBSURFACE CONDITIONS

- A. A geotechnical investigation was completed at the project site by Findling, Inc. A copy of the geotechnical engineering report dated August 2022 prepared by Findling is included in Appendix E.
- B. It is recognized that the boring locations described in the geotechnical investigation report do not coincide with the proposed location of the New Operator Building. Such boring results are only made available in order that the Contractor may have access to the same information available to the County. It must be expressly understood by the Contractor that the County will only be responsible for the information or data shown at the individual boring locations. Any deduction, interpretation, or conclusion drawn therefrom by the Bidder as the sub-surface or latent physical conditions beyond the boring location will be entirely at the risk of the Bidder and will not be the responsibility of the County.
- B. Before submitting his bid each bidder shall, upon approval of written application, at his own expense, make such additional subsurface investigations as he may deem necessary to determine his bid price for performance of the work within the terms of the contract.
- C. Soil borings or test pits for soil determination in improved roads are not to be excavated by the Contractor unless application is made by the Contractor prior to, and permit is issued by Anne Arundel County.

1.04 EXISTING STRUCTURES AND UTILITIES

- A. All known subsurface lines, pipes, conduits and structures are shown on the plans and profiles. These lines are shown based upon the best available plans and maps. Unless specifically indicated otherwise, the locations have not been verified by test pits and the County assumes no responsibility for the accuracy of the Drawings. In any area where the Contractor must make connections to, or cross existing lines, it shall be his responsibility to test pit the lines and verify the locations to his satisfaction. In the event that lines are not found located as shown on the plans, the Contractor shall notify the Engineer so that an evaluation can be made as to the magnitude and methods of any adjustments in the plans.

- B. The Contractor shall be solely responsible for all damage to underground or aboveground lines encountered in any manner during construction. When crossing and working in the vicinity of existing lines, it shall be the Contractor's responsibility to properly support and maintain the operation of the lines. Extreme care must be exercised in excavation and backfill operations. The Contractor shall correct, at his own expense, all damage caused to existing lines.
- C. The Contractor shall assume that existing gates and valves have some leakage and shall be responsible for addressing such leakage during construction.

1.05 INTERFACE WITH EXISTING FACILITIES

- A. The Contractor's attention is directed to the fact that the existing facilities are integral components of the Broad Creek II WTP. The treatment plant must be maintained in continuous operation at all times during the course of work under this contract, except for the shutdown periods permitted under the conditions described in this section.
- B. When the Contractor desires certain electrical and/or mechanical functions to be interfaced, he shall inform the Engineer in writing a minimum of 14 calendar days prior to the date he desires those interfaces to be made. Only authorized County personnel will be allowed to operate or alter settings on existing electrical and/or mechanical equipment including all gates and valves.

1.06 COORDINATION OF TRADES

- A. Where the work of any trade will be installed in close proximity to the work of other trades, or where there is evidence that the work of any trade will interfere with the work of other trades, the Contractor shall work out space allocations to make satisfactory adjustment. If so ordered by the Engineer, the Contractor shall prepare composite working drawings and sections at a suitable scale, not less than ¼-inch equals one foot, clearly showing how work is to be installed in relation to the work of other trades. If the Contractor permits any work to be installed before coordinating with the various trades or so as to cause interference with the work of other trades, he shall make necessary changes in the work to correct the condition without extra cost to the County.
- B. The Contractor shall arrange that each trade determine the location, size, and arrangement of all chases and openings and shall establish clearances in concealed spaces required for the proper installation of its work and shall see that such are provided.

1.07 PRECONSTRUCTION CONFERENCE

- A. Before starting the work, a conference will be held to establish procedures for coordination/interfaces, handling shop drawings and other submissions, and for the processing of applications for payment. Among those present at the conference will be the Contractor and his Superintendent, the Facility Superintendent, the Engineer, and the inspector.
- B. The Engineer will arrange for and organize the preconstruction conference.
- C. The purpose of the conference is to designate responsible personnel and establish lines of communication. Matters requiring coordination will be discussed and procedures for handling such matters established. The preliminary agenda will include:
 - 1. Contractor's preliminary progress schedule and Schedule of Values
 - 2. Transmittal, review and distribution of Contractor's submittals
 - 3. Maintaining record documents
 - 4. Critical work sequencing
 - 5. Field decisions and change orders
 - 6. Use of premises, office and storage areas, security, housekeeping and the County's needs
 - 7. Major equipment deliveries and priorities
 - 8. Contractor's assignments for safety and first aid
 - 9. Confined space program.
- D. The Engineer will preside at the conference and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.

1.08 SAFETY CONFERENCE

- A. The Contractor's superintendent, the Engineer and the inspector shall meet with the Facility Superintendent for a minimum of one hour for a contractor safety conference. The purpose of this meeting will be to review facility safety issues. The Engineer will prepare a written summary of the meeting.

1.09 PROGRESS MEETINGS

- A. Project progress meetings will be held monthly to review the progress and schedule of the work. The Contractor shall make his Project Manager and Field Superintendent available for said progress meetings and to meet the County and Engineer on-site. The Engineer on-site will prepare a written summary of the meeting.

1.10 AUTHORITY OF FACILITY SUPERINTENDENT

- A. The Facility Superintendent is responsible for the public health and safety of County plant personnel, the security of the plant property and compliance with the facility. He exercises sole authority over plant personnel and, may as required, control the conduct of the Contractor's forces by request to the Engineer.
- B. The Facility Superintendent has the authority to modify or stop operations of the Contractor's work forces which might cause contamination of the plant water supply or interfere with plant processes. Such orders will be relayed through the Engineer except in case of an emergency.
- C. The Facility Superintendent will not direct the Contractor or his work forces in areas of the Contractor's responsibility for construction, workmanship and progress of work or changes in contract scope. Such direction if and as appropriate will be provided solely by the Engineer.
- D. All requests by the Contractor for operation of valves, gates, pumps or other plant equipment will be coordinated by the Facility Superintendent or his designated representative through the Engineer.

1.11 ADDITIONAL MATERIAL AND/OR EQUIPMENT

- A. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the structural and finish conditions affecting his work and shall arrange his work accordingly, providing such fittings, valves, transitions, pull or junction boxes, and accessories as may be required to meet such conditions, at no additional cost to the County.

1.12 SINGULAR NUMBER

- A. Where material, a device, or part of the equipment is referred to in the singular number, it is intended that such reference shall apply to as many items of material, devices or parts of equipment as are required to complete the installation.

1.13 EQUIPMENT UNIFORMITY

- A. All pumps, valves and other multiple-unit equipment within its use category shall be the product of a single manufacturer.

1.14 SHOP DRAWINGS

SUPPLEMENT "Section 5.04.2 Submittals" of the Standard Specifications with the following:

- A. After checking and verifying all field measurements, the Contractor shall submit to the Engineer, for approval, a minimum of ten (10) copies of all submittals, which shall have been checked by and stamped with the approval of the Contractor and identified as shown herein. The following stamp shall be affixed to each submittal and appropriately completed:

CHECKED AND APPROVED FOR SUBMISSION	
(CONTRACTOR'S NAME)	
JOB	_____
CONTRACT NO.	_____
DATE	_____ BY _____
SUBMITTAL NUMBER	_____
ITEM	_____
CONTRACT REFERENCES:	
SPECIFICATION	_____
DRAWING	_____
SUBMITTED AS: <input type="checkbox"/> SPECIFIED ITEM <input type="checkbox"/> QUAL ITEM <input type="checkbox"/> SUBSTITUTE	

Resubmittals shall be labeled with the letter "R" followed by the number of the resubmission. Example: The Contractor's tenth submittal, being resubmitted for the first time shall be numbered Submittal No. 10R1, resubmitted for the second time shall be numbered Submittal No. 10R2, etc. Submittals of supplemental information requested by the Engineer shall be labeled with sequential letters of the alphabet beginning with "A". Example: The Engineer reviews the Contractor's tenth submittal and finds it generally acceptable but requests additional information, such as a color chart or supporting calculations. The Contractor shall submit the supplemental information numbered Submittal No. 10A. If additional supplemental information is required, such information shall be submitted as Submittal No. 10B, etc.

- B. All shop drawings shall be in conformity with the Contract Drawings and Special Provisions. Shop drawings shall clearly indicate the quantities of materials or components to be provided. All shop drawings except diagrams, illustrations, brochures and schedules shall be to appropriate scale, but in no case smaller than 1/4" = 1'-0", and shall give all dimensions required for manufacture, fabrication, assembly, installation and incorporation in the work. All shop drawings shall be complete, accurate and distinct, and shall show outline and section views, details, kinds of materials to be used, the kind of machine work and finish to be applied, and the installed locations of the said materials, equipment, accessories, appurtenances and related items. Shop drawings showing field assembly of piping and/or conduit systems shall incorporate sufficient views, sections, plans and elevations to show

each and every fitting, specialty, and item of equipment, including locations and spacing of hangers and supports. Piping and/or conduit systems 2-inches in diameter and smaller may be shown as a single line. Equipment and specialties installed within and/or connected to piping and conduit systems shall be cross referenced to equipment and specialty shop drawings by submittal identification number, manufacturer name, and catalog or model number. Such cross reference data may be shown at each individual equipment or specialty item on the system assembly drawing or, at the Contractor's option, may be incorporated in a coded bill of materials prepared integral with, and as a part of, the applicable shop drawing.

- C. Where several model numbers, sizes, or options are shown in the shop drawings, the applicable items to be provided shall be clearly marked and non-applicable items shall be cross out.
- D. All shop drawings depicting layouts of piping, equipment, rooms made specifically for this contract shall be 22-inches by 34-inches in size with a 1 1/2-inch binding margin on left hand side of sheet. The Contractor may incorporate one (1) or more small drawings on prints 22-inches by 34-inches in size. Diagrams, illustrations, brochures, schedules, and other data may be prepared and executed, complete, on sheets measuring 8 1/2-inches by 11-inches. Shop drawings submitted other than as specified herein will be returned for re-submittal without being reviewed.
- E. A maximum of two submissions of each submittal will be reviewed, checked, and approved or commented upon without charge to the Contractor. Any additional submissions which are ordered by the Engineer to fulfill the stipulations of the Contract Documents, and which are required by virtue of the Contractor's neglect or failure to comply with the requirements of the Contract Documents or to make those modifications and/or corrections ordered by the Engineer in the review of the first two submissions of each submittal, will be reviewed and checked as deemed necessary by the Engineer, and the cost of such review and checking will be based upon a maximum rate of \$110.00 per hour and will be deducted from the Contractor's monthly invoices or from monies retained under the provisions of the Contract Documents. It is therefore incumbent upon the Contractor to make all modifications and/or corrections, and/or to cause such modifications and/or corrections to be made by his subcontractors, suppliers, distributors, equipment fabricators and/or manufacturers, as may be required by the Engineer in an accurate, complete, and timely fashion.

1.15 AS-BUILT DRAWINGS

SUPPLEMENT "5.04.7 As-Built Drawings" of the Standard Specifications with the following:

- A. Provide two copies of the as-built drawings in electronic format.
- B. As-built drawings shall be completed and approved within 30 days of conditional acceptance.

1.16 MATERIAL SAFETY DATA SHEETS

- A. The Contractor shall submit to the inspector a Material Safety Data Sheet (MSDS) for all materials brought onto the facility. All MSDS sheets will be in a clearly labeled binder (MSDS SHEETS) in alphabetical order and turned over to the inspector. The inspector will place the MSDS in a location that is agreed upon with the Facility Superintendent so that all facility personnel have access to the information. The MSDS sheets shall be turned over to the County prior at the end of the project.

1.17 WORKING AREA

- A. The Contractor shall not occupy with men, tools, equipment, or materials any part of the County property outside of the "Limit of Work" areas shown on the Drawings or established by the Engineer and the Facility Superintendent.
- B. No work shall be permitted outside of the limit of work.

1.18 CONTRACTOR STORAGE AREA

- A. A storage area has been assigned on the plant site, as generally shown on the Drawings, for use by the Contractor for storage of his materials, tools, equipment, and other items necessary for construction. The exact limits of the areas will be designated in the field by the Engineer and Facility Superintendent. The Contractor shall be fully responsible for the security of this area, including fencing, watchmen, and other means of security. Under no circumstances will the County be responsible for the security of any property belonging to the Contractor, his subcontractors, or any of his workforce.
- B. The Contractor shall not use any portion of the plant site for storage of his property, except as specified.
- C. The Contractor shall grade and stabilize a portion of the assigned storage area for a temporary mobilization and parking area for his use during the contract period and shall restore the entire storage area to its original condition upon completion of the project.
- D. Any additional staging / storage /stockpile areas required to complete the work will be offsite and the costs and coordination to use such sites are the Contractor's responsibility.

1.19 PROTECTION OF STRUCTURES AND EQUIPMENT

- A. The Contractor shall perform all pumping necessary to prevent accumulation of water in excavations and flotation of any part of the structures during construction with his own pumping equipment.

- B. The Contractor shall, for the duration of the contract and with his own equipment, pump out all liquids which may seep or leak into structures. The extent of pumping required will be the responsibility of the Contractor.
- C. Before discontinuing pumping or permitting any rise in water level, the Contractor shall submit computations to show that the structure is safe against uplift. A factor of 1.1 shall be used in such computations.
- D. The Contractor is advised that in the computation of the weight of the structures, a value of zero shall be applied to the backfilled material contiguous to the structures.
- E. No separate payment will be made for pumping. The cost thereof shall be considered as included in the lump sum and unit prices bid.

1.20 TEMPORARY SERVICES

- A. The Contractor shall provide, subject to the approval of the Engineer, and pay for the acquisition, maintenance and removal of such temporary water, sanitary, heat, light, power, telephone, high-speed internet service, fence around excavated area or enclosed storage, watchman and all other temporary services as may be required in the prosecution of this Contract.
- B. The Contractor shall provide and maintain one temporary portable chemical toilet on the site for the full term of the Contract. The Contractor will not be allowed to use plant restrooms.
- C. The Contractor shall provide for the sole use by the resident Inspector, an equipped, air conditioned, ventilated, lighted and heated field office. The type of field office to be provided shall be Office Type 2 as specified in Anne Arundel County's Standard Specifications and further subject to the approval of the Engineer. The resident Inspector's office shall be a separate entity from any field office the Contractor intends to supply for his own use. Upon completion of the work, the resident Inspector's field office shall be removed from the site by the Contractor and the site cleaned up and left in a neat, acceptable condition. The Engineer, CM/I will provide their own PC and mobile telephone service. The Contractor shall provide electrical service, water, sewer, telephone, Intranet access, a new printer/scanner/FAX machine, and weekly office cleaning.
- D. The cost of any temporary electric and telephone service installation or use for the completion of this Contract and the testing of all electrical and mechanical equipment and other related work shall be borne by the Contractor up to and including the date of the final acceptance.
- E. The Contractor shall be responsible for all permitting efforts, including application, costs and inspections, associated with the Contractor's and Inspector's field offices.

1.21 CONFINED SPACE REQUIREMENTS

- A. The Contractor's confined space procedures shall be in accordance with the space classifications defined by Anne Arundel County DPW. The Contractor shall follow

all confined space procedures in accordance with the Contractor's confined space program. The Contractor shall provide documentation that workers have received confined space entry training.

- B. The Contractor is responsible for reviewing the County's space designations in the attached Confined Space Procedural Memorandum DPW D-17 as provided in an appendix in this Project Manual for information purposes. Reclassification of space designations (i.e., from permit required to no permit required) is not permitted.
- C. A copy of the Contractor's confined space program shall be submitted to the County for information purposes at the pre-construction meeting.
- D. The Contractor shall review the County's classification procedure pertaining to excavations greater than four (4) feet in depth and establish whether or not such excavations are to be considered permit-required confined spaces. If any excavations are determined to be permit-required confined spaces, the Contractor shall follow the appropriate confined space procedures.
- E. Wastewater pump-around vaults are classified by the County as "Non-Permit Required Confined Spaces." Wetwells and sewer manholes are classified by the County as "Routine Permit Required Confined Spaces." Contractor's personnel shall have the required training to enter.

1.22 WORKING HOURS

- A. The Contractor's access to the facility shall be limited to between the hours of 6:00 am and 4:00 pm Monday through Friday although no heavy equipment or construction that may cause noise disturbance to neighboring properties can be operated or completed prior to 7:00 am. No work is allowed outside normal working hours or County Holidays without written approval from the County.

1.23 SCHEDULE OF VALUES

- A. In order to determine the amount of the monthly estimate, the Contractor shall furnish a complete breakdown of his total bid for Items A of the Bid Form, also referred to as a Schedule of Values. The Contractor shall furnish this information within ten (10) days after receipt of Notice-to-Proceed. At a minimum, the breakdown shall provide values for the categories of work shown below. The value of work not specifically listed below shall be identified and either be included in the items shown or shall be included as separate items in the Schedule of Values. Upon approval by the Engineer, the breakdown shall be the basis for calculating the amount of monthly estimates specified in the Standard Specifications. No invoices will be processed until the Schedule of Values is approved.

1.24 CONSTRUCTION SEQUENCING, COORDINATION AND SCHEDULING

- A. Construction shall interfere to the least extent possible with the operation of the Broad Creek Water Treatment Plant. As the plant is essential to the treatment of drinking water for Anne Arundel County, the plant must be maintained in continuous

operation at all times to meet its water supply and quality requirements during the course of work under this contract.

- B. The contractor shall provide a construction schedule within 10-days after receipt of the notice to proceed. The Contractor shall prepare a project schedule in Gantt Chart format which indicates the critical path. The schedule shall indicate when the shop drawing submittal list will be submitted. The schedule shall be updated monthly.

1.25 PHOTOGRAPHIC REPORTS

- A. The Contractor shall submit each month during construction not less than ten (10) 8" x 10" digital photographs (color prints and electronic files) to the County, as outlined and stipulated hereinafter. All color prints shall have a 2" x 3" label in the lower right corner with the contract number, job name, County's name, Engineer's name, date and a short description.
- B. The County, or its representative, will designate the origin points of the photographs and the desired scope or perception of the photographs which are intended to give a complete picture of the status of the project. The photographs shall be taken by a person or firm experienced in such work and approved by the Engineer. The cost of the aforementioned will not be a pay item, but shall be included in the lump sum price bid and no additional compensation to the Contractor will be considered.

1.26 TEST PITS

- A. All known subsurface lines, pipes, conduits, and structures are indicated on the plans and profiles. These lines indicated are based upon the best available plans and maps. The locations have not been verified by test pits and the County assumes no responsibility for the accuracy of the Drawings. In any area where the Contractor must make connections to or cross existing lines, it shall be his responsibility to locate existing utilities and verify the locations to his satisfaction. In the event that utilities are not as shown on the Contract Drawings, the Contractor shall immediately notify the Engineer so that adjustments can be made if required.
- B. The Contractor shall be solely responsible for all damage to underground or aboveground lines encountered in any manner during construction. When crossing and working in the vicinity of existing lines, it shall be the Contractor's responsibility to properly support and maintain the operation of the lines. Extreme care must be exercised in excavation and backfill operations. The Contractor shall correct, at his own expense, all damage caused to existing lines.
- C. The Contractor shall take additional precautions towards locating and protecting the existing 24" Raw Water Pipeline that is located near the proposed New Operator Building. The Contractor shall test pit to determine the exact location and depth of this pipeline prior to beginning any excavation. Contractor shall take precautions by installing visible markings identifying the location of the pipeline that warns construction workers to avoid excavating or placing heavy equipment directly over this pipeline.

1.27 ENGINEERS OFFICE

- A. Engineers Office shall not be required for this project.

1.28 MEASUREMENT AND PAYMENT

A. GENERAL

Measurement and payment for the work completed under this Contract will be made at the lump sum and unit prices bid as shown on the Proposal and as described in this section. Except where a specific unit price bid item is provided for in the Proposal, all work shall be included in the lump sum items shown. The absence from the Proposal form of bid items specifically described in the Contract Documents shall be interpreted as meaning that the cost of any such work contemplated by the Contract Documents shall be included in the lump sum prices bid. The Total Bid Amount shall include all lump sum bid items and contingency items.

The method of measurement and payment described in this section supersedes the "METHOD OF MEASUREMENT" and "BASIS OF PAYMENT" portion of each section in the Standard Specifications Divisions 1 through 10, unless specifically noted otherwise. Thereby, DELETE the provisions of "METHOD OF MEASUREMENT" and "BASIS OF PAYMENT" from each section of the Standard Specifications in Divisions 1 through 16, unless specifically noted otherwise.

The lump sum and unit prices shall include the furnishing of all labor, tools, equipment, materials and services and the performance of all work required to complete the Contract as indicated and specified in accordance with all requirements of the Contract Documents and to the satisfaction of the Engineer. Payment for delivery of major equipment shall be limited to 50% of the equipment value.

B. BID OR PROPOSAL PAYMENT ITEMS

Item No. 1 – Mobilization

Mobilization shall be as specified in the Standard Specifications.

Item No. 2 – New Operator Building

The lump sum price bid for this item shall include furnishing all labor, material, tools and equipment necessary to completely provide, test, and make operable, the process improvements and all related work as shown and specified which shall generally include, but not necessarily be limited to the following:

1. Construction of the new Operations Building and all related work as shown on the Contract Drawings and as specified herein including clearing and grubbing, rough and finish grading, building structure and all furnishings and equipment, utilities, paving and landscaping.

Measurement of this item will not be made for payment.

Payment for the work completed under this item will be made at the lump sum price bid for Item No. 2 – “New Operator Building” of the Proposal.

Item No. 3 – Allowance for Interior Furnishings, Appliances and Equipment

An allowance of \$35,000 is provided under this item for the Contractor to purchase and provide interior furnishings, appliances and equipment such as tables, chairs, workstation desks, Break Room appliances and electronic equipment including a Conference Room 72” TV Display and other equipment to be selected and approved by the County at the time of construction. The Contractor shall coordinate with the County to solicit price quotations from reputable office furnishing suppliers for specific materials and furnishings to be selected by the County. The Contractor shall purchase and install selected furnishings based on price quotations approved by the County.

Payment for the furnishings supplied, delivered and installed under this item shall be made based on actual documented material cost plus a maximum 5 percent (5%) Contractor markup. Requests for payment under this item must be supported with actual itemized receipts from the supplier of the furnishings, appliances or equipment.

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

(NOT USED)

END OF SECTION 01000

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SECTION 02230

CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Work of This Section Includes, But Is Not Limited To:

1. Clearing
2. Grubbing
3. Stripping and stockpiling topsoil
4. Debris disposal

B. Related Work Specified Elsewhere

1. Section 02300 - Earthwork
2. Section 02311 - Finish Grading and Seeding
3. Section 02315 - Trenching, Backfilling & Compacting

C. Definitions

1. Clearing is defined as the removal of trees, brush, down timber, rotten wood, rubbish, trash, any other vegetation, and objectionable material at or above original ground elevation not designated to be saved; clearing also includes removal of fences, walls, guard posts, guard rail, signs, and other obstructions interfering with the proposed work.
2. Grubbing is defined as the removal from below the surface of the natural ground of stumps, roots and stubs, brush, organic materials, and debris.

1.02 JOB CONDITIONS

- A. The Contractor may clear all obstructions within the property except those specifically indicated on the Contract Drawings or specified to be saved or restored.
- B. Obstructions specifically designated to be saved or restored will be marked by the Engineer.

1.03 SUBMITTALS

- A. Burning Permits: Submit two copies of each on-site burning permit if such permits are required by local jurisdictional authorities.

B. Permits for Disposal of Debris

1. Arrange for disposal of debris resulting from clearing and grubbing to locations outside the Owner's property and obtain written agreements with the owners of the property where the debris will be deposited.
2. Submit two copies of the agreement with each property owner releasing the Owner from responsibility in connection with the disposal of the debris.

PART 2- PRODUCTS

2.01 MATERIALS

A. Temporary Fencing

1. The temporary fencing at the site perimeter shall be chain link and match the existing fence for height.
2. Fence posts, driven a minimum 2-ft into the ground.
3. Panel Fencing with above-ground base stands may be used in lieu and shall be approved by Engineer.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Mark areas to be cleared, the areas to be grubbed, and items to be saved with stakes, flags, paint or plastic colored ribbon for the approval of the Engineer.
- B. Protect benchmarks, property corners, utilities, existing trees, shrubs and other landscape features designated for preservation with temporary fencing or barricades satisfactory to the Engineer.
- C. No material shall be stored or construction operation carried on within 4 feet of any tree to be saved or within the tree protection fencing.

3.02 UTILITY RELOCATIONS

Inform utility companies, individuals and others owning or controlling facilities or structures within the limits of the work which have to be relocated, adjusted or reconstructed in sufficient time for the utility to organize and perform such work in conjunction with or in advance of the Contractor's operations.

3.03 CLEARING

- A. Confine clearing to within the property.

- B. Fell trees in a manner that will avoid damage to other trees, shrubs, and other installations which are to be retained.
- C. Where stumps are not required to be grubbed, flush-cut to the ground elevation.

3.04 GRUBBING

- A. Grub areas within the construction limits to remove roots and other objectionable material to a minimum depth of 12".
- B. Remove all stumps within the cleared areas except those designated to be saved as indicated on the Plans.

3.05 STRIPPING AND STOCKPILING TOPSOIL

- A. Strip topsoil to whatever depth it may occur from areas to be excavated, filled, or graded and stockpile at a location approved by the Engineer for use in finish grading.
- B. The topsoil is the property of the Owner and shall not be used as backfill. Topsoil shall not be removed from the site unless otherwise authorized by the Engineer.

3.06 DEBRIS DISPOSAL

- A. Trees, logs, branches, brush, stumps, trash, rubbish, and other debris resulting from clearing and grubbing operations shall become the property of the Contractor unless specified otherwise on plans or by Engineer and shall be legally disposed of.
- B. Do not deposit or bury on the site debris, resulting from the clearing and grubbing work.
- C. Debris may be burned on-site if local ordinances allow open-air burning, if required permits are obtained, and if burning operations are conducted in compliance with local ordinances and regulations.

3.07 RESTORATION

- A. Repair all injuries to bark, trunk, limbs, and roots of remaining plants by properly dressing, cutting, tracing and painting, using approved arboricultural practices and materials.
- B. Replace trees, shrubs and plants designated to be saved which are permanently injured or die during the life of the Contract as a result of construction operations with like species acceptable to the project Owner.

- C. Remove protective fences, enclosures and guards upon the completion of the project.
- D. Restore guard posts, guard rail, signs and other interferences to the condition equal to that existing before construction operations.

END OF SECTION - 02230

SECTION 02300

EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The work to be performed under this section includes, but is not limited to, the furnishing of all materials, labor, tools, and equipment necessary to complete excavation, including blasting, and backfilling for structures, site backfilling, select backfill, installation of geotextile fabric, stripping, shoring, benching, and placing topsoil necessary for the complete and satisfactory completion of this item of work.
- B. Related Work Specified Elsewhere
 - 1. Section 01300 - Submittals
 - 2. Section 02230 - Clearing and Grubbing
 - 3. Section 02315 - Trenching, Backfilling & Compacting
 - 4. Section 02240 - Dewatering
 - 5. Section 02311 - Finish Grading and Seeding
- C. Classification of Excavation

All excavation work under this Contract shall be unclassified, and includes excavation and removal of all soil, rock, fill, and all other materials encountered of whatever nature.
- D. Controlled blasting is a method used to remove rock in which the various elements of the blast, hole size, depth spacing, burden, charge size, explosive charge weight per delay, distribution, and delay sequence, are carefully balanced and controlled to provide a distribution of the charge that will fracture the rock so it may be excavated to the required contours and minimize over-break and fracturing of the rock beyond the contour line. Smooth wall blasting, pre-splitting, cushion blasting and line drill are examples of operations included in the term "controlled blasting".

1.02 QUALITY ASSURANCE

- A. Testing Agency: In-situ density testing will be performed by an independent soils testing laboratory engaged and paid for by the Contractor and approved by the Engineer.
- B. Referenced Standards

1. American Society for Testing and Materials (ASTM)
 - a. D1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
 - b. D2487 Standard Practice for Classification of Soils for Engineering Purposes (USCS)
 - c. D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort
 - d. D1556 Test Method for density and Unit Weight of Soil in Place by the Sand Cone Method
 - e. D2922 Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods
2. OSHA Standards for Trench Safety Standards

C. Density Testing

1. Conduct density test at locations as directed by the Engineer during backfilling operations.
2. Determine density by ASTM D1556 or ASTM D2922

1.03 JOB CONDITIONS

- A. The locations shown for utilities are approximate. Proceed with caution in the areas of existing utilities and expose them by hand or other excavation methods acceptable to the utility owner.
- B. Erect sheeting, shoring, and bracing as necessary for protection of persons, improvements, and excavations.
- C. Furnish and maintain barricades, signs and markings for excavated areas.
- D. Select and install a system of dewatering to accomplish groundwater control in excavations.
- E. Preserve, protect and maintain operable existing drainage ways, drains and utilities.
- F. Determine safe slopes of excavations for the earth materials encountered.
- G. Maintain bench marks, monuments, and other reference points. Replace any disturbed or destroyed bench marks.

H. Storage and Transport of Explosives

Proper building or magazines, with separate compartments for detonators in suitable positions for the storage of explosives in the manner and quantities to be approved, shall be provided by the Contractor. Separate vehicles or vessels for detonators shall also be used for the transportation of explosives. All explosives shall be delivered to the site in vehicles that are in compliance with state and local codes and regulations. The prevention of any unauthorized use or improper use of any explosives brought onto the site shall be the responsibility of the Contractor and only experienced licensed shot firers shall be employed to handle the explosives for the purposes of the Work.

The relevant security regulations dealing with the storage, handling, and transport of explosives shall comply with all applicable federal, state, and local codes.

The quantity of explosives on the job site shall at all time be limited to that required to complete one day's work. All explosives on the job site shall be stored in locked, heavy, shockproof containers. Detonators and explosives shall be inventoried at the end of each work day. Any missing items shall be immediately reported to the proper authorities and to the Engineer.

1.04 SUBMITTALS

A. General: Submit in accordance with Section 01300.

B. Certificates

1. Submit a Certificate of Compliance, together with supporting data, from the materials supplier attesting that the composition analysis of backfill materials meets specification requirements.
2. Compaction Equipment List: Submit a list of all equipment to be utilized for compacting, including the equipment manufacturer's lift thickness limitations.
3. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - a. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
 - b. Laboratory compaction curve according to ASTM D 1557 for each on-site and borrow soil material proposed for fill and backfill.

C. Submit signed and sealed Shop Drawing and Calculations for Sheeting

and Shoring for review and approval of the Engineer. The sheeting and shoring shall be designed by a structural engineer licensed in the State of Maryland who has a minimum of 5-years of experience with the design of similar support of excavation structures. This submittal should also include the Contractor's sequence of construction.

PART 2 - PRODUCTS

2.01 MATERIALS - GENERAL

- A. On site or imported natural soils as approved by Engineer.
- B. Suitable fill material is defined as earth fill or rock fill required materials necessary to raise the grade from an existing elevation or prepared foundation elevation to the finished elevation indicated in the Contract documents. Suitable fill materials shall meet the following:

Site FILL:

- USCS Classification of: CL, ML, CL-ML, SM, SC, SP, SW, GM, GC, GP, or GW
- Free from topsoil, organic matter, debris, cinders, or frozen material
- Total content of gravel or rock fragments larger than ½" shall not exceed 30-percent by weight of the mass

Select FILL:

- USCS Classification of: SM, SC, SP, SW, GC, GP, or GW
- Liquid Limit less than or equal to 40
- Plastic Index less than or equal to 10
- Free from topsoil, organic matter, debris, cinders, or frozen material
- Total content of gravel or rock fragments larger than ½-inch shall not exceed 30-percent by weight of the mass

2.02 PERVIOUS MATERIAL/ SELECT STONE FILL

- A. Compacted stone at locations indicated in the Contract Documents.
- B. Stone shall be granular material and shall comply with AASHTO #57.

2.03 GEOTEXTILE FABRIC

Geotextile fabric, also referred to as filter cloth, is to be installed under and around pervious material, or as directed by the Engineer. The filter cloth shall be placed over the newly exposed subgrade, prior to placement of pervious

material, and shall conform to the following requirements:

Fabric Property	Test Method	Minimum Value
Grab tensile strength	ASTM D4632	300 lb
Grab tensile elongation	ASTM D4632	15%
Trapezoidal tear strength	ASTM D4533	110 lb.
Puncture strength	ASTM D4833	110 lb.
Permittivity	ASTM D4491	0.05 sec ⁻¹
Apparent Opening Size	ASTM D4751	0.15 mm

2.04 SOURCE OF MATERIALS

- A. Use materials for fill which were excavated for the construction of structures or utilities on the project site if they meet the material requirements specified in Section 2.01. If sufficient material meeting these requirements is not available from required excavation, obtain requisite material from other sources.
- B. Use only material which has been approved as to quality, location of source and zone of placement in the fill.
- C. The Engineer has the right to reject material at the job site by visual inspection, pending sampling and testing.

2.05 SHORING MATERIALS

Props, shores, jacks, needles, braces, sheeting, cribbing, tie backs, and similar items of proper size, and in good serviceable condition. Do not use materials that are unsuitable for indicated purposes, or which are severely damaged.

PART 3 - EXECUTION

3.01 PREPARATION AND LAYOUT

- A. Establish and identify required lines, levels, contours and datum.
- B. Maintain bench marks, monuments and other reference points.
- C. Protect trees, shrubs, lawns and other features remaining as portion of final landscaping.
- D. Construct and implement sediment and erosion control procedures including upstream diversions.
- E. Stripped topsoil from the project site should be stockpiled for reuse and temporarily seeded and mulched if not used within seven days and immediately install sediment and erosion protection as required.

3.02 ROUGH GRADING

- A. Rough grade to uniform contours; form foundations for embankments and load bearing fills.
- B. Construct the finished subgrade to vary not more than 1-inch above or below the elevation shown.
- C. Rough grade to prevent ponding of water in any area; install temporary swales if necessary to improve surface drainage.
- D. Complete embankment slopes to vary not more than 6-inches from the slope line shown.
- E. In situ areas indicating sponginess and instability during earth moving operations shall be excavated and prepared to receive acceptable fill materials as specified; material excavated due to unsuitability shall be removed from site.
- F. Excavated subsoil materials to be used for fill materials shall be approved by Engineer; materials rejected by Engineer shall be removed from the site.

3.03 FOUNDATION PREPARATION OF LOAD BEARING AREAS

- A. A load bearing area is defined as an area supporting loads of a structure or pavement area subject to motor traffic.
- B. The entire exposed natural soil of the load bearing area shall be proof-rolled with no less than 5 complete coverages of vibratory compaction equipment (minimum of (1) 10,000-lb. smooth drum roller capable of a combined active and passive pressure of 30,000-lbs); all soft spots or irregularities within the natural soil, disclosed as the proof-rolling progresses, shall be excavated to sound material and then backfilled or leveled to grade as hereinafter specified; Project Engineer shall be so advised by Contractor that additional excavation is necessary to achieve satisfactory proof-rolling; additional excavation required will be paid for by a Change Order.
- C. All backfill shall be compacted to 95% of maximum dry density at $\pm 2\%$ optimum moisture as determined by ASTM D1557 in areas to support floor slabs and footings and within 2(H):1(V) of the building foundation. All other areas should be backfilled to 92% of maximum density at $\pm 2\%$ optimum moisture as determined by ASTM D1557.

3.04 SHORING, SHEETING AND BRACING

- A. The design of sheeting and shoring shall be the responsibility of the Contractor. Responsibility for the performance of shoring methods and devices, including slopes, if any, shall lie entirely with the Contractor. Correction of settlement and damage to persons and property due to settlement shall be the responsibility of the Contractor.

Any damage to persons, property, roads, and utilities, due to settlement, movement, or other conditions caused by inadequate support work, shall be made good by the Contractor as directed by the Engineer at no additional cost to the owner.

- B. Install shoring, sheeting and bracing to comply with Federal, State and local code requirements. Responsibility for the safety of the work, personnel and structures rests solely with the Contractor.
- C. Place bottom of excavation support system deep enough to allow for subsequent excavations of footings, structural elements, and pits, without affecting stability of support system or causing detrimental effect to subgrade of above.
- D. Follow the excavation closely with sheeting and shoring placement.
- E. Perform excavation for the installation of sheeting carefully to minimize the foundation of voids.
- F. If unstable material is encountered during excavation, take measures to contain it in place and prevent ground displacement.
- G. Have sufficient quantity of material on hand at all times for sheeting, shoring, bracing and other operations for the protection of the work and for use in case of accident or emergency.
- H. Leave sheeting and shoring in place as long as possible, compatible with the placing and compacting of backfill.
- I. Optional Methods
 - 1. Change methods of support, if approved by the Engineer, to accommodate unforeseen conditions.
 - 2. Any suggestions that the Contractor may have to expedite work of this Section to promote greater safety, or insure more practical or efficient installation, will be considered for approval.
 - 3. The Contractor shall be responsible for entire work, regardless of methods specified or used. Take practical precautions to insure complete safety and sufficiency of work under this section and of related or adjacent work.

3.05 EXCAVATION - GENERAL

- A. Excavate to the neat lines or setback lines for mixed face conditions and grades indicated on the Contract Drawings. Material excavated will be unclassified.
- B. Excavate in sequence and stages which will not subject permanent or temporary structures, installations, or surfaces to unstable conditions.

- C. Excavate as required to provide sufficient working space to permit placing, inspection, and completion of the structures.
- D. Shape excavations accurately to the cross-sections and grades indicated.
- E. Support the sides of excavations as specified or required.
- F. Keep excavations free from water.
- G. Where excess excavation is required to remove unsuitable material at bottom of foundation or structure excavations, fill to foundation/structure bearing or bottom of pervious material elevation with select stone fill material; properly compact select stone fill by methods acceptable to the Engineer to 95% of the maximum dry density at $\pm 2\%$ of the optimum moisture as determined by modified Proctor test (ASTM D1557).
- H. If rock is exposed at design footing grades, the rock shall be over-cut one foot and replaced with select stone fill.
- I. Fill all openings and fractures in the excavation bottom and sides with cement grout. Obtain Engineer's written approval of the foundation excavation before placing any foundation stone bedding or concrete.
- J. The Contractor's failure to maintain dewatering operations for structure excavations shall not be a basis for payment for removal and replacement of unsuitable materials.

3.06 EXCAVATION WITHIN LOAD BEARING FILL AREAS

- A. After completion of the fill placement and compaction specified under this Specification and as approved by the Project Engineer, footing excavation can begin.
- B. Footing Inspections: The Engineer shall inspect the footing excavations for the building foundations; and shall verify that the design bearing pressures are available and that no loose pockets exist beneath the bearing surfaces of the footing excavations.
- C. Backfilling:
 - 1. Any excavation (such as for utilities, walls, footings, etc.) done within the select fill area shall be backfilled with select fill material with placement and compaction as described in this Section.
 - 2. Where select backfill is placed against walls, either (1) the difference in elevation of the top of the controlled fill on either side of the wall shall not be allowed to exceed 1-foot or (2) the wall shall be adequately braced.

3.08 BACKFILL STRUCTURES

- A. Do not commence backfilling around any structure until such structure

has been examined and approved by the Engineer.

- B. Do not place backfill until the requirements for concrete curing and waterproofing have been complied with and, if required, until the test cylinders for the particular structure indicate that the concrete has attained the compressive strength specified.
- C. When backfilling against structures and where applicable, place backfill material in equal lifts and to similar elevations on opposite sides of structures in order to equalize opposing horizontal pressures. Place material in uniform increments over fill area.
- D. Protect structures from damage by construction activity, equipment, and vehicles. Repair or replace damaged structures to the satisfaction of the Owner.
- E. See Section 3.03.D for compaction.

3.09 BENCHING

When fill is to be placed against the sides of the excavation the slopes on which the fill is to be placed shall be continuously benched at right angles to the ground surface. The benching operation shall be done as the embankment is brought up in layers. Benching shall be a minimum width of 5 feet. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous excavation. Material conforming to backfill requirements cut from the benches shall be compacted along with the new fill material.

3.10 DISPOSAL OF EXCAVATED MATERIAL

Surplus excavated materials shall become the property of the Contractor and be removed from the project site. Surplus excavated materials is defined as: 1. Excess excavated unsuitable materials, and/or 2. Excess excavated suitable materials.

3.11 MOISTURE CONTROL

- A. Control moisture content of fill materials to $\pm 2\%$ of the optimum moisture content as determined by ASTM D1577; material that is too wet may be spread and scarified on the fill surface and permitted to dry, until the moisture content is within specified limits; when fill material is too dry, sprinkle each layer of the fill and work moisture into the material until a uniform distribution within the specified limits is obtained; if, in the opinion of the Project Engineer, the top surface of a partial fill section becomes too dry to permit a suitable bond, scarify loosen the dried surface, dampen the loosened material and compact the moistened material.
- B. Keep the top plane of load bearing fill areas under construction sloped for drainage; when rain or inclement weather is expected, flat roll the top of embankment to seal it.

3.12 SURFACE DRAINAGE

- A. Intercept and divert surface drainage away from the excavation by the use of dikes, curb walls, ditches, pipes, sumps or other means.
- B. Design surface drainage systems so that they do not cause erosion on or off the site, or cause unwanted flow of water.
- C. Remove the surface drainage system when no longer required.
- D. Remove debris and restore the site or sites to original condition.

3.13 DRAINAGE AND DEWATERING OF EXCAVATED AREAS

- A. Dewatering of excavations shall be done in accordance with Section 02140
- B. Provide and maintain ditches to collect surface water and seepage which may enter the excavations and divert.
- C. Dispose of precipitation and subsurface water clear of the work. Comply with provisions of the Sediment and Erosion Control Plan.
- E. Backfill drainage ditches and sumps when no longer required with granular material or other material as approved by the Project Engineer.

3.14 FINISHING

- A. On completion of the work, clean ditches and channels and finish the site in a neat and presentable condition. Slope areas to provide positive drainage.
- B. Place topsoil and seed all areas disturbed by construction as specified in Section 02485, Finish Grading and Seeding, unless otherwise indicated.

3.15 PLACEMENT OF PERVIOUS MATERIAL

- A. Grade pervious material smooth and even, free of voids, compacted, and to required thickness and elevation; provide final grades within a tolerance of ½-inch when tested with a 10-foot straightedge.
- B. Compaction shall continue until all compaction marks are eliminated and the course is thoroughly and properly compacted.
- C. The Geo-textile Fabric shall be placed in accordance with manufacturers specifications.

3.16 TESTING AND INSPECTION

- A. Inspect and test construction of embankments, fills, backfill, and

subgrades and certify to the Owner conformance in all particulars relating to specification requirements.

B. Scheduling

1. Inspection Agency shall be on site at all times when operations are scheduled and no Earthwork will be permitted in their absence.
2. Contractor to provide at least 48-hours notice of scheduled work.

C. Responsibility of Inspection Agency

1. Certification of subgrade preparation and suitability.
2. Moisture content and field density test on all layers of material placed.
3. Certification of degree of compaction attained in material placed.
4. Verification of subgrade capacity.
5. Approval of all materials used.

D. Make results available to the Owner and the Engineer within 24-hours upon completion of testing.

E. Prior to final payment to the Contractor, the Inspection Agency shall certify that all Work has been performed in accordance with the Specifications.

END OF SECTION 02300

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SECTION 02310

SITE GRADING

PART 1 - GENERAL

1.01 RELATED WORK

- A. Roadway Excavation, Backfill and Compaction
- B. Finish Grading
- C. Definitions:
 - 1. Subgrade: Prepared earth surfaces on or over which additional materials will be placed or work is to be performed.

1.02 JOB CONDITIONS

- A. Classification of Excavated Materials: No consideration will be given to the nature of materials encountered in site grading operations. Therefore, as unclassified excavation, no additional payment will be made for difficulties occurring in excavating and handling of materials.
- B. Environmental Requirements:
 - 1. Do not perform grading when soil or weather conditions are unsuitable. Unsuitable conditions include moisture saturated or frozen in place soil and precipitation of any kind present on the soil or occurring during the Work.
 - 2. Exercise the necessary means and methods to control dust on the site as well as in the off-site work areas where excavation and grading are required.
 - 3. Do not leave the site in a dusty condition following the work of this Section. If necessary, employ a watering schedule to control the dust.
 - 4. Do not use-frozen material in performing the work or place materials on frozen surfaces.
 - 5. When it is necessary to haul soft or wet soil material over roadways, use suitable tight vehicles to prevent spillage. Clear away spillage of materials on roadways caused by hauling at no expense to the Owner. Dewatering of such material prior to hauling over roadways may be necessary.
 - 6. Plan work so as to provide adequate protection during storms with provisions available at all times for preventing flood damage.

- C. Protection: Assume all risks attending the presence or proximity of overhead or underground public utility and private lines, pipes, conduits and support work for same, also existing structures and property of whatever nature, in or over excavations or adjacent to such excavations. Complete responsibility for replacement and restitution work of whatever nature to the above, as damaged or destroyed by work of this Contract, rests solely with the Contractor and at no expense to the Owner.
1. Outside Limit of Work: Take necessary precautions to protect trees, shrubs, lawns and such other landscaping from damage. Restitution work for damages rests solely with the Contractor and at no expense to the Owner.
 2. Temporary Protective Construction: Erect and maintain at Contractor's expense substantial barricades to exclude pedestrians or vehicles, as necessary to protect the public.
- D. Accommodation of Traffic: Do not obstruct streets, roads and highways, unless the Engineer authorizes in writing the complete closing of the street, road or highway. Employ such measures, at no expense to the Owner, as may be necessary to keep the street, road or highway open and safe for traffic. Maintain a straight and continuous passageway on sidewalks and over crosswalks, at least three feet wide and free from obstructions.
- E. Explosives and Blasting are not permitted in performance of site grading work.
- F. Excess Materials: No right of property in materials is granted the Contractor of excess on site materials prior to completion of Site Work. This provision does not relieve the Contractor of his responsibility to remove surplus excavated materials. Unsuitable material such as sod, trash, rubbish, stumps and spongy soil as well as excess rock shall become the property of the Contractor and shall be disposed of legally off-site. Excess suitable materials shall be stockpiled on site where directed by the Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Backfill: On-site excavated soil or soil-rock mixed materials free of topsoil, plant life, lumber, metal, refuse and rock or similar hard objects larger than six inches in any dimension.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Salvaged Topsoil: Within the areas indicated for grading strip turf and topsoil to the depth of suitable topsoil material and stock pile for subsequent topsoiling operations.
 - 1. Topsoiling: Performed as work of Finish Grading as specified in this Division.
- B. Stockpiling: Place topsoil storage piles within the limits of the project, on well-drained land and at locations not interfering with the prosecution of Work. Storage piles of topsoil shall be temporarily seeded and mulched if stored for longer than seven days.

3.02 PERFORMANCE

- A. Erosion Control: Implement erosion control measures during performance of work of this Section as specified and required by the Contract Documents and the State of Maryland whether explicitly shown on plans or not.
- B. Overlot Grading: Perform rough grading over the site within the areas to be graded as indicated on the Drawings.
 - 1. Topsoiled areas: Not more than 0.15 feet above or below indicated grade less specified topsoil depths.
- C. Vehicle Traffic Area Grading: As specified in Roadway Excavation, Backfill and Compaction.

3.03 FIELD QUALITY CONTROL

- A. Surface Tolerance: Check finished subgrade for smoothness and elevation in accordance with the following:
 - 1. Use an approved template shaped to conform to the design requirement indicated on the Drawings for checking crown and contour of roadways.
 - 2. Use an approved ten-foot straightedge to check for longitudinal irregularities in the subgrade.
 - 3. Use string lines for controlling the finished elevation of roadway subgrade. Maintain such lines until surface irregularities have been satisfactorily corrected.

END OF SECTION 02310

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SECTION 02311

FINISH GRADING AND SEEDING

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The Work of This Section Includes, But Is Not Limited To
 - 1. Placing topsoil
 - 2. Soil conditioning
 - 3. Finish grading
 - 4. Seeding
 - 5. Maintenance
 - 6. Termite Control
- B. The “Seeding Restoration Table” shown on the Contract Drawings lists specified seeding restoration requirements.
- C. Related Work Specified Elsewhere
 - 1. Section 02230 - Clearing and Grubbing
 - 2. Section 02300 - Earthwork
 - 3. Section 02315 - Trenching, Backfilling & Compacting

1.01 QUALITY ASSURANCE

- A. Source Quality Control:
 - 1. Packaged Products shall indicate the manufacturer's guaranteed analysis on each package and arrive on site as originally packaged and unopened.

1.03 REFERENCES

- A. American Society for Testing and Materials, ASTM C 602, Specification for Agricultural Liming Materials.
- B. American Association of State Highways and Transportation Officials, AASHTO M 140, Emulsified Asphalt.

1.04 SUBMITTALS

- A. Test Reports: Submit laboratory test reports of the soil analysis and supplement recommendations to the Engineer for approval prior to adding any soil supplements to the topsoil.
 - 1. Laboratory reports shall recommend both grade and application rates of fertilizer and such other soil supplements as required.
 - 2. Take sufficient quantity of topsoil samples to give a representative analysis of on-site topsoil and topsoil from outside sources, if any.
- B. Soil Supplement Product Certification: Submit certificates certifying such products to have a guaranteed analysis in conformity with the Engineer approved laboratory soil supplement recommendations report.
- C. Seed Certification: Submit certificates or certifying tags indicating lawn seed mixture, seed purity percentage, seed germination percentage and weed seed content percentage to certify conformity with the Specifications.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver packaged products to the site in unopened containers with labels intact and legible.
- B. Store packaged products in such a manner to prevent moisture damage and other forms of contamination.

1.06 SITE CONDITIONS

- A. Environmental Requirements: Do not perform Work of this Section when soil or weather conditions are unsuitable. Unsuitable conditions include moisture saturated or frozen in place soil and precipitation present or occurring during the Work.
- B. Seeding Dates: The following dates shall govern except when environmental conditions warrant, the Engineer may extend the seeding dates.
 - 1. Spring: March first to June first.
 - 2. Fall: August first to October first.
- C. Existing Conditions: Following performance of related construction and prior to Finish Grading do such debris removal and site leveling as necessary in preparation for Finish Grading. Dispose of such debris in a lawful manner off site.
- D. Dust Control: Exercise the necessary means and methods to control dust on the site as well as in the off-site work areas where Top-soiling and Finish Grading are required.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Topsoil: Use fertile, friable, natural, productive surface soil such as is available on site. Use topsoil free of subsoil, clay, stones or similar hard objects larger than two inches in greatest dimension and partially disintegrated debris and materials toxic or harmful to growth.

2.02 SOIL SUPPLEMENT MATERIALS

- A. Agricultural Liming Materials: Products containing calcium and magnesium compounds capable of neutralizing soil acidity and containing not less than 80 percent of total carbonates. Use liming materials meeting requirements of ASTM Designation C602 and conforming to applicable state liming material regulations.
- B. Fertilizer: Commercial fertilizer of uniform composition, free-flowing and in conformity with applicable state fertilizer laws.
 - 1. Analysis: As recommended by laboratory soil supplement recommendations report.

2.03 LAWN AND SEED MATERIALS

A. Grass Seed: New crop seed, furnished in sealed packages with proof of correct mixture evidenced, age of seed indicated and compliance with applicable state regulations evidenced if required.

B. Mixture No. 1:

<u>Species in Mix</u>	<u>Mix Percent by Weight</u>	<u>Min Purity</u>	<u>Percent Germination</u>	<u>Max Percent Weed Seed</u>
Red Fescue (Festuca rubra) (Illahoe strain)	30	95	85	0.50
Kentucky Bluegrass (Poa pratensis)	50	85	80	0.40
Red Top (Agrostis alba)	3	90	90	0.75
Perennial Ryegrass (Lolium perenne)	17	90	90	0.50

C. Lawn Mulch: Straw Stalks of any threshed grain or tall hay grass stalks free from seed bearing stalks or roots harmful to lawn growth. Mulch material containing noxious weeds, decomposed material or brittle weed

material is not acceptable.

- D. Mulch Binder: Emulsified asphalt conforming to the requirements of AASHTO M 140, Grade RS-1 and which does not contain solvents or other diluting agent's toxic to plant life.

2.04 FERTILIZER

- A. Liquid formulations may be used in lieu of dry formulations, provided the rate of application is adjusted to apply the same quantities of nitrogen, phosphorus and potassium per unit area as specified for dry formulations.
- B. Contractor may submit soils samples to an approved laboratory for fertilizing recommendations.

2.05 LIME

Apply lime in accordance with manufacturer's rate table or soil sample analysis.

2.06 INOCULANT

- A. Inoculate leguminous seed before seeding with nitrogen fixing bacteria culture prepared specifically for the species.
- B. Do not use inoculant later than the date indicated by the manufacturer.
- C. Protect inoculated seed from prolonged exposure to sunlight prior to sowing.
- D. Reinoculate seed not sown within 24 hours following initial inoculation.

2.07 EROSION CONTROL FABRIC

- A. Shall be a knitted construction of yarn with uniform openings interwoven with strips of biodegradable paper, furnished in rolls with 4-mil opaque polyethylene base as protection for outdoor storage.
- B. Fabric 0.2 pound per square yard.

2.08 JUTE MATTING

Shall be heavy weight, minimum 0.9 pound per square yard, jute mesh with 1" opening.

2.09 FABRIC/MATTING ANCHORS

Staples for fastening fabric to ground shall be minimum 11-gauge wire, "U" shaped, with a 1" crown and 6" legs.

2.10 MULCHING MATERIALS

- A. Mulches for seeded areas shall be one, or a combination, of the following:
1. Timothy hay or mixed clover and timothy hay, or wheat, or oat straw; thoroughly threshed.
 - a. Cured to less than 20% moisture content by weight.
 - b. Containing no stems of tobacco, soybeans, or other coarse or woody material, free of mature seed bearing stalks or roots of prohibited or noxious weeds.
 2. Wood Cellulose
 - a. Containing no growth or germination-inhibiting substances.
 - b. Green-dyed and air-dried.
 - c. Packages not exceeding 100 pounds.
 - d. Moisture Content: $12\% \pm 3\%$
 - e. Organic Matter (Dry oven basis) $98.6\% \pm 0.2\%$
 - f. Ash Content: $1.4\% \pm 0.2\%$
 - g. Minimum Water-Holding Capacity: 100%
 3. Mushroom Manure:
 - a. Organic origin, free of foreign material larger than 2" and substances toxic to plant growth.
 - b. Organic Matter: 20% minimum
 - c. Water-Holding Capacity: 120% minimum
 - d. pH: 6.0
- B. Mulch Binders
1. Emulsified Asphalt AASHTO M140, Grade SS-1.
 2. Cut Back Asphalt AASHTO M81, RC 250.
 3. Nonasphaltic Emulsion - Natural Vegetable Gum Blended with Gelling and Hardening Agents
 4. Polyvinyl Acetate Emulsion Resin, Containing 60% ($\pm 1\%$) total Solids by Weight.

2.11 SOIL TREATMENT MATERIALS

A. Chemicals

1. Soil treatment chemicals shall be one of the following:
 - a. Dursban TC: To be used at a concentration of 1.0%, applied in water emulsion.
 - b. Dragnet TC: To be used at a concentration of 0.5%, applied in water emulsion.
 - c. Pryfon 6: To be used at a concentration of 0.75% applied in water emulsion.
2. Soil treatment chemicals used shall be mixed in the following proportions:
 - a. Dursban TC: 1.0% water emulsion, 2 gallons of Dursban TC per 98 gallons of water.
 - b. Dragnet TC: 0.5% water emulsion, 1.25 gallons of Dragnet TC per 98.75 gallons of water.
 - c. Pryfon 6: 0.75% water emulsion, 1 gallon of Pryfon 6 with 96 gallons of water.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Prepare subsoil surface for finish grading by dressing and shaping to provide for the uniform placement of topsoil.
- B. Prepare subsoil surface for top-soiling by loosening to a depth of four inches and dressing and shaping to provide for the uniform placement of topsoil.
- C. Remove surface rock or other foreign objects exceeding 3/4 - inches in greatest dimension. Dispose of such rock and debris in a lawful manner off site.

3.02 PERFORMANCE

- A. Placement: Place topsoil over areas indicated for new grading contours. However, before topsoil placement, construction work in top-soiled areas shall have been completed. Observe precautions as follows:
 1. Do not place topsoil over areas indicated to receive paving or walkways.
 2. Do not work topsoil while frozen or wet. Do not work topsoil in a dusting condition but moisten same to prevent a dust nuisance.
 3. Scarify subsoil to a depth of two inches for bonding topsoil with

subsoil.

4. On sloped areas, work topsoil into subsoil to blend so as to eliminate slip-planing between the two soils; but leave a sufficient cover of topsoil to insure seed germination. Perform such blending of soils by ridging or serrating the subsoil on the slopes.
 5. Place topsoil as needed for dressing-up minor depressions due to settling and erosion and to eliminate other minor irregularities.
- B. Finished Elevations and Lines: Grade top-soiled areas of the site to within a tolerance of plus or minus one-tenth of a foot of the elevations and lines indicated and in accordance with the following:
1. Grade a uniform longitudinal fall in swales and other surface drainage areas to provide a drainage flow line that can easily be maintained and traversed with normal lawn maintenance equipment.
 3. Establish finish grade of topsoil 1/2 to 3/4 inch below top of abutting walks or paving to provide positive drainage of same.
 4. Do not finish grade topsoil to a depth less than six inches nor greater than 12 inches.
 5. Leave finish grade surfaces free of objectionable material larger than 3/4 - inches in greatest dimension. Dispose of such objectionable material in a legal disposal area off site.
- C. Compaction: Compact finish grades as the final operation using a light roller weighing not over 120 pounds per foot-width of roller.
- D. Tillage: Till finish graded soil over areas indicated for lawn regardless of type of lawn work performed. Use equipment and methods common to such work, and till soil to a two-inch depth minimum.
- E. Soil Supplement Addition: The soil supplements for lawn areas, as required according to the Engineer approved laboratory test reports, may be incorporated into the soil during tillage operations.
- F. Seeding: Sow seed mixtures when air current is low and not more than five days after soil supplements have been applied. Sow seeds in two applications using either mechanical power seeders or mechanical hand seeders. Sow one-half of the seed mixture in one direction over designated areas and the remainder at right angles to the first sowing. Seeding rates as follows:
1. Grass Seed Mixture: Five pounds per 1,000 sq. ft. area.
- G. Seed Cover: Imbed seed mixtures into topsoil 1/4 inch using a light drag

or rake and moving in directions parallel to the contour lines. Immediately after dragging or raking, compact seeded areas using a cultipacker or similar design lawn roller, weighing 60 to 90 pounds per linear foot of roller, and roll at right angles to existing slopes.

- H. Contractor Option: Seeding and soil supplement application may be performed by the hydroseeding method. However, rates of application, methods and equipment shall receive Engineer's prior approval.
- I. Lawn Mulching: Evenly apply mulch over seeded areas not more than 48 hours after seeding. Start mulching at windward side of relatively flat areas, or at the upper part of slopes. Spread mulch in a total coverage at a depth not less than 1-1/2 inches nor more than three inches.
- I. Mulch Binding: Immediately following mulch spreading, apply mulch binder to anchor mulch to the soil. The number of passes over the mulch as needed to secure it firmly shall not exceed three passes with maximum applied binder not exceeding 10.0 gallons per 1,000 square feet.

3.03 MAINTENANCE

- A. Maintenance operations shall begin immediately after seeding and shall continue throughout the construction time and guarantee period.
 - 1. Seeded Areas: Keep seed moist continually for proper germination and water thereafter as necessary to prevent drying out or burning. Reseed areas not showing a prompt catch of grass, correct depressions and irregularities and reseed; repeat until a complete coverage is obtained. Cut seeded areas at required intervals to maintain grass at a maximum height of 2 1/2 inches.
- B. At conclusion of maintenance period, the Engineer shall make an inspection of the lawn work to determine condition of acceptance. Make such additional repairs as required by the Engineer. Perform such work at no expense to the Owner.

END OF SECTION 02311

SECTION 02370

EROSION CONTROL DURING CONSTRUCTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. General

Drawings and general provisions of the Contract, including General and Supplementary conditions and Division 1 specification sections, apply to this section.

B. Referenced Sections

1. Section 02311 – Finish Grading and Seeding.

1.02 DESCRIPTION OF WORK

The contractor shall provide the soil erosion controls as specified herein. The cost of all erosion control measures shall be included in the appropriate Bid Items described in the Prices to Include. The Owner shall be responsible for obtaining the necessary NPDES Permit(s) for construction of the erosion and sediment control during construction. Contractor is responsible for securing and permitting off-site waste and borrow areas.

1.03 QUALITY ASSURANCE

A. Scheduling

Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise temporary erosion control measures will be required between successive construction stages. These erosion control measures shall be maintained in effective operating condition during construction until final grading and seeding occurs. Special attention must be given to dewatering activities to minimize release of silt-laden water off-site. The sediment free flows shall only be released into storm sewers, stream channels, or other stabilized drainage receptors and not onto exposed soils or any other site where flows could cause further erosion.

B. Dust Control.

Dust generation shall be minimized, including wetting down of paved and unpaved areas during the construction activities.

C. Operation Limits

The Engineer will delineate the area of excavation and backfilling operations in progress commensurate with the Contractor's capability and progress in keeping the finished grading, mulching, seeding, and other such temporary or permanent control measures current in accordance with the specifications. Should seasonal limitations make permanent control measures unrealistic, temporary erosion control measures including seeding and mulching shall be taken immediately. Surplus excavated material and equipment storage is prohibited within 200 feet of any stream bank, in wooded areas, or in other environmentally sensitive areas. Surplus excavated materials shall be disposed of at site approved by the Owner.

D. Site containment

Site access will be limited and protected by the Contractor to prevent off-site tracking of soil and sediment by construction traffic. Any off-site tracking of soil and sediment will be cleaned up immediately to prevent any sedimentation escaping off-site.

E. Conflicts

1. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal or State or local agencies, the more restrictive laws, rules, or regulations shall apply.
2. Notes or specific requirements listed on plans shall govern if more restrictive than these specifications.

F. Reference Standards

1. MDE – Maryland Department of the Environment
2. SHA – Maryland State Highway Administration
3. Soil Conservation Service (Natural Resources Conservation Service)
4. Garrett County Department of Planning and Land Development

1.04 SUBMITTALS

Submit in accordance with Specification 01300.

1.05 JOB CONDITIONS

A. General

The contractor shall limit the surface area of erodible earth material

exposed by the clearing and grubbing, excavation, and backfill operations and provide permanent or temporary control measures to prevent contamination of adjacent streams or other water courses, lakes, ponds, or other areas of water impoundment. Such work will involve the use of temporary and/or permanent mulches, mats, seeding or other control and contain devices or methods necessary to control erosion and sedimentation. If work is suspended for any reason, the Contractor shall maintain the soil erosion and sedimentation controls in good operating condition during the suspension of the work. Also, when the suspension of work is expected to exceed a period of 7 days, the Contractor shall temporarily seed, fertilize, and mulch all disturbed areas left exposed when the work is stopped.

B. Permanent Erosion control

The Contractor shall incorporate all permanent erosion control features into the project at the earliest practicable time. Except where future construction operations will damage slopes, the Contractor shall perform the permanent fertilizing, seeding and mulching as soon as substantial areas can be made available. This will require the establishing of final grades and application of fertilizer, seeding and mulching. No areas where construction is completed shall be left for longer than 7 days without, as a minimum, temporary fertilizer seeding and mulching. Any disturbed area that will not be actively under construction for a period of 7 days or more shall be temporarily stabilized immediately by fertilizer, seeding and mulching.

1.06 DELIVERY, STORAGE, AND HANDLING

NOT USED

1.07 SPECIAL WARRANTY

NOT USED

PART 2 - PRODUCTS

2.01 FERTILIZER, SEED AND MULCH

All products utilized for erosion control purposes shall be provided in accordance with the requirements of specifications.

PART 3 - EXECUTION

3.01 FERTILIZER, SEED AND MULCH

All erosion control work shall be executed in accordance with specifications.

3.02 SEDIMENT BARRIERS

A. Filter Barriers (FB)

The filter barrier may be constructed using burlap or standard strength synthetic filter fabric. It is designed for low or moderate flows not exceeding 1 cfs.

1. The height of a filter barrier shall be a minimum of 15 inches and shall not exceed 18 inches.
2. Burlap or standard strength synthetic filter fabric shall be purchased in a continuous roll and cut to the length of the barrier to avoid the use of joints (and thus improve the strength and efficiency of the barrier).
3. The stakes shall be spaced a maximum of 3 feet apart at the barrier location and driven securely into the ground (minimum of 8 inches).
4. A trench shall be excavated approximately 4 inches wide and 4 inches deep along the line of stakes and upslope from the barrier.
5. The filter material shall be stapled to the wooden stakes, and 8 inches of the fabric shall be extended into the trench. Heavy-duty wire staples at least 1/2 inch shall be used. Filter material shall not be stapled to existing trees.
6. The trench shall be backfilled and the soil compacted over the filter material.
7. If a filter barrier is to be constructed across a ditch line or swale, the barrier shall be of sufficient length to eliminate end flow, and the plan configuration shall resemble an arc or horseshoe with the ends oriented upslope.
8. Filter barriers shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

B. Silt Fence (SF)

The silt fence uses a standard strength or extra strength synthetic filter fabrics. It is designed for situations in which only sheet or overland flows are expected.

1. The height of a silt fence shall not exceed 36 inches (higher fences may impound volumes of water sufficient to cause failure

of the structure).

2. The filter fabric shall be purchased in a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are necessary, filter cloth shall be spliced together only at a support post, with a minimum 6-inch overlap, and securely sealed.
3. Posts shall be spaced a minimum of 10 feet apart at the barrier location and driven securely into the ground (minimum of 12 inches). When extra strength fabric is used without the wire support fence, post spacing shall not exceed 6 feet.
4. A trench shall be excavated approximately 4 inches wide and 4 inches deep along the line of posts and upslope from the barrier.
5. When standard strength filter fabric is used, a wire mesh support fence shall be fastened securely to the upslope side of the posts using heavy duty wire staples at least 1 inch line, tie wires or hog rings. The wire shall extend into the trench a minimum of 2 inches and shall not extend more that 36 inches above the original ground surface.
6. The standard strength filter fabric shall be stapled or wired to the fence, and 8 inches of the fabric shall be extended into the trench. The fabric shall not extend more than 36 inches above the original ground surface. Filter fabric shall not be stapled to existing trees.
7. When extra strength filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated. In such a case, the filter fabric is stapled or wired directly to the posts with all other provisions of item No. 6 applying.
8. The trench shall be backfilled and soil compacted over the filter fabric.
9. Silt fences shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

C. Maintenance

1. Silt fences and filter barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.
2. Should the fabric on a silt fence or filter barrier decompose or become ineffective prior to the end of the expected useable life and the barrier is still necessary, the fabric shall be replaced promptly.

3. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.
4. Any sediment deposit remaining in place after the silt fence or filter barrier is no longer required shall be dressed to conform with the existing grade, prepared and seeded.

3.03 MATTING

Matting shall be provided on all final slopes 3:1 or greater and bottom of drainage ditches.

3.04 TOP SOIL STOCKPILES

The Contractor may stockpile topsoil in accordance with these plans and specifications. The Contractor shall provide temporary drainage diversion of runoff around the stockpile to control soil erosion and in accordance with MDSHA Standard Construction Drawings. Stockpiled topsoil shall be protected through the use of temporary seeding and mulching or covering such as with anchored straw mulch. Silt barriers shall be installed down gradient of these areas on contour and with their ends up slope of the contour to prevent silt-laden runoff from entering waterways or storm sewers. Within 7 days of completion of construction, any remaining soil shall either be removed or permanently stabilized.

3.05 STREAM BANKS

If construction results in the disturbance of a stream bank, it shall be restored, graded, seeded and mulched in accordance with the specifications immediately upon completion of the work crossing the stream.

END OF SECTION 02370

SECTION 02600

PAVING AND SURFACING

PART 1 - GENERAL

- A. The work to be performed under this section includes, but is not limited to, the furnishing of all materials, labor, tools and equipment necessary to construct all of the various items of pavement as indicated on the Contract Drawings and specified herein.

PART 2 - PRODUCTS

- A. The following table details the recommended flexible and rigid pavement sections.

Table 1.1 – Pavement Sections		
Flexible Pavement (Travel Lanes)	2.0-inches HMA Superpave 12.5 mm, PG76-22	Compaction Level 1
	3.0-inches HMA Superpave 19 mm, PG64-22	Compaction Level 1
	12.0-inches Geosynthetic Stabilized Aggregate Base (GSSA)	
Rigid Pavement (Parking Pads and Loading Docks)	7-inches Plain Cement Concrete Pavement (SHA Mix 6 air entrained)	
	12.0-inches GSSA	

PART 3 - EXECUTION

- A. Topsoil, other organic materials, frozen, wet, soft or loose soils, and other deleterious materials should be removed and wasted prior to pavement construction. These stripping operations should be performed in a manner consistent with good erosion and sediment control practices.
- B. After stripping, the area should be proofrolled with a heavily-loaded (15-20 ton) dump truck or another pneumatic-tired vehicle of similar size and weight. The purpose of the proofrolling is to provide surficial densification and to locate any isolated areas of soft or loose soils. A geotechnical engineer licensed in the State of Maryland or an engineering technician under the supervision of such an engineer should witness the stripping and proofrolling operations.
- C. Unsuitable areas should be undercut a minimum of 1-foot, lined with a separation fabric and backfilled with Graded Aggregate Base (GAB), having a maximum dry density of at least 105-pcf in accordance with the modified Proctor test method ASTM D-1557. In accordance with Section 204.03.04 of the Maryland Department of Transportation, State Highway Administration, Standard Specifications for Construction and Materials, dated January 2001.

- D. Fill and backfill should be placed in horizontal, eight-inch maximum loose lifts and compacted to at least 92 percent of the modified Proctor maximum dry density ASTM D-1557 and the uppermost one-foot (after compaction) should be compacted to 100-percent of the maximum dry density. In accordance with Section 204.03.04 of the Maryland Department of Transportation, State Highway Administration, Standard Specifications for Construction and Materials, dated January 2001.
- E. The thickness of the GSSA is measured after compaction. GSSA should be thoroughly compacted to the recommended density as specified in Section 204.03.04 of the Maryland Department of Transportation, State Highway Administration, Standard Specifications for Construction and Materials, dated January 2001, and provided with a means of positive drainage such as stub drains or edge drains to inlets. The indicated sections are developed for post construction use. Construction traffic is often much heavier than in-service traffic.
- F. The in situ CBR value should be determined prior to placing the pavements to verify the design CBR value of 3.0. The in situ CBR can be verified using the Clegg Impact Hammer or the field CBR procedure.

END OF SECTION 02600

SECTION 02800

LANDSCAPING

Delete Specification Sections 02820 - TURF ESTABLISHMENT, and 02860 - FURNISH AND PLANT TREES, SHRUBS, VINES, GROUNDCOVERS AND SEEDLING STOCK from the Anne Arundel County Standard Specifications and replace with the following:

02800.01 GENERAL

A. Description

1. This division includes the requirements for topsoiling, seeding and mulching, sodding, shrubs, trees and miscellaneous other related work.

B. Areas Requiring Seeding or Sodding

1. All areas that have been disturbed or damaged by construction operations, with the exception of areas to be sodded, shall be seeded and mulched to provide a dense, uniform and healthy stand of grass, unless otherwise directed by the Engineer. Tack coat mulch over seeded areas.
2. Surface drainage ditches that have been disturbed or damaged by construction operations shall be re-shaped and sodded to one foot beyond the top of the ditch.

C. Quality Assurance

1. Ship landscape materials with certificates of inspection as required by government authorities. Comply with governing regulations applicable to landscape materials.
2. Do not make substitutions. If specified landscape material is not obtainable, submit to Engineer proof of non-availability and proposal for use of equivalent material. When authorized, adjustment of Contract amount will be made.
3. Package standard products with manufacturer's certified analysis.
4. Seed shall be certified by the Maryland State Board of Agriculture and shall conform to requirements of Maryland Turf Grass Law and Regulations, Publication No. 41.

D. Submittals

1. Submit certificates of compliance for seed material stating mixture percentages of species, purity, germination, weed seed.
2. Submit certificates of compliance for sod.
3. Submit certificates of compliance for shrubs.

4. Submit certificates of compliance for trees.
5. Submit certificates of compliance for soil amendments.

E. Product Delivery, Storage and Handling

1. Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery, and while stored at the site.

F. Guarantee

1. Guarantee landscaping work through the specified maintenance period until final acceptance.

G. Job Conditions

1. Examine the subgrade, verify the elevations, observe the conditions under which work is to be performed, and notify Engineer of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected.
2. Proceed with and complete the landscape work as rapidly as portions of the site become available, working within the seasonal limitations for each kind of landscape work required.
3. Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required, to minimize possibility of damage to underground utilities.
4. Plant or install materials during normal planting seasons for each type of landscape work required. Correlate planting with specified maintenance periods to provide maintenance until occupancy by the Owner.

H. Tree and Shrub Replacement

1. Replace trees and shrubs on developed property disturbed by construction activities that are dead, weakened, diseased or damaged.
2. Replacement trees and shrubs shall be the same type and size as those that require replacement due to construction activities.
3. Replacement trees and shrubs shall be at the Contractor's expense.

02800.02 MATERIALS

A. Soil Amendments

1. Lime
 - a. Lime shall be natural dolomitic limestone containing not less than 85 percent of total carbonates, ground so that not less than 90 percent passes a 10 mesh sieve and not less than 50 percent passes a 100 mesh sieve.

2. Fertilizer

- a. Fertilizer shall be a commercial fertilizer, uniform in composition, free flowing, of neutral character with less than 5% phosphorous content. Fertilizer shall be delivered to the site fully labeled according to applicable state fertilizer laws and shall bear the name, trade name or trademark and warranty of the manufacturer. Fertilizer shall be supplied with the percentage of total nitrogen, available phosphoric acid and total potash as indicated for specific applications as specified hereinafter.

3. Peat Moss

- a. Peat moss shall be a sphagnum peat moss and shall be free from woody substances.

B. Grass Materials

1. Seed shall be fresh, clean, new crop grass seed complying with the tolerance purity and germination established by the Official Seed Analysts of North America. Provide seed of the grass species, proportions and minimum percentage of purity and germination, and maximum percentage of weed seed, as specified.
2. The following seed mixtures shall be used for all areas to be seeded except as otherwise noted:
 - a. General Turf Areas (Fertilized and mowed on a regular basis): Home lawns, Commercial sites, Parks, Playgrounds.
 - i. Kentucky Bluegrass - Full sun mixture - For use in areas that receive intensive management. Irrigation required.
 - a. Recommended Certified Kentucky Bluegrass Cultivars** 100%
 - b. Seeding Rate: 1.5 to 2.0 pounds/1,000 square feet

** A minimum of three bluegrass cultivars should be chosen ranging from a minimum of 10% to a maximum of 35% of the mixture by weight.
 - ii. Kentucky Bluegrass/Perennial Rye - Full sun mixture - For use in full sun areas where rapid establishment is necessary and when turf will receive medium to intensive management.
 - a. Certified Perennial Ryegrass Cultivars 10-15%
 - b. Certified Kentucky Bluegrass* 85-90%
 - c. Seeding Rate: 2 pounds mixture/1,000 square feet.
 - d. A minimum of 3 Kentucky bluegrass cultivars must be chosen, with each cultivar ranging from a minimum of 10% to a maximum of 35% of the mixture by weight.

iii. Tall fescue/Kentucky Bluegrass - Full sun mixture - For use in drought prone areas and/or for areas receiving low to medium management in full sun to medium shade.

- a. Certified Tall Fescue Cultivars** 95-100%
- b. Certified Kentucky Bluegrass Cultivars 5-0%
- c. Seeding Rate: 5 to 8 lb. mixture/1,000 square feet.

** One or more cultivars may be blended.

iv. Kentucky Bluegrass/Fine Fescue - Shade Mixture - For use in areas with shade in Bluegrass lawns. For establishment of a high quality, intensively managed turf area.

- a. Certified Kentucky Bluegrass Cultivars* 30-40%
- b. Certified Fine Fescue 60-70%
- c. Seeding Rate: 1 1/2 to 3 lbs/1,000 square feet.

*A minimum of 3 Kentucky bluegrass cultivars must be chosen, with each cultivar ranging from a minimum of 10% to a maximum of 35% of the mixture by weight.

NOTE: Varieties should be selected from those listed in the current University of Maryland publication Agronomy Mimeo #77, "Turfgrass Cultivar Recommendations for Maryland".

b. Rough Areas: Not generally mowed and cannot be prepared with conventional equipment. Hydroseeding will be the normal method of seeding these areas.

i. Level Areas

- March 1 to May 15 50-100% Tall Fescue
- August 1 to November 15 5-25% perennial Ryegrass
- 0-15% Canada Bluegrass
- 0-15% Kentucky Bluegrass (Common Type)
- 0-15% Fine Fescue
- 0-10% Red Top

Seeding Rate: 150 lb/Acre

May 16 to July 30 Add Lovegrass at 2 lb/acre or Foxtail Millet at 10 lb/acre

November 16 to February 28 Add Cereal Rye at 56 lb/acre

ii. Sloped Areas - Add 16 lbs per acre of crown vetch or 20 lb per acre of Sericea Lespedeza. Inoculant should be used at 10 times the manufacturers recommended rate when hydroseeding.

C. Sod

1. Sod shall be Certified or Approved grade as graded by the Maryland State Board of Agriculture and shall conform to Requirements of Maryland Turf Grass Law and Regulations, Publication No. 41. Sod shall be machine cut at a uniform thickness of 3/4- inch \pm 1/4-inch, excluding top growth and thatch. Each individual sod piece shall be strong enough to support its own weight when lifted by the ends. Broken pads, irregularly shaped pieces, and torn or uneven ends will be unacceptable.
2. Sod shall be as follows:
 - a. "Maryland State Approved" Multi-Use Turf Sod
 - b. Tall Fescue: 100% Certified Kentucky 31

D. Screening

1. Overall Design Objectives
 - a. Existing vegetation should be utilized whenever possible.
 - b. A minimum 10-foot planting strip must be maintained on all sides between chain link fence and adjacent property lines or right-of-ways.
 - c. Overall objective is to provide 75% evergreen screening with 25% deciduous trees to provide color and variety.
 - d. Provide screening/landscaping that requires minimal maintenance.
2. Design Requirements
 - a. If 25 feet of dense, existing vegetation can be retained, no additional planting will be required. Existing vegetation and fence will be sufficient for that area. For purposes of these standards, existing vegetation shall include vegetation within the Dewatering Building property lines only.
 - b. If existing vegetation can be retained but is less than 25 feet in depth, clusters of evergreen and deciduous shrubs and ornamental trees must be planted in accordance with percentages stated in Paragraph A.3 and with size and spacing requirements shown on attached "recommended planting list". These plant materials are referenced with this symbol: *.
 - c. For planting strips of 10 feet or less where no existing vegetation remains, a dense evergreen screen must be planted with a mixture of evergreen shrubs and small trees as shown on the attached "recommended planting list". These plant materials are referenced with this symbol: **.
 - d. Plant materials must be installed by a qualified nurseryman, and in accordance with the Landscape Specification Guidelines for the Baltimore - Washington Metropolitan Area. Sample planting details are to be as shown on Dewatering Building Drawings.
 - e. Soil conditions shall be considered when selecting approximate plantings using the

attached list "Recommended Plants for Droughty/Wet Soils".

- f. Landscape plans shall include contour lines, existing vegetation, nearby houses/structures, proposed plantings, utility locations, and provide a planting list.

Recommended Planting for Pumping Stations:

SHRUBS	COMMON NAME	SIZE	SPACING	SOIL
*Abelia Grandiflora	Glossy Abelia	24-30"	4' o.c.	(D)
*Berberis Juliana	Luliana Barberry	24-30"	3' o.c.	(D)
**Euonymus Alatus	Winged Euonymus	24-30"	3' o.c.	(D)
*Euonymus Kiautschovicus	Evergreen Euonymus	24-30"	3' o.c.	(D)
*Ilex Glabra, Nellie R. Stevens	Inkberry Nellie R. Stevens	24-30"	4' o.c.	(W)
*Juniperis C. C. Pfitzeriana	Phitzer Juniper	24-30"	4' o.c.	(D)
*Myrica Pennsylvanica	Northern Bayberry	24-30"	4' o.c.	(W)
**Photinia X. Fraseri	Red Top Photinia	24-30"	4' o.c.	(D)
*Prunus Laurocerasus	Cherry Laurel	24-30"	4' o.c.	(D)
ORNAMENTAL TREES	COMMON NAME	SIZE		SOIL
Acer Ginnala	Amur Maple	1 1/2-1 3/4"	CAL	(D)
Crataegus Phaenopyrum	Washington Hawthorn	1 1/2-1 3/4"	CAL	(D)
Koelruetaria Paniculata	Golden Raintree	1 1/2-1 3/4"	CAL	(D)
Prunus Ceracifera "Thunder Cloud"	Purple Leaf Plum	1 1/2-1 3/4"	CAL	(D)
Prunus Servlatta Kwanzan	Kwanzan Cherry	1 1/2-1 3/4"	CAL	(D)
Pyrus Calleryana "Redspire"	Redspire Pear	1 1/2-1 3/4"	CAL	(D)

EVERGREEN TREES	COMMON NAME	SIZE	SPACING	SOIL
** Cupressocyparis X. Leylandi	Leyland Cypress	4-5'	5' o.c.	(W)
*Ilex X. Attenuata "Foster"	Fosters Holly	4-5'	5' o.c.	(D)
Pinus Strobus	Eastern White Pine	4-5'	10' o.c.	(D)
**Pinus Thunbergiana	Japanese Black Pine	4-5'	8' o.c.	(D)
**Thuja Occidentalis "Nigra"	Dark Green Arborvitae	4-5'	4' o.c.	(W)

Droughty Soils (D) - Those that, at the time of construction, exhibit no moisture cohesion, are friable, low in organic content, and do not retain moisture.

Wet Soils (W) - Those which, at the time of construction, exhibit moisture cohesion, high organic content and due to local topography, are likely to be exposed to seasonal flooding or swampy conditions.

E. Plants & Plant Materials

1. Plants and plant materials shall meet the detailed description as given on the plans and as described herein.
2. All plant material, unless otherwise specified, shall be nursery grown, of good average uniform growth, free from irregularities, typical of the species and variety, well formed, uniformly branched and have a vigorous root system. They shall be healthy, vigorous plants free from defects, decay, disfiguring roots, sunscald injuries, abrasions of the bark, plant disease, insect pest eggs, boxers and all forms of infestations of objectionable disfigurements. Plant materials that are weak or which have been cut back from larger grades to meet certain specified requirements will be rejected. All plants shall be freshly dug: no heeled in plants or plants from cold storage will be acceptable.
3. All plant characteristics including, but not limited to; ball diameter, caliper and height measurements, shall be in accordance with the current edition of the "U.S.A. Standard for Nursery Stock", as recommended by the American Association of Nurserymen, Inc.
4. All trees shall be symmetrically balanced according to their normal habit of growth. No forked leader stock will be accepted.
5. All plants shall be planted within the planting season that shall be defined as September 15 through November 30 and March 1 through May 30.
6. All planting furnished under this contract shall be guaranteed to remain viable and to thrive in a healthy condition for a period of one (1) year. Trees that are not thriving satisfactorily, as determined by the landscape architect, within said one (1) year

period shall be replaced by the Contractor at his sole expense. All plant materials shall be planted in accordance with the plans and specifications for the original plantings. Replacement shall include the cost of tearing up and replacing that portion of sidewalk or paving, if any, required for tree replacement, all at the contractor's sole expense. All replacement plants shall be guaranteed for a minimum period of one (1) year.

7. The contractor shall notify all utility companies five (5) days prior to beginning work.
8. Any damage to the existing utilities, building, paving, curb, walls and vegetation (not so designated for removal on these plans) shall be repaired to previous condition or replaced by the contractor at his expense.
9. All planting beds shall have three inches of medium pine bark mulch placed on top of 4 inches of topsoil.
10. Topsoil shall be free from brush, weeds and other litter; and shall be free from clay lumps, stones, or other objects larger than one inch in diameter, and any other substance that may be harmful to plant growth. Prepared topsoil shall conform to the following specifications:
11. Prepared topsoil for evergreen plants: shall consist of two parts topsoil to one part humus or other approved organic material. Fertilize with 3 lbs. 10-10-10 evergreen (acidic) fertilizer or approved equal per cubic yard of prepared topsoil or as soil test dictates.
12. Prepared topsoil for deciduous plants: shall consist of two parts topsoil, to one part well rotted cow or horse manure. Fertilize with 3 lbs. standard 10- 10-10 fertilizer or approved equal per cubic yard of prepared topsoil or as soil test dictates.
13. After fertilizer application, all plant beds (not individual plant pits) shall be covered with weed barrier fabric installed per manufacturer's specifications. The barrier shall be neatly trimmed at edges to conform to bed configuration. Cut holes to size and location of excavated plant pits.

F. Miscellaneous Landscape Materials

1. Mulch for protection of permanent seeding shall be clean, weed free, unrotted straw.
2. Mulch for tree and shrub planting shall be 100 percent true pine bark ground mulch, with minimum 90 percent organic content, and a white wood content not to exceed 10 percent. Mulch shall be a uniform brown color, with not more than 50 percent capable of passing a 3/4-inch sieve.
3. Soil mix for trees and shrubs shall consist of a mixture of 50 cubic feet of peat moss in 12 cubic yards of topsoil, with no lime added.
4. Binder for straw mulch shall be emulsified asphalt, conforming to the requirements for MSHA Grade SS-1 emulsified asphalt, Table 20.12.11.
5. Soil stabilization netting shall be polypropylene. Netting shall be "Erosion Control Netting",

1.5 x 1.3 strands/inch, mesh opening 5/8-inch by 3/4-inch as manufactured by American Excelsior Company, or equal. Staples for securing soil stabilization matting shall be No. 11 or heavier steel wire bent to form a U shape. Staples shall be one inch wide and minimum six inches long after bending.

6. Weed barrier in planted landscape areas shall be Biobarrier II fabric by Reemay or approved equal, with ten year guarantee.

02800.03 EXECUTION

A. General

1. All seeded areas not covered with soil stabilization netting shall be covered with straw mulch. Mulched areas shall be coated with binder.
2. All seeded areas with a slope of 4:1 or greater shall be covered with soil stabilization netting. Netting shall extend one foot beyond crown of slopes, one foot beyond limit of disturbed area, or one foot beyond 4:1 grade as applicable.

B. Spreading Topsoil

1. All areas to be seeded or sodded shall be covered with four inches of topsoil.
2. Prior to topsoiling and finish grading operations, all rough graded areas shall be corrected, mounds and ridges shall be cut off, gullies and depressions filled, and other necessary repairs performed to enable all surfaces to be brought to the original grades, or, for areas where grading is indicated, to the grades shown on the Drawings, in an even and properly compacted condition.
3. After the area to be topsoiled has been prepared, the surface shall be loosened and made friable by raking or other approved methods, to a full depth of at least two inches to permit blending of topsoil to the subgrade. All stones and debris one inch or more in any dimension shall be raked up and removed from the site.
4. All stockpiled topsoil shall be spread and compacted to a uniform thickness over the areas to be topsoiled. The Contractor shall verify the amount of topsoil previously stockpiled to determine the thickness of the topsoil layer.
5. Topsoil shall not be placed when either the subgrade or the topsoil is wet or frozen enough to cause clodding.
6. The finished surface shall be free of stones, sticks or other material one inch in any dimension, smooth and true to the required grades.

C. Seeding

1. The areas to be seeded shall be cleaned of any rough grass, weeds and debris, with the

ground brought to an even grade and the top four (4) inches of topsoil thoroughly worked into a satisfactory seedbed.

2. Apply dolomitic lime at a rate recommended by USDA for the soil conditions per current soil test.
3. Apply fertilizer of 10-10-10 strength at a rate of 25 pounds per 1,000 square feet, minimum.
4. Thoroughly mix lime and fertilizer into the top four inches of topsoil.
5. Moisten seedbed during periods of high temperature and when directed by the Engineer.
6. Apply seed mixture uniformly with mechanical power driven seeders, mechanical cyclone hand seeders or with hydroseeding equipment. Sow the seed mixture at a rate of 200 pounds per acre, or five pounds per 1,000 square feet, minimum, between March 1 and May 31 and between August 15 and October 31.
7. Rake seed lightly into the top 1/4-inch of topsoil, roll lightly and water using a fine spray.

D. Mulching and Soil Stabilization

1. Immediately after seeding apply mulch to a rate of 70 pounds per 1,000 square feet, minimum, to a loose depth between one and three inches, to all seeded areas not covered with soil stabilization netting.
2. Apply binder over mulch at a rate of 5 gallons per 1,000 square feet on flat areas and slopes no more than 8 feet high. On slopes 8 feet or more in height apply binder at a rate of 8 gallons per 1,000 square feet. Application of binder shall be doubled 4 feet around edges, in valleys and at the crest of slopes to prevent wind from lifting mulch. The remainder of binder application shall be uniform in appearance.
3. The Contractor shall place protective coverings over structures prior to application of binder material. The Contractor shall take every precaution against damaging or disfiguring structures or property on or adjacent to the work. The Contractor shall repair all damage caused by his operations to the satisfaction of the Engineer, at the Contractor's expense.
4. Immediately after seeding, apply soil stabilization netting to all slopes 4:1 and greater that have been seeded. Extend netting to one foot beyond top of slope. Netting shall be rolled in the direction of the flow of water. Strips shall overlap a minimum of four inches. Ends shall overlap a minimum of six inches. The upgrade end of each strip of netting shall be turned down and buried to a depth of six inches, minimum. Overlap with the upgrade section on top. Place staples two feet apart along edges and center of netting strips. At ends of netting, place staples six inches apart. Drive staples vertically into the soil and flush with the surface.

E. Sodding

1. The areas to be sodded shall be cleaned of any rough grass, weeds and debris. Loosen the

subsoil to a depth of four inches. Sod shall be placed on all disturbed areas not to be paved which are: slopes steeper than 3:1, drainage ditches, improved lawn areas, and where shown on the Drawings.

2. Remove stones 1-1/2 inches and larger, clods, brush, roots, trash and other objectionable material from the top four inches of soil.
3. Apply dolomitic lime at a rate of 50 pounds per 1,000 square feet, minimum, to areas to be sodded.
4. Apply fertilizer of 10-10-10 analysis at a rate of 25 pounds per 1,000 square feet, minimum.
5. Thoroughly mix lime and fertilizer into the top four inches of topsoil.
6. Moisten sod bed if dry and when directed by the Engineer.
7. Deliver sod to the site and install sod within 48 hours after being cut.
8. Place sod in straight parallel lines. Stagger lateral joints and butt tight.
9. On slopes 2:1 and greater, stake each strip of sod with at least two stakes or with wire staples.
10. After laying sod, roll, tamp and water until the underside of the sod pad and soil surface beneath it are thoroughly wet and in contact with each other. Rolling, tamping and watering shall be completed within an eight-hour period after laying sod.
11. Sod shall not be laid on frozen ground or when the air temperature is below 32 degrees F. Perform sodding before December 1 and after February 15.

F. Maintenance

1. Begin maintenance immediately after planting, seeding or sodding.
2. Maintain seeded, sodded and planted areas for one full year after installation to produce good stands of grass free from eroded or bare areas, and healthy trees and shrubs, acceptable to the Engineer.
3. Maintain grass areas by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading, replanting, and resodding as required.

G. Cleanup and Protection

1. During landscaping work, store materials and equipment where directed. Keep pavements clean and work area in an orderly condition.
2. Protect landscaping work and materials from damage. Maintain protection during

installation and maintenance periods. Treat, repair or replace damaged landscaping work as directed.

3. Fertilizer spilled on impervious surfaces shall be promptly cleaned up.

H. Inspection and Acceptance

1. When the landscaping work is in progress, the Engineer will, upon request, make inspections to determine acceptability.
2. Where inspected landscaping work does not comply with the requirements, replace rejected work and continue specified maintenance until reinspected by the Engineer and found to be acceptable.

I. Objective

1. The objective of all landscapes is to keep construction and maintenance costs at a minimum, and create an aesthetically pleasing site that will blend in with the surrounding neighbor(s).

END OF SECTION 02800

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
1. Footings.
 2. Foundation walls.
 3. Slabs-on-grade.
 4. Miscellaneous concrete.

1.02 DEFINITIONS

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

1.03 REFERENCED STANDARDS AND SPECIFICATIONS

- A. American Concrete Institute (ACI)
1. 117 Standard Specifications for Tolerances for Concrete Construction and Materials
 2. 201 Guide for Making a Condition Summary of Concrete In Service
 3. 211.1 Recommended Practice for Selecting Proportions for Normal and Heavy Weight Concrete
 4. 214 Recommended Practice for Evaluation of Compression test Results of Field Concrete
 5. 301 Specifications for Structural Concrete for Buildings
 6. 304 Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete
 7. 305R Hot Weather Concreting
 8. 306R Cold Weather Concreting

9. 308 Recommended Practice for Curing Concrete
10. 309 Recommended Practice for Consolidation of Concrete
11. 315 Manual of Standard Practice for Detailing Reinforcing Concrete Structures
12. 318 Building Code Requirements for Reinforced Concrete
13. 347 Recommended Practice for Concrete Formwork
14. 350R Concrete Sanitary Engineering Structures

B. American Society for Testing and Materials (ASTM)

1. A185 Specification for Welded Steel Wire Fabric for Concrete Reinforcement
2. A615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
3. C31 Making and Curing Concrete Test Specimens in the Field
4. C33 Specifications for Concrete Aggregate
5. C39 Test for Compressive Strength of Cylindrical Concrete Specimens
6. C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
7. C88 Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
8. C94 Specification for Ready-Mixed Concrete
9. C138 Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
10. C143 Test for Slump of Portland cement Concrete
11. C150 Specification for Portland cement
12. C171 Specification for Sheet Materials for Curing Concrete
13. C172 Sampling Fresh Concrete
14. C173 Test for Air Content of Freshly Mixed Concrete by the Volumetric Method

15. C231 Test for Air Content of Freshly Mixed Concrete by the Pressure Method
 16. C260 Specification for Air-Entraining Admixtures for Concrete
 17. C309 Specification for Liquid Membrane-forming Compounds for Curing Concrete
 18. C494 Specification for Chemical Admixtures for Concrete
 19. C535 Test for Resistance to Abrasion of Large Size Coarse Aggregate by the Use of the Los Angeles Machine
 20. C881 Specification for Epoxy-Resin-Base Bonding Systems for Concrete
 21. D1752 Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Construction
 22. D2103 Standard Specification for Polyethylene Film and Sheeting
 23. E154 Standard Test Methods for Water Vapor Retarders used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
- C. American Welding Society (AWS)
1. D12.1 Welding Reinforcing Steel Metal Inserts and Connections in Reinforced Concrete Construction
- D. Corps of Engineers
1. CRD C572 Specification for Polyvinyl Chloride Waterstop
- E. American Association Of State Highway and Transportation Officials (AASHTO)
1. M182 Burlap Cloth Made From Jute or Kenaf

1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture in accordance with ACI 350. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar

schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional Engineer detailing fabrication, assembly, and support of formwork.
- E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates.
- F. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Waterstops.
 - 6. Curing compounds.
 - 7. Bonding agents.
 - 8. Adhesives.
 - 9. Vapor barriers.
 - 10. Repair materials.
- G. Field quality-control test and inspection reports.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. 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."

- C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.01 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.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.

- b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spilling of concrete on removal.
- 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.02 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

2.03 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. 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," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.04 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, Type II or Type IIA.
- B. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source
 1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

2.05 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 1. Water-Reducing Admixture: ASTM C 494, Type A.
 2. Retarding Admixture: ASTM C 494, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

Products: (or equal)

- a. Boral Material Technologies, Inc.; Boral BCN.

- b. Euclid Chemical Company (The); Eucon CIA.
- c. Grace Construction Products, W. R. Grace & Co.; DCI.
- d. Master Builders, Inc.; Rheocrete CNI.
- e. Sika Corporation; Sika CNI.

C. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

- 1. Products: (or equal)
 - a. Axim Concrete Technologies; Catexol 1000CI.
 - b. Boral Material Technologies, Inc.; Boral BCN2.
 - c. Cortec Corporation; MCI 2000.
 - d. Grace Construction Products, W. R. Grace & Co.; DCI-S.
 - e. Master Builders, Inc.; Rheocrete 222+.
 - f. Sika Corporation; FerroGard-901.

2.06 WATERSTOPS

- A. Extrudable swelling waterstop, bentonite-free. One component, polyurethane-based.
- B. Retrofit water stop: Polyvinyl Chloride water stop with stainless steel batten bars and stainless steel fasteners for anchoring to the existing structure with the aid of an epoxy gel having 7/16 inch minimum thickness, spacing as required by manufacturer. Retrofit water stop shall be:
 - a. Sika Greenstreak.
 - b. JP Specialties, Inc.
 - c. Or approved equal.

2.07 VAPOR BARRIERS

- A. Polyethylene sheet not less than 10 mils thick. ASTM D2103.

2.08 CURING MATERIALS

- A. Evaporation Retarder

1. Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
2. Products (or equal)
 - a. Axim Concrete Technologies; Cimfilm.
 - b. Burke by Edoco; BurkeFilm.
 - c. ChemMasters; Spray-Film.
 - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film.
 - f. Euclid Chemical Company (The); Eucobar.
 - g. Kaufman Products, Inc.; Vapor Aid.
 - h. Lambert Corporation; Lambco Skin.
 - i. L&M Construction Chemicals, Inc.; E-Con.
 - j. MBT Protection and Repair, Div. of ChemRex; Confilm.
 - k. Meadows, W. R., Inc.; Sealtight Evapre.
 - l. Metalcrete Industries; Waterhold.
 - m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
 - n. Sika Corporation, Inc.; SikaFilm.
 - o. Symons Corporation, a Dayton Superior Company; Finishing Aid.
 - p. Unitex; Pro-Film.
 - q. US Mix Products Company; US Spec Monofilm ER.
 - r. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.

- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
1. Products: (or equal)
 - a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
 - b. Burke by Edoco; Aqua Resin Cure.
 - c. ChemMasters; Safe-Cure Clear.
 - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
 - e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
 - f. Euclid Chemical Company (The); Kurez DR VOX.
 - g. Kaufman Products, Inc.; Thinfilm 420.
 - h. Lambert Corporation; Aqua Kure-Clear.
 - i. L&M Construction Chemicals, Inc.; L&M Cure R.
 - j. Meadows, W. R., Inc.; 1100 Clear.
 - k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
 - l. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
 - m. Tamms Industries, Inc.; Horncure WB 30.
 - n. Unitex; Hydro Cure 309.
 - o. US Mix Products Company; US Spec Maxcure Resin Clear.
 - p. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

2.09 RELATED MATERIALS

- A. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- B. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

- C. Reglets: Fabricate reglets of not less than 0.0217-inch- thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- D. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 CONCRETE MIXTURES, GENERAL

- 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. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash: 25 percent.
 - 2. Combined Fly Ash and Pozzolan: 25 percent.
 - 3. Ground Granulated Blast-Furnace Slag: 50 percent.
 - 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
 - 5. Silica Fume: 10 percent.
 - 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
 - 7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
 - 8. Admixtures: Use admixtures according to manufacturer's written instructions.
 - a. Use water-reducing admixture in concrete, as required, for placement and workability.
 - b. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

- c. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
 - d. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
9. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.11 CONCRETE MIXTURES

A. For all concrete:

- 1. Minimum Compressive Strength: 4,000 psi at 28 days.
- 2. Maximum Water-Cementitious Materials Ratio: 0.45
- 3. Slump Limit: 3 inches prior to mid-range water reducer
- 4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size
- 5. Footings supporting CMU do not require entrained air.

2.12 FABRICATING REINFORCEMENT

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

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete:

- 1. Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
- 2. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing:

- 1. Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M.
- 2. Mix concrete materials in appropriate drum-type batch machine mixer.

3. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
4. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
5. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.01 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, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces.
- F. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Install keyways, reglets, recesses, and the like, for easy removal.
- G. Do not use rust-stained steel form-facing material.
- H. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- I. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

- J. ACI 301 requires chamfers, unless otherwise specified.
 - 1. Chamfer exterior corners and edges of permanently exposed concrete.
 - 2. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 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.
- B. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- C. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
- E. Install dovetail anchor slots in concrete structures as indicated.

3.03 REMOVING AND REUSING FORMS

- A. Period of 24 hours is halved to 12 hours in ACI 347R.
- B. Commentary in ACI 318 recognizes 12 hours for concrete using regular Portland cement but advises that this period may be insufficient for concrete using Type II and Type V Portland cements or ASTM C 595 blended hydraulic cements, concrete with retarding admixtures, and concrete using ice during mixing.
- C. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

- D. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
- E. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- F. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- G. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.04 VAPOR BARRIERS

- A. Lap joints 6 inches and seal with manufacturer's recommended tape.
- B. Granular Course: Cover vapor retarder with granular fill, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.
 - 1. Place and compact a 1/2-inch- thick layer of fine-graded granular material over granular fill.

3.05 STEEL REINFORCEMENT

- A. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Weld reinforcing bars according to AWS D1.4, where indicated.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging.
- F. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.06 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints
 - 1. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
 - 2. Place joints perpendicular to main reinforcement.
 - 3. Continue reinforcement across construction joints, unless otherwise indicated.
 - 4. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 5. Keyed joints are used in walls and floors and between walls and slabs or footings. ACI 302.1R recommends limiting keyed joints to lightly trafficked floors because keys may fail and lips may chip after concrete shrinks.
 - 6. Form keyed joints as indicated.
 - a. Embed keys at least 1-1/2 inches into concrete.
 - b. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - c. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - d. Space vertical joints in walls 20 feet.
 - e. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - f. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade:
 - 1. Form weakened-plane contraction joints, sectioning concrete into areas as indicated.
 - 2. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

- a. Select type of joint-forming method from two subparagraphs below or retain both subparagraphs as Contractor's option.

D. Grooved Joints

1. Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch.
2. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
3. Description does not distinguish conventional wet- and dry-cut saws from early-entry dry-cut saws. Timing is critical to sawed joints. Early-entry dry-cut saws have been used within one to two hours of finishing concrete. To leave concrete undamaged from sawing, conventional saw cutting must be delayed, usually 4 to 12 hours but not so long that uncontrolled cracking of concrete could occur.

E. Sawed Joints

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

F. Isolation Joints in Slabs-on-Grade

1. 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.
2. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
3. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.
4. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

G. Doweled Joints

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

3.07 WATERSTOPS

A. Swelling Waterstop:

1. Install only in locations noted "swellable waterstop".
2. Install according to manufacturer's instructions.

B. Retrofit Waterstop:

1. Install only in locations noted "retrofit waterstop".
2. Install according to manufacturer's instructions.

3.08 CONCRETE PLACEMENT

A. General

1. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.
3. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
4. Do not add water to concrete after adding high-range water-reducing admixtures to mixture. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
5. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
6. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.

- d. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
 7. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 8. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 9. Maintain reinforcement in position on chairs during concrete placement.
 10. Screed slab surfaces with a straightedge and strike off to correct elevations.
 11. Slope surfaces uniformly to drains where required.
 12. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
 13. Do not further disturb slab surfaces before starting finishing operations.
- B. Cold-Weather Placement:
1. Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 3. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 4. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- C. Hot-Weather Placement
1. Comply with ACI 301 and as follows:
 - a. Maintain concrete temperature below 90 deg F at time of placement.

- b. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water.
- c. Using liquid nitrogen to cool concrete is Contractor's option.
- d. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete.
- e. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.09 FINISHING FORMED SURFACES

A. Rough-Formed Finish:

- 1. As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched.
- 2. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
- 3. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish

- 1. As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
- 2. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
- 3. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish

- 1. Apply the following to smooth-formed finished as-cast concrete where indicated:
 - a. Smooth-Rubbed Finish (SRF): 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.
 - b. Grout-Cleaned Finish (GCF): 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 fi

ne 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.

- c. Cork-Floated Finish (CFF): 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

1. 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.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General

1. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
2. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
3. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

B. Slip-Resistive Finish

1. Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps.
2. Apply according to manufacturer's written instructions and as follows:
 - a. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aggregate over surface in 1 or 2 applications. Tamp aggregate flush with surface, but do not force below surface.
 - b. Revise float finish in first subparagraph below to trowel finish if required.

- c. After broadcasting and tamping, apply float finish.
- d. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In

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

B. Curbs

- 1. Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations

- 1. Provide machine and equipment bases and foundations as shown on Drawings.
- 2. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs

E. Provide concrete fill for steel pan stair treads, landings, and associated items.

F. Cast-in inserts and accessories as shown on Drawings.

G. Screed, tamp, and trowel-finish concrete surfaces.

3.12 CONCRETE PROTECTING AND CURING

A. General

- 1. 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

1. Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations.
2. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms.
2. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces

1. Begin curing immediately after finishing concrete.
2. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
3. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - a. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - 1) Water.
 - 2) Continuous water-fog spray.
 - 3) Absorptive cover, water saturated, and kept continuously wet.
 - 4) Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - b. Moisture-Retaining-Cover Curing
 - 1) Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
 - 2) Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

- 3) Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
- 4) Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
- 5) Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

c. Curing Compound

- 1) Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions.
- 2) Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
- 3) After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
- 4) Curing and sealing compound in subparagraph below is usually for floors and slabs and may act as a permanent surface finish.

d. Curing and Sealing Compound:

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

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete

1. Repair and patch defective areas when approved by Engineer.
2. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Patching Mortar

1. Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
2. Insert provision for testing repair technique on a mockup or surface to be concealed later, before repairing surfaces.

C. Repairing Formed Surfaces

1. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
2. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth.
3. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
4. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
5. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by the Engineer.
6. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.
7. Repair materials and installation not specified above may be used, subject to Engineers's approval.

3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports. See Section 01400.
- B. Inspections:
 1. Steel reinforcement placement.

2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests

1. Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - a. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - b. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump
 - a. ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
3. Air Content
 - a. ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight

- a. ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure sets of two standard cylinder specimens for each composite sample.
 7. Compressive-Strength Tests: ASTM C 39/C 39M
 8. Test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 - c. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 - d. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 9. Nondestructive Testing
 - a. Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
- D. Additional Tests
1. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive

strengths, or other requirements have not been met, as directed by Engineer.

2. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Engineer.
3. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
4. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
5. Measure floor and slab flatness and levelness according to ASTM E within 48 hours of finishing.

END OF SECTION 03300

SECTION 03600

GROUT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The work of this section includes grouting as indicated on the drawings or specified in other sections. Unless otherwise specified, all grouting shall be done with non-shrinking grout.

1.02 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 308, Recommended Practice for Curing Concrete.
- B. American Society for Testing and Materials:
 - 1. ASTM C33; Concrete Aggregates.
 - 2. ASTM C109; Test Method for Compressive Strength of Hydraulic Cement Mortars (Using two inch or 50-mm Cube Specimens).
 - 3. ASTM C150; Specification for Portland Cement.
 - 4. ASTM C191; Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.
 - 5. ASTM C596; Test Method for Drying Shrinkage of Mortar Containing Portland Cement.
 - 6. ASTM C827; Test Method for Early Volume Change of Cementitious Mixtures.

1.03 SUBMITTALS

- A. Submit a statement of compliance, together with supporting data, from the materials suppliers attesting to the conformance of products and ingredients with these specifications.
- B. Submit manufacturer's instructions for mixing, handling, surface preparation, and placing the epoxy type and the non-shrink, non-metallic type grouts.

1.04 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Grout manufacturer shall furnish copies of current

independent laboratory test results showing the non-shrink, non-metallic grout as non-shrink from time of placement according to the following:

1. The grout indicates no expansion after final set according to ASTM C827.
2. The grout indicates 4,000-psi strength developed with a trowelable mix within 24 hours according to ASTM C109.
3. The grout indicates placement time limitation based on initial set of not less than 60 minutes according to ASTM C191.
4. Test results, as supplied by the grout manufacturer, shall indicate that in projects of similar scope and size, the effective bearing area was between 95 and 100 percent.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Provide protection for the products to prevent moisture damage and contamination of the grout materials.
- B. Store the grout in undamaged condition with seals and labels intact as packaged by the manufacturer.

1.06 PROJECT CONDITIONS

- A. Protect freshly poured grout against high and low temperatures and unfavorable environmental conditions in accordance with ACI Standards 308.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C150, Type II.
- B. Water: Potable; containing no impurities, suspended particles, algae, organic substances, acids, alkalis, or dissolved natural salts in quantities that will cause:
 1. Corrosion of steel,
 2. Volume change that will increase shrinkage cracking,
 3. Efflorescence,
 4. Excess air entraining.
- C. Fine Aggregate:

1. Washed natural sand.
2. Gradation in accordance with ASTM C33 and represented by a smooth granulometric curve within the required limits.
3. Free from injurious amounts of organic impurities as determined by ASTM C40.

2.02 RAPID-CURING EPOXY GROUT

- A. High strength, three-component epoxy grout formulated with thermosetting resins and inert fillers.
- B. Grout shall be rapid curing, have high adhesion, and be resistant to ordinary chemicals, acids and alkalis.

<u>Physical Properties</u> <u>Spec.</u>	<u>Reference</u>
Compressive Strength	12,000 psi (7-day) ASTM C579
Tensile Strength	2,000 psi minimum ASTM C307
Coefficient of Expansion	3 x 10 ⁻⁶ in/in/°F ASTM
C531	
Shrinkage	None ASTM C827

2.03 NON-SHRINK, NON-METALLIC CEMENTITIOUS GROUT

- A. Pre-mixed ready for use formulation requiring only the addition of water; non-shrink, non-corrosive, non-metallic, non-gas forming, no chlorides. No more water shall be used than is necessary to produce a flowable grout.
- B. Certified to maintain initial placement volume or expand after set and meet the following minimum properties when tested in accordance with Corps of Engineers Specification CRD-C621, for Type D non-shrink grout:

Setting Time:	Initial	2 hours (Approx.)
ASTM C191	Final	3 hours (Approx.)
Expansion:		0.4% Maximum
Compressive Strength:	1 day	4,000 psi
CRD-C621	7 days	7,000 psi
	28 days	10,000 psi

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

- A. Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces by brushing, hammering, chipping or other

similar means until a sound, clean concrete surface is achieved. Perform additional surface preparation in accordance with non-shrink, non-metallic grout manufacturer's instructions.

- B. Lightly roughen the concrete, but not enough to interfere with the proper placement of grout.
- C. Remove foreign materials from metal surfaces in contact with grout.
- D. Align, level and maintain final positioning of components to be grouted.
- E. Take special precautions during periods of extreme weather conditions in accordance with the manufacturer's written instructions.
- F. Saturate concrete surfaces with clean water; remove excess water, leave none standing.

3.02 FORMWORK

- A. Construct leakproof forms anchored and shored to withstand grout pressures, so that no movement is possible.
- B. Provide clearance between the formwork and the area to be grouted to permit proper placement of grout.
- C. Forms shall be provided where structural components of baseplates or bedplates will not confine the grout.
- D. Pre-treat wood forms with forming oils so that they do not absorb moisture.
- E. Remove supports only after grout has hardened.

3.03 MIXING

- A. Portland Cement Grout:
 - 1. Prepare grout composed of Portland cement, sand and water; do not use ferrous aggregate or staining ingredients in grout mix.
 - 2. Use proportions of 2 parts sand and 1 part cement, measured by volume.
 - 3. Prepare grout with sufficient water to obtain consistency to permit placing and packing.
 - 4. Mix water and grout in two steps; pre-mix using approximately 2/3 of the water; after partial mixing, add the remaining amount of water to bring mix to the desired placement consistency and continue mixing

2-3 minutes.

5. Mix only that quantity of grout that can be placed within 30 minutes after mixing.
 6. After the grout has been mixed, do not add more water for any reason.
- B. Epoxy Grout & Non-Shrink Cementitious Grout: Mix and prepare epoxy grout and non-shrink cementitious grout in strict accordance with the manufacturer's instructions.
- C. Mix grout components as close to the work area as possible and transport the mixture quickly and in a manner that does not permit segregation of materials.

3.04 PLACING

- A. Unless otherwise specified or indicated on the drawings, the thickness of grout under baseplates shall be 1-1/2 inches. Grout shall be placed in strict accordance with the directions of the manufacturer so that all spaces and cavities below the top of baseplates and bedplates are completely filled, without voids.
- B. Place grout material quickly and continuously.
- C. Do not use pneumatic-pressure or dry-packing methods.
- D. Apply grout from one side only to avoid entrapping air. The final installation shall be thoroughly compacted and free of air pockets.
- E. Do not vibrate the placed grout mixture, or permit it to be placed if the area is being vibrated by nearby equipment.
- F. In all locations where the edge of the grout will be exposed to view, the grout shall be finished smooth after it has reached its initial set. Except where shown to be finished on a slope, the edges of grout shall be cut off flush at the baseplate, bedplate, member, or piece of equipment.
- G. Do not remove leveling shims for at least 48 hours after grout has been placed.
- H. Unless otherwise noted in the drawings, anchor bolts and threaded rod anchors shall be epoxy grouted in holes drilled into hardened concrete. Diameters of holes shall be as follows:

<u>Item</u>	<u>Diameter of Hole</u>
Threaded	1/8 inch larger than the bar or rod

Rod Anchors	outside diameter
Anchor Bolts	Per manufacturer's instructions

- I. The embedment depth for epoxy grouted anchor bolts and threaded rod anchors, shall be not less than 15 bolt or rod diameters, unless otherwise indicated on the drawings. Holes shall be prepared for grouting as recommended by the grout manufacturer.
- J. Anchor bolts and threaded rod anchors shall be clean, dry, and free of grease and other foreign matter at time of installation. The bolts, rods, and bars shall be set and positioned, and the epoxy grout shall be placed and finished in accordance with the recommendations of the grout manufacturer. Particular care shall be taken to ensure that all space and cavities are filled with epoxy grout, without voids.
- K. During assembly of all threaded stainless steel components, anti-seize thread lubricant shall be liberally applied to the threaded portion not embedded in concrete.

3.05 CURING

- A. After grout has attained its initial set, keep damp for a minimum of 3 days.
- B. Prevent rapid loss of water from the grout during the first 48 hours by the use of an approved membrane-curing compound or with the use of the wet burlap method.

END OF SECTION 03600

SECTION 04261

MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Clay face brick.
2. Mortar.
3. Ties and anchors.
4. Embedded flashing.
5. Miscellaneous masonry accessories.

- B. Products Installed but not Furnished under This Section:

1. Steel lintels in masonry veneer.

- C. Related Requirements:

1. Section 054000 "Cold Formed Metal Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
2. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 ALLOWANCES

- A. Face brick is part of the Face Brick Allowance.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:

1. Clay face brick, in the form of straps of five or more bricks.
2. Colored mortar.
3. Weep holes/vents.

D. Samples for Verification: For each type and color of the following:

1. Clay face brick, in the form of straps of five or more bricks.
2. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.
3. Weep holes and vents.
4. Accessories embedded in masonry.

1.6 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Material Certificates: For each type and size of the following:

1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include test report for efflorescence according to ASTM C67.
2. Mortar admixtures.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Anchors, ties, and metal accessories.

C. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.

- D. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

- A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.

1. Build sample panels for typical exterior wall in sizes approximately 60 inches x 48 inches by full thickness.
2. Build sample panels facing south.
3. Where masonry is to match existing, build panels adjacent and parallel to existing surface.
4. Clean exposed faces of panels with masonry cleaner indicated.
5. Protect approved sample panels from the elements with weather-resistant membrane.
6. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for typical exterior wall in sizes approximately 96 inches long by 72 inches high by full thickness, including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least 16 inches (400 mm) long in mockup.
 - b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches (300 mm) wide by 16 inches (400 mm) high.
 - c. Include through-wall flashing installed for a 24-inch (600-mm) length in corner of exterior wall mockup approximately 16 inches (400 mm) down from top of mockup, with a 12-inch (300-mm) length of flashing left exposed to view (omit masonry above half of flashing).
 - d. Include metal studs, sheathing, water-resistive barrier, sheathing joint-and-penetration treatment air barrier, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
3. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
4. Clean exposed faces of mockups with masonry cleaner as indicated.

5. Protect accepted mockups from the elements with weather-resistant membrane.
6. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
7. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of veneer, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches (600 mm) down face of veneer, and hold cover securely in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry. Immediately remove grout, mortar, and soil that come in contact with masonry.
 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.

3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- C. 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 TMS 602/ACI 530.1/ASCE 6.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

2.3 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.

3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Clay Face Brick: Facing brick complying with ASTM C216] [or] [hollow brick complying with ASTM C652, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area)].
1. Manufacturers
 - a. Glen-Gery Brick www.glengery.com
 - b. Potomac Valley Brick www.pvbrick.com
 - c. The Belden Brick Co www.beldenbrick.com
 2. Grade: SW.
 3. Type: FBX.
 4. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C7.
 5. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."
 6. Size (Actual Dimensions): 3-5/8 inches (92 mm) wide by 2-1/4 inches (57 mm) high by 7-5/8 inches (194 mm) long.
 7. Color and Texture: As selected by Architect.

2.4 MORTAR MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C91/C91M.
- E. Mortar Cement: ASTM C1329/C1329M.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.

- G. Colored Cement Products: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
1. Colored Portland Cement-Lime Mix:
 2. Manufacturers
 - a. Amerimix www.amerimix.com
 - b. Lehigh Hanson Inc. www.lehighhanson.com
 - c. Approved Equal.
 3. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 4. Pigments shall not exceed 10 percent of portland cement by weight.
 5. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
- H. Aggregate for Mortar: ASTM C144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- J. Water: Potable.

2.5 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16-mm) cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
1. Mill-Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A641/A641M, Class 1 coating.
 2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
 3. Stainless Steel Wire: ASTM A580/A580M, [Type 304] [Type 316].
 4. Galvanized-Steel Sheet: ASTM A653/A653M, Commercial Steel, G60 (Z180) zinc coating.

5. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
6. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, [Type 304] [Type 316].

C. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf (445-N) load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch (1.5 mm).
2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch- (1.90-mm-) thick steel sheet, galvanized after fabrication.
3. Fabricate wire ties from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized steel wire unless otherwise indicated.
4. Fabricate wire connector sections from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized, carbon steel wire.
5. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry-veneer anchors specified.
6. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with a projecting vertical tab having a slotted hole for inserting wire tie.
7. Stainless Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 (4.83-mm) diameter by length required to penetrate steel stud flange with not less than three exposed threads; either made from Type 410 stainless steel or made with a carbon-steel drill point and 300 Series stainless steel shank.

2.6 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.016 inch (0.40 mm) thick.
2. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but not exceeding 12 feet (3.7 m). Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch (76-mm) intervals along length of flashing to provide an integral mortar bond.
4. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees.
5. Solder metal items at corners.

B. Flexible Flashing: Use one of the following unless otherwise indicated:

1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-

laminated polyethylene film to produce an overall thickness of not less than 0.030 inch (0.76 mm).

- a. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
2. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.030 inch (0.76 mm).
 - a. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
- C. Application: Unless otherwise indicated, use the following:
1. Where flashing is indicated to receive counterflashing, use metal flashing.
 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.
 4. Where flashing is fully concealed, use metal flashing or flexible flashing.
- D. Solder and Sealants for Sheet Metal Flashings:
1. Solder for Stainless Steel: ASTM B32, with acid flux of type recommended by stainless steel sheet manufacturer.
 2. Elastomeric Sealant: ASTM C920, chemically curing urethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.
- E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- F. Termination Bars for Flexible Flashing: Stainless steel steel bars 1/8 inch by 1 inch (3 mm by 25 mm).

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 1. Manufacturers:
 - a. Mortar Net Solutions www.mortarnet.com

- b. Wire Bond www.wirebond.com
 - c. Approved Equal.
2. Configuration: Provide one of the following:
- a. Strips, full depth of cavity and 10 inches (250 mm) high, with dovetail-shaped notches 7 inches (175 mm) deep that prevent clogging with mortar droppings.
 - b. Strips, not less than 1-1/2 inches (38 mm) thick and 10 inches (250 mm) high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
 - c. Sheets or strips, full depth of cavity and installed to full height of cavity.
 - d. Sheets or strips not less than 1 inch (25 mm) thick and installed to full height of cavity with additional strips 4 inches (100 mm) high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from clogging with mortar.

2.8 MASONRY CLEANERS

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

2.9 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime mortar unless otherwise indicated.
 - 3. For exterior masonry, use portland cement-lime mortar.
 - 4. 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. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Use Type N unless another type is indicated.
 - 1. For masonry below grade or in contact with earth, use Type S.

- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Pigments shall not exceed 5 percent of masonry cement by weight.
 - 3. Mix to match Architect's sample.
 - 4. Application: Use pigmented mortar for exposed mortar joints.

- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
 - 1. Mix to match Architect's sample.
 - 2. Application: Use colored aggregate mortar for exposed mortar joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 INSTALLATION, GENERAL

- A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

- B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, 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.

- C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

- D. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

- E. 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 according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 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.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
4. 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.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).

5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

3.4 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. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- B. Lay hollow brick with face shells fully bedded in mortar and with head joints of depth equal to bed joints. At starting course, fully bed entire units, including area under cells.
 1. At anchors and ties, fully bed units and fill cells with mortar as needed to fully embed anchors and ties in mortar.
 2. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 3. Allow cleaned surfaces to dry before setting.
 4. Wet joint surfaces thoroughly before applying mortar.
 5. Rake out mortar joints for pointing with sealant.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten screw-attached seismic anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 - 2. Embed tie sections in masonry joints.
 - 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - 4. Space anchors as indicated, but not more than 16 inches (406 mm) o.c. vertically and 25 inches (635 mm) o.c. horizontally, with not less than one anchor for each 2.67 sq. ft. (0.25 sq. m). Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 36 inches (914 mm), around perimeter.
- B. Provide not less than 1 inch (25 mm) of airspace between back of masonry veneer and face of sheathing.
 - 1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.7 LINTELS

- A. Install steel lintels where indicated.
- B. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.8 FLASHING, WEEP HOLES, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - 2. Extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches (200 mm); with upper edge tucked under [water-resistive barrier] [air barrier], lapping at least 4 inches (100 mm). [Fasten upper edge of flexible flashing to sheathing through termination bar.]

3. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
 4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
 5. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
 6. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
 7. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.
 8. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in veneers in head joints of first course of masonry immediately above embedded flashing.
1. Use open-head joints to form weep holes.
 2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
 3. Space weep holes 24 inches (600 mm) o.c. unless otherwise indicated.
- E. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- F. Install vents in head joints in exterior wythes at spacing indicated. Use open-head joints to form vents.
1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.9 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
- C. Testing Prior to Construction: One set of tests.
- D. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C67 for compressive strength.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for mortar air content and compressive strength.

3.10 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Protect adjacent stone and non masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 7. Clean stone trim to comply with stone supplier's written instructions.

8. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.11 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. 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. Crush masonry waste to less than 4 inches (100 mm) in each dimension.
 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
 3. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04261

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SECTION 05310

STEEL DECK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Steel roof deck.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 5 Section "Metal Fabrications" for framing openings with miscellaneous steel shapes.
 - 2. Division 9 Section "Painting" for touchup and repair painting of deck.

1.03 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of deck, accessory, and product specified.
- C. Shop drawings showing layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.
- D. Product certificates signed by manufacturers of steel deck certifying that their products comply with specified requirements.
- E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- F. Product test reports from qualified independent testing agencies evidencing compliance with requirements of the following based on comprehensive testing:
 - 1. Mechanical fasteners.

- G. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence steel deck's compliance with the building code in effect for the Project.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Engineer's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work. Testing Agency to be hired by the Contractor at no cost to the Owner.
- C. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- D. FM Listing: Provide steel roof deck evaluated by Factory Mutual and listed in Factory Mutual "Approval Guide" for Class 1 fire rating and Class 1-60 windstorm ratings.
- E. Engineer Qualifications: A professional engineer legally authorized to practice in the jurisdiction where Project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of steel deck similar to this Project in material, design, and extent and that have a record of successful in-service performance.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. United Steel Deck, Inc.
2. Vulcraft Div. of Nucor Corp.
3. Wheeling Corrugating Co., Div. of Wheeling-Pittsburgh Steel Corp.
4. Or Equal.

2.02 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.03 ROOF DECK

- A. Steel Roof Deck: Fabricate panels without top-flange stiffening grooves conforming to SDI Publication No. 31 "Specifications and Commentary for Steel Roof Deck" and the following:
1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
 2. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
 4. Deck Profile: As indicated.
 5. Profile Depth: As indicated.
 6. Design Uncoated-Steel Thickness: As indicated.
 7. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
 8. Span Condition: As indicated.
 9. Side Laps: As indicated.

2.04 ACCESSORIES

- A. General: Provide accessory materials for steel deck that comply with requirements indicated and recommendations of the steel deck manufacturer.
- B. Mechanical Fasteners: Manufacturer's standard, corrosion-resistant, low-velocity, powder-actuated or pneumatically driven carbon steel fasteners; or self-drilling, self-threading screws.
- C. Side Lap Fasteners: Manufacturer's standard, corrosion-resistant, hexagonal washer head; self-drilling, carbon steel screws, No. 10 minimum diameter.
- D. Rib Closure Strips: Manufacturer's standard vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Roof Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material and thickness as deck panels, unless otherwise indicated.
- H. Hanger Tabs: Manufacturer's standard piercing steel sheet hanger attachment devices for floor deck panels.
- I. Weld Washers: Manufacturer's standard uncoated-steel sheet weld washers, shaped to fit deck rib, 0.0598 inch thick with 3/8-inch (9.5-mm) minimum diameter pre-punched hole.
- J. Galvanizing Repair Paint: ASTM A 780/A 780M.
- K. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine supporting framing and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of steel deck.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Locate decking bundles to prevent overloading of supporting members.

3.03 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary of SDI Publication No. 31, manufacturer's recommendations, and requirements of this Section.
- B. Install temporary shoring before placing deck panels when required to meet deflection limitations.
- C. Place deck panels on supporting framing and adjust to final position with ends accurately aligned and bearing on supporting framing before being permanently fastened. Do not stretch or contract side lap interlocks.
- D. Place deck panels flat and square and fasten to supporting framing without warp or deflection.
- E. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to the decking.
- F. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.
- G. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.
- H. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's instructions.

3.04 ROOF DECK INSTALLATION

- A. Fasten roof deck panels to steel supporting members by screws of the size indicated below and as follows:
 - 1. Screws: #12 TEK Screws
 - 2. Screw: Screw edge ribs of panels at each support. Space fasteners an average of 12 inches apart, with a minimum of four screws per unit at each support.
- B. Side Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding 30 inches, using the following method:
 - 1. Mechanically fasten with self-drilling No. 10 diameter or larger carbon steel screws.

- C. End Bearing: Install deck ends over supporting framing with a minimum end bearing of 2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking, and weld flanges to top of deck. Space welds not more than 12 inches apart with at least one weld at each corner.
- E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's recommendations. Weld to substrate to provide a complete deck installation.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's instructions to ensure complete closure.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: A qualified independent testing agency employed and paid by Contractor will perform field quality-control testing.
- B. Field welds will be subject to inspection.
- C. Testing agency will report test results promptly and in writing to Owner, Contractor, and Architect/Engineer.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional testing will be performed to determine compliance of corrected work with specified requirements.

3.06 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces with galvanized repair paint according to ASTM A 780 and the manufacturer's instructions.
- B. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on both surfaces of installed deck panels.

1. Touch up painted surfaces with same type of shop paint used on adjacent surfaces.
 2. Where shop-painted surfaces are exposed in-service, apply touchup paint to blend into adjacent surfaces.
- C. Provide final protection and maintain conditions to ensure steel decking is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05310

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SECTION 05400

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior load-bearing wall framing.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated.
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
 - 3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
 - 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1/2 inch (13 mm).

- C. Cold-Formed Steel Framing Design Standard: AISI 240-15: American Iron and Steel Institute, North American Standard for Cold-Formed Steel Structural Framing, 2015 Edition

1.4 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - 1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding certificates.
- D. Qualification Data: For professional engineer and testing agency.
- E. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Vertical deflection clips.
 - 6. Horizontal drift deflection clips
 - 7. Miscellaneous structural clips and accessories.
- F. Research/Evaluation Reports: For cold-formed metal framing.

1.5 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- D. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- F. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
 - 1. Clark Steel Framing.
 - 2. Dale/Incor.
 - 3. Dietrich Metal Framing; a Worthington Industries Company.
 - 4. United Metal Products, Inc.
 - 5. Or Approved Equal.

2.2 MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As required by structural performance

2. Coating: G90

- B. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: As required by structural performance
 2. Coating: G90

2.3 EXTERIOR LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch or as required by structural performance.
 2. Minimum Flange Width: 1-5/8 inches or as required by structural performance.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: Matching steel studs.
 2. Minimum Flange Width: 1-1/4 inches (32 mm)
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch
 2. Minimum Flange Width: 1-5/8 inches
- D. Steel Single- or Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch
 2. Top Flange Width: 1-5/8 inches

2.4 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.

2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.

2.5 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless, hooked bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- E. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.
- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.
- C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.
- D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.7 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
 2. Cut framing members by sawing or shearing; do not torch cut.
 3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
 4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

3.3 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- H. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to bottom track, unless otherwise indicated. Space studs as follows:
 1. Stud Spacing: As indicated on drawings.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Align roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- E. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
 2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- F. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- G. Install horizontal bridging in stud system, spaced vertically as indicated on Shop Drawings. Fasten at each stud intersection.
 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs.

- Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
 - H. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05400

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SECTION 05440

COLD-FORMED METAL TRUSSES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes pre-engineered, pre-fabricated cold-formed steel framing elements. Work includes:
 - 1. Cold-Formed metal trusses (Referred to as Steel Trusses on drawings).
 - 2. Anchorage, bracing and bridging.
- B. Related Sections
 - 1. Section 05310 STEEL DECK

1.02 REFERENCES

- A. Reference standards:
 - 1. ASTM:
 - a. ASTM A653/A653M-15 "Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot Dip Process."
 - b. ASTM A780-20 "Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings."
 - 2. American Welding Society (AWS)
 - a. AWS D1.1 "Structural Welding Code - Steel."
 - b. AWS D1.3 "Structural Welding Code - Sheet Steel."
 - 3. Light Gauge Steel Engineers Association (LGSEA) Field Installation Guide
 - 4. AISI S240-15: American Iron and Steel Institute, North American Standard for Cold-Formed Steel Structural Framing, 2015 Edition

1.03 PERFORMANCE REQUIREMENTS

- A. AISI "Specifications": Calculate structural characteristics of cold-formed steel truss members according to American Iron and Steel Institute, North American Standard for Cold-Formed Steel Structural Framing, 2015 Edition

- B. Structural Performance: Design, fabricate, and erect cold-formed steel trusses to withstand specified design loads within limits and under conditions required.
1. Design Loads: As shown on Drawing Sheet S-01 and S-04.
 2. Deflections: Live load deflection meeting the following (unless otherwise specified):
 - a. Roof Trusses: Vertical deflection less than or equal to Length/240.
 3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 120 deg F (67 deg C).
 4. Design the truss to structure connections to resist all uplift forces.
 5. Trusses shall produce no horizontal thrust on bearing walls.
 6. Design the truss members to support the roof overhangs as shown on the drawings. Design to support the roof gutter and soffit loads. Design and furnish the structural members between the trusses to support the roof gutters and soffits and provide appropriate connection details.
 7. Maximum truss spacing shall be 4 feet.
 8. Representative truss layout plans are shown on the drawings. The truss manufacturer and designer shall have an option to provide the framing layout of his own as long as the indicated plan dimensions and roof slopes are maintained.

1.04 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions for each type of cold-formed steel framing and accessory required.
- B. Submit detailed roof truss layouts indicating placement of trusses.
- C. Submit individual truss drawings, sealed and signed by a Professional Engineer registered in the State of Maryland, verifying accordance with local building code and design requirements.

Include:

1. Description of design criteria.

2. Engineering analysis depicting member stresses and truss deflection.
 3. Truss member sizes and thickness and connections at truss joints.
 4. Truss support reactions.
 5. Top chord, bottom chord and web bracing requirements.
- D. Submit final roof and floor plan drawings sealed and signed by a qualified Professional Engineer, registered in the State of Maryland, depicting final installed truss assembly.

Include:

1. All truss to truss connections
 2. All truss to structure (bearing) connections
 3. Plan and details for the location of all permanent lateral and diagonal bracing and/or blocking required in the top chord, web, and bottom chord planes. (Diaphragms excluded)
- E. Installation Instructions: Truss Component Manufacturer's printed instructions for handling, storage, and installation of each item of cold-formed metal framing and each accessory specified in this section.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Fabrication shall be performed in a quality controlled manufacturing environment by a cold-formed steel truss fabricator with experience fabricating Cold-Formed Steel trusses equal in material, design, and scope to the trusses required for this Project. The Truss Fabricator shall have at least 5 years experience in production of Cold-Formed Steel Trusses.
1. Installation of Cold-Formed Steel truss roof or floor assembly shall be performed by an installer with experience installing Cold-Formed Steel trusses equal in material, design and scope to the trusses required for this Project.
- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."
1. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."
- C. Pre-Installation Meeting: Prior to the scheduled beginning of installation, attendees must meet at job site to review requirements:
1. Attendees: Require attendance by representatives of the following:
 - a. Truss Fabricator, if requested by installer.

- b. Installer of this section.
 - c. Other entities directly affecting, or affected by, construction activities of this section, including but not limited to, the following:
 - 1) Installer of truss support framing.
 - 2) Installer of mechanical systems.
 - 3) Installer of electrical systems.
2. Review potential interface conflicts; coordinate layout and support provisions.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's unopened containers or bundles, fully identified by name, brand, type and grade. Exercise care to avoid damage during unloading, storing and erection.
- B. Store trusses on blocking, pallets, platforms or other supports off the ground and in an upright position sufficiently braced to avoid damage from excessive bending.
- C. Protect trusses and accessories from corrosion, deformation, damage and deterioration when stored at job site. Keep trusses free of dirt and other foreign matter.
- D. Any damaged trusses shall not be accepted.

1.07 PROJECT CONDITIONS

- A. During construction, adequately distribute all loads applied to trusses so as not to exceed the carrying capacity of any one truss.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Aegis Metal Framing, LLC
- B. Nucon Steel, a Nucor Company
- C. TrusSteel, an ITW Company
- D. Dietrich Metal Framing, Inc.

- E. Or approved equal.

2.02 COMPONENTS

- A. System components: Aegis Metal Framing, LLC ULTRA-SPAN® and POSI-STRUT® light gauge steel roof truss and floor truss components.
- B. Provide manufacturer's standard steel truss members, bracing, bridging, blocking, reinforcements, fasteners and accessories with each type of steel framing required, as recommended by the manufacturer for the applications indicated and as needed to provide a complete cold-formed steel truss roof or floor assembly.

2.03 MATERIALS

- A. Materials:
 - 1. For all chord and web members: Fabricate components of structural quality steel sheet per ASTM A653 with a minimum yield strength of 50,000 psi.
 - 2. Bracing, bridging and blocking members: Fabricate components of commercial quality steel sheet per ASTM A653 with a minimum yield strength of 33,000 psi.
- B. Ultra-Span steel truss components: Provide sizes, shapes and gauges as required for structural performance.
- C. Finish: Provide components with protective zinc coating complying with ASTM A653, minimum G60 coating.
- D. Fastenings:
 - 1. Manufacturer recommended self-drilling screws with corrosion-resistant plated finish, bearing stamp of Truss Component Manufacturer for ready identification. Fasteners shall be of sufficient size and number to ensure the strength of the connection.
 - 2. Welding: Comply with AWS D1.1 when applicable and AWS D1.3 for welding base metals less than 1/8" thick.
 - 3. Other fasteners as accepted by truss engineer.

2.04 FABRICATION

- A. Factory fabricate cold-formed steel trusses plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
 - 1. Fabricate truss assemblies in jig templates.

2. Cut truss members by sawing or shearing or plasma cutting.
3. Fasten cold-formed steel truss members by screw fastening, or other methods as standard with fabricator.
 - a. Locate mechanical fasteners and install according to cold-formed steel truss component manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
- B. Care shall be taken during handling, delivery and erection. Brace, block, or reinforce truss as necessary to minimize member and connection stresses. Refer to LGSEA "Field Installation Guide".
- C. Fabrication Tolerances: Fabricate trusses to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet (1:960) and as follows:
 1. Spacing: Space individual trusses no more than plus or minus 1/8 inch (3mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 2. Squareness: Fabricate each cold-formed steel truss to a maximum out-of-square tolerance of 1/8 inch (3mm).
 3. Fabricate straight, level, and true, without rack, and to following tolerances:
 - a. Trusses up to 30 feet long: Maximum 1/2 inch variation from design length.
 - b. Trusses over 30 feet long: maximum 3/4 inch variation from design length.
 - c. Trusses up to 5 feet high: Maximum 1/4 inch variation from design height.
 - d. Trusses over 5 feet high: Maximum 1/2 inch variation from design height.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine structure, substrates and installation conditions. Do not proceed with cold-formed steel truss installation until unsatisfactory conditions have been corrected.

- B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION, GENERAL

A. General:

1. Erection of trusses, including proper handling, safety precautions, installation bracing and other safeguards or procedures is the responsibility of the Contractor and Contractor's installer. Refer to LGSEA "Field Installation Guide".
 2. Exercise care and provide installation bracing required to prevent toppling of trusses during erection. Provide Ultra-Span Stabilizer™ from Aegis Metal Framing for lateral bracing.
- B. Erect trusses with plane of truss webs vertical and parallel to each other, accurately located at design spacing indicated.
 - C. Provide proper lifting equipment, including spreader bar, suited to sizes and types of trusses required, applied at lift points recommended by truss fabricator. Exercise care to avoid damage to truss members during erection and to keep horizontal bending of the trusses to a minimum.
 - D. Provide framing anchors as indicated or accepted on the engineering design drawing or erection drawings. Anchor trusses securely at bearing points.
 - E. Install trusses plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations.
 1. DO NOT cut truss members without prior approval of truss engineer.
 2. Fasten cold-formed steel trusses by screw fastening, welding or other methods, as standard with fabricator.
 - a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to cold-formed truss manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
 3. Install trusses in one-piece lengths, unless splice connections are indicated.
 4. Provide installation bracing and leave in place until trusses are permanently stabilized.

- F. Erection Tolerances: Install trusses to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Space individual trusses no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Limit out-of-plane bow and plumb per LGSEA "Field Installation Guide".
- G. Repair or replace damaged chords, webs, and complete trusses as directed and approved in writing in advance by the Truss Component Manufacturer.

3.03 ROOF TRUSS INSTALLATION

- A. Install trusses per installation documents provided for in Section 1.4 (D).
- B. Space trusses per sealed truss drawings.
- C. Do not alter, cut, or remove truss members or connections of truss members.
- D. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacing indicated.
- E. Erect trusses without damaging truss members or connections.
- F. Anchor trusses securely at all points of support, per installation documents provided for in Section 1.04 (D).
- G. Install all continuous bridging and permanent truss bracing per installation documents provided for in Section 1.04 (D).
- H. Perform all truss-to-truss connections per installation documents provided for in Section 1.04 (D).

3.04 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanizing repair paint according to ASTM A780 and the manufacturer's instructions.

3.05 FIELD QUALITY CONTROL

- A. Engineer will provide inspection service to inspect field connections, see section 01 45 02.

END OF SECTION 05440

SECTION 06100
ROUGH CARPENTRY

PART 1 - PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This section includes the requirements for rough carpentry work shown on the Drawings and whatever rough carpentry may be required to properly construct the project. Materials and installation requirements shall be as specified and accepted practices of the trade for work and materials commonly assigned to rough carpentry and as specified in other sections of the work.

- A. Rough carpentry work includes, but is not limited to, the following:
 - 1. Wood framing and/or blocking of walls, roofs, parapets and decks.
 - 2. Wood grounds, nailers, blocking and sleepers.
 - 3. Temporary railings, enclosures, forms and rough hardware and anchoring devices.
 - 4. Installation of hollow metal frames.

1.02 QUALITY ASSURANCE

- A. Lumber Standards: Shall comply with PS-20-70 for each indicated use, including moisture content not to exceed 19 percent, and actual size related to the indicated nominal sizes, except as otherwise indicated.
- B. Plywood Standards: Shall comply with PS-1-74 and APA's requirements, except as otherwise indicated for each use.
- C. Factory mark each piece of lumber and plywood with type, grade, mill and grading agency identification; except omit marking from surfaces to receive transparent finish and submit mill certificate that material has been inspected and graded in accordance with requirements if it cannot be marked on a concealed surface.
- D. Certificate of inspection and grading by a recognized agency may be submitted with each shipment, in lieu of factory marking at Contractor's option.

1.03 SUBMITTALS

- A. Wood Treatment Data: Submit chemical treatment manufacturer's instructions for proper use and handling of treated material.
- B. Submit certification of drying to 19 percent moisture content after

treatment.

- C. For pressure treatment of each type specified, submit certificates of compliance from the treating plant stating chemicals and process used, net amount of salts retained and conformance to the following specifications:
 - 1. Wolmanized (CCA), meeting AWPA.
 - 2. Standard P-5 and conforming to AWPA.
 - 3. Standard LP-2

1.04 PRODUCT HANDLING

Keep rough carpentry materials dry during delivery, storage, and handling. Store lumber and plywood in stacks with provisions for air circulation within stacks. Protect bottom of stacks against contact with damp surfaces. Protect exposed materials against weather.

1.05 JOB CONDITIONS

- A. Time delivery and installation of carpentry work to comply with protection and storage requirements.
- B. Examine substrates and supporting structure and conditions under which work is to be installed and notify Engineer in writing of conditions detrimental to work. Do not proceed with installation until unsatisfactory conditions have been corrected.
- C. Correlate location of furring, nailers, blocking, grounds and similar supports so that attached work will comply with design requirements.

PART 2 - MATERIALS

2.01 MATERIALS

- A. All materials that could be exposed to moisture, such as roof blocking, plates, grounds, etc., shall be wolmanized treated.
- B. Light Framing: For framing 2 inches to 4 inches thick and not exceeding 6 inches in width, provide:
 - 1. Southern Pine, Grade Number 2.
 - 2. Douglas Fir-Larch, Grade Number 2.
- C. Board Lumber:
 - 1. Where lumber less than 2 inches in nominal thickness is shown or specified, provide boards dressed S4S, Grade Number 2, Southern Pine.
 - 2. Moisture Content: 19 percent maximum, mark boards "S-DRY".

- D. Miscellaneous Lumber:
1. Provide wood for support or attachment of other work such as cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members. Provide lumber of the sizes shown or specified, worked to shapes shown and as follows:
 2. Grade: Construction Grade light framing size lumber of any species or board size lumber as required. Provide Construction Grade boards or Number 2 boards (SPIB or WWPA).
- E. Anchorage and Fastening Materials: Select proper type, size material and finish for each application. Comply with the following:
1. Nails and Staples: FS FF-N-105.
 2. Wood Screws: FS FF-S-111.
 3. Bolts and Studs: FS FF-B-575.
 4. Nuts: FS FF-N-836.
 5. Washers: FS FF-W-92.
 6. Lag Screws or Lag Bolts: FS FF-B-561
 7. Masonry Anchoring Devices: For expansion shields, nails, and drive screws, comply with FS FF-S-325.
 8. Bar and Strap Anchors: ASTM A575 carbon steel bars.
 9. Framing Anchors: Shall be of the type best suited for the connection or detailed as manufactured by Simpson, Silver, Hickman, or equal, having ICBO approval, or proper gauge and galvanized metal.

PART 3 - EXECUTION

3.01 Installation

- A. General
1. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with a minimum of joints or the optimum joint arrangement.
 2. Fit carpentry work to other work. Scribe and cope as required for accurate fit.
 3. Set carpentry work accurately to required levels and lines with members plumb and true.

4. Shim with metal or slate for bearing on concrete and wood shakes at masonry substrates. Where indicated, grout with one part Portland cement to three (3) parts sand for full bearing.
 5. Securely attach carpentry work to substrates by anchoring and fastening as shown and as required such as Hilti pneumatic fastening, or equal.
 - a. Provide washers under bolt heads and nuts in contact with wood.
 - b. Nail plywood to comply with the recommendations of the American Plywood Association.
 - c. All fasteners exposed to exterior shall be galvanized or cadmium plated.
 6. Store all timber open-stacked in piles at least one foot above the ground surface, properly supported to prevent warping. Timber shall be covered to shed water and for protection from weather. Timber shall not be stored in flood prone areas.
- B. Fasteners: Use common wire nails, except as otherwise shown or specified herein. Use finishing nails for exposed work. Do not wax or lubricate fasteners that depend on friction for holding power. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required. Do not drive threaded friction type fasteners; turn into place. Tighten bolts and lag screws at installation and retighten as required for tight connections prior to closing in or at completion of work.
- C. Wood Grounds, Nailers, Blocking and Sleepers:
1. Provide wherever shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached or screeded.
 2. Coordinate location with other work; refer to shop drawings of such work if applicable.
 3. Attach to substrates securely with anchor bolts or other attachment devices as shown and as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry as work progresses, cutting to fit masonry unit size involved. Anchor to formwork before concrete placement.
 4. Provide grounds of dressed, key bevelled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary

grounds when no longer required. Where indicated as permanent grounds, provide treated lumber.

D. Wood Furring:

1. Install plumb and level with closure strips at edges and openings. Shim with wood as required.
2. Fire stop furred spaces on walls at each floor level with wood blocking or incombustible materials accurately fitted to close furred spaces. Comply with governing regulations. Use only as necessary.
3. Tolerance: Shim and level wood furring to a tolerance of 1/8-inch in 10 feet.
4. Installation shall be provided where shown and as necessary for facing materials specified. Except as shown otherwise, furring strips shall be 1- inch by 3-inches continuous, and spaced 24 inches on center. Furring shall be erected vertically or horizontally as necessary. Furring strips shall be nailed to trusses and to masonry. Wood plugs shall not be used. Furring strips shall be anchored near ends and at a 2 foot interval between. Furring strips shall be provided around openings, behind bases, and at angles and corners. Furring shall be plumb, rigid and level, and shall be shimmed as necessary to provide a true, even plane with surfaces suitable to receive the finish required. Furring for cornices, offsets and breaks in walls or ceilings shall be formed on 1-inch by 3-inch wood strips spaced 16 inches on center.

- E. Plywood: Comply with recommendations of American Plywood Association for fabrication and installation of plywood work. Provide thickness shown, or if not shown, provide as recommended by APA "Guide to Plywood Sheathing for Floors, Walls, and Roofs" for spacing of supports and types of substrates involved in the work.

END OF SECTION 06100

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SECTION 06160

SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Wall sheathing.
- 2. Sheathing joint and penetration treatment.

- B. Related Requirements:

- 1. **Section 061000 "Rough Carpentry"** for plywood backing panels.
- 2. Section 072500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
 - 3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
 - 4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Foam-plastic sheathing.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WALL SHEATHING

- A. Foil-Faced, Polyisocyanurate-Foam Wall Sheathing: ASTM C 1289, Type I, Class 1, Grade 3, rigid, cellular, polyisocyanurate thermal insulation with minimum **15-mil- (0.38-mm-)** thick foil facers on both sides. Foam-plastic core shall have a flame-spread index of 25 or less.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Hunter Panels LLC; Xci Class A or a comparable product by one of the following:
 - a. Atlas EPS; a Division of Atlas Roofing Corporation.
 - b. Carlisle Coatings & Waterproofing Inc.
 - 2. Thickness: **1 inch (25 mm)**
 - 3. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For **wall** sheathing, provide fasteners **with hot-dip zinc coating complying with ASTM A 153/A 153M**.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Composite Nail Base Insulated Roof Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117. Provide washers or plates if recommended by sheathing manufacturer.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

- E. Coordinate **wall and roof** sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 FOAM-PLASTIC SHEATHING INSTALLATION

- A. Comply with manufacturer's written instructions.
- B. Foam-Plastic Wall Sheathing: Install vapor-relief strips or equivalent for permitting escape of moisture vapor that otherwise would be trapped in stud cavity behind sheathing.
- C. Apply sheathing tape to joints between foam-plastic sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

END OF SECTION 061600

SECTION 06200

FINISH CARPENTRY

PART 1 - GENERAL

1.01 THE REQUIREMENTS

- A. Furnish all labor, materials, equipment and appliances required for the complete execution of Work as shown on the Drawings and specified herein.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Architectural Woodwork Institute (AWI) -"Architectural Woodwork Quality Standards."

1.03 SUBMITTALS

- A. In accordance with the procedures and requirements set forth in Section 01300 –Submittals, submit the following:
 - 1. Manufacturer's product data.
 - 2. Certification that woodwork manufacturer's work complies with the quality grades and other requirements indicated.
 - 3. Plastic laminate color samples. Up to two colors will be selected.

1.04 SHIPPING, HANDLING AND STORAGE

- A. Protect finish carpentry during transit, delivery, storage, and handling to prevent damage, soiling, and deterioration.
- B. Do not deliver woodwork, until painting, wet work, sanding, and other similar operations have been completed.

PART 2 - PRODUCTS

2.01 PLASTIC LAMINATE

- A. Acceptable manufacturers
 - 1. Formica Corporation
 - 2. Nevamar Corporation
 - 3. Wilsonart

- B. NEMA LD-3, of thickness, type and grade designation indicated.
 - 1. Horizontal: General purpose, NEMA Standard - GP50.
 - 2. Vertical: General purpose, NEMA Standard - GP28.
 - 3. Countertops: General purpose, NEMA Standard - GP50.

2.02 WOOD PRODUCTS

- A. Particleboard: ANSI A-208.1, mat-formed, Grade 1-M-2 with minimum density of 45 pounds per cubic foot, internal bond of 60 psi; and a minimum screw holding capacity of 225 pounds on facades and 200 pounds on edges.
- B. Plywood: APA INT.
- C. Standing and Running Trim: Southern Yellow Pine, Grade clear.

2.03 FASTENERS AND ANCHORAGES

- A. Provide nails, screws, and other anchoring devices of the type, size, material, and finish required for the application indicated to provide secure attachment, concealed where possible, and complying with applicable standards and codes.

2.04 HARDWARE

- A. Hinges: Concealed, 165 degree swing, self closing.
- B. Wire pulls: 4" stainless steel.
- C. Drawer slides: Full extension, ball bearing, 100 pound capacity.
- D. Shelf standards: Surface mounted, Model # 255 by K&V. Shelf clips, Model #256 by K&V.

2.05 CASEWORK

- A. Construction Style: Flush Overlay.
- B. Construction: Plastic laminate clad cabinets complying with AWI Section 400, and its Division 400B "Laminate Clad Cabinets", custom grade.

2.06 COUNTERTOPS

- A. Exposed surfacing material: High pressure plastic laminate, General Purpose Type (GP 50).

- B. Substrate: Particle board. Nominal thickness at edge 1-1/2 inch.

2.07 FINISHES

- A. Exposed surfaces which do not receive plastic laminate, including interior of cabinets and drawers, bottom and edges of shelves, etc. shall be filled and stained, sealed, and then two finish coats of clear varnish or polyurethane.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Use only sound, thoroughly seasoned, well manufactured materials of the congest practical lengths and sizes to minimize jointing. Use materials free from warp which cannot be easily corrected by anchoring and attachment. Sort out and discard warped material and material with either defects which would impair the quality of the work.
- B. Securely attach carpentry to substrates by anchoring and fastening as shown, and as required by recognized standards.
- C. Provide washers under bolt heads and nuts in contact with wood.
- D. Nail plywood to comply with the recommendations of the American Plywood Association.
- E. Countersink nail heads on exposed carpentry work and fill holes.
- F. Set carpentry work accurately to required levels and lines with members plumb and true and accurately cut and fitted.
- G. Shim with metal for full bearing on concrete, steel, or masonry substrates.

3.02 CASEWORK CONSTRUCTION

- A. Construct casework without face frames and of hardwood plywood and edging. No exposed plywood edges will be accepted. All joinery and fastenings shall be concealed from view and meet accepted standards as endorsed by the Architectural Woodwork Institute.
- B. Assemble casework square and install plumb, level, and true to the building structure. Scribe casework, as required to fit around columns, chases and other conditions.
- C. Protect from damage before, during, and after installation. Damaged casework shall be removed and replaced with equivalent.

Broad Creek WTP
New Operator Building

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END OF SECTION 06200

SECTION 07130

BELOW GRADE VAPOR RETARDERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Application of an underslab vapor retarder.

1.02 RELATED SECTIONS

- A. Section 03300 - Concrete.
- B. Section 07100 – Dampproofing and Waterproofing.

1.03 REFERENCES

- A. ASTM D1709 - 09 Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
- B. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- C. ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs.
- D. ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- E. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
- F. ASTM F1249-01 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

1.04 SUBMITTALS

- A. Comply with Section 01330 - Submittal Procedures.
- B. Submit manufacturer's product data and application instructions.

1.05 QUALITY ASSURANCE

- A. Use an experienced installer and adequate number of skilled personnel

who are thoroughly trained and experienced in the application of the vapor retarder.

- B. Obtain vapor retarder materials from a single manufacturer regularly engaged in manufacturing the product.
- C. Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

1.06 PRECONSTRUCTION MEETING

- A. Pre-Construction Meeting: Convene one week prior to installation of underslab vapour retarder. Attendees to be as follows: - Architect, Engineer, General Contractor, Vapor Retarder Installer, and Vapor Retarder Manufacturer to discuss the application in detail.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store materials in a clean, dry area in accordance with manufacturer's instructions.
- C. Protect materials during handling and application to prevent damage or contamination.
- D. Ensure membrane is stamped with manufacturer's name, product name, and membrane thickness at intervals of no more than 85" (220 cm).

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Product not intended for uses subject to abuse or permanent exposure to the elements.
- B. Do not apply on frozen ground.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. W. R. MEADOWS, INC., PO Box 338, Hampshire, Illinois 60140-0338. (800) 342-5976. (847) 683-4500. Fax (847) 683-4544. Web Site www.wrmeadows.com.

2.02 MATERIALS

- A. Plastic Vapor Retarder

1. Performance-Based Specification: Vapor retarder membrane shall be manufactured from virgin polyolefin resins, and when tested according to all requirements of ASTM E1745, shall meet the following minimum performance requirements:
 - a. Maximum Water Vapor Permeance (ASTM E154 Sections 7, 8, 11, 12, 13, by ASTM E96, Method B or ASTM F1249)
 - 1) As received: 0.0063 perms.
 - 2) After Wetting and Drying: 0.0052 perms.
 - 3) Resistance to Plastic Flow and Temperature: 0.0057 perms.
 - 4) Effect Low Temperature and Flexibility: 0.0052 perms
 - 5) Resistance to Deterioration from Organisms and Substances in Contacting Soil: 0.0052 perms.
 - b. Puncture Resistance (ASTM D1709): >3,200 grams.
 - c. Tensile Strength ASTM E154, Section 9: 72 Lb. Force/Inch

2.03 ACCESSORIES

A. Seam Tape

1. High Density Polyethylene Tape with pressure sensitive adhesive. Minimum width 4" (100 mm).
 - a. Perminator Tape by W.R. Meadows.

B. Pipe Collars

1. Construct pipe collars from vapor retarder material and pressure sensitive tape per manufacturer's instructions.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

- A. Prepare surfaces in accordance with manufacturer's instructions.
- B. Level, tamp, or roll earth or granular material beneath the slab base.

3.02 EXAMINATION

- A. Examine surfaces to receive membrane. Notify architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.03 APPLICATION

- A. Install the vapor retarder membrane in accordance with manufacturer's instructions and ASTM E 1643-98.
- B. Unroll vapor retarder with the longest dimension parallel with the direction of the pour.
- C. Lap vapor retarder over footings and seal to foundation walls.
- D. Overlap joints 6" (152 mm) and seal with manufacturer's tape.
- E. Seal all penetrations (including pipes) with manufacturer's pipe boot.
- F. No penetration of the vapor retarder is allowed except for reinforcing steel and permanent utilities.
- G. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6" (152 mm) and taping all four sides with tape.

END OF SECTION 07130

SECTION 07210
THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Extruded polystyrene foam-plastic board.
 - 2. Glass-fiber blanket.
- B. Related Requirements:
 - 1. Section 061600 "Sheathing" for foam-plastic board sheathing installed directly over wood or steel framing.
 - 2. **Section 092900 Gypsum Board** for sound attenuation blanket used as acoustic insulation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

- A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.
- B. Extruded Polystyrene Board, Type IV: ASTM C 578, Type IV, 25-psi (173-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Owens Corning; FOAMULAR 250 or a comparable product by one of the following:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Kingspan Insulation.
 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 GLASS-FIBER BLANKET

- A. Insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Glass-Fiber Blanket, Polypropylene-Scrim-Kraft Faced: ASTM C 665, Type II (nonreflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Owens Corning; EcoTouch Flame Spread 25 FIBERGLAS Insulation or a comparable product by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.

2.3 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AGM Industries, Inc.
 - b. Gemco.
 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.
- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AGM Industries, Inc.
 - b. Gemco.
 2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
 - a. Attic spaces.
- C. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch (25 mm) between face of insulation and substrate to which anchor is attached.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Gemco.
- D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AGM Industries, Inc.
 - b. Gemco.

2.4 ACCESSORIES

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF SLAB INSULATION

- A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of **24 inches (610 mm)** below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 - 1. If not otherwise indicated, extend insulation a minimum of **24 inches (610 mm)** in from exterior walls.

3.4 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.

- B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
 2. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
 4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.5 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Maintain **3-inch (76-mm)** clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 5. For metal-framed wall cavities where cavity heights exceed **96 inches (2438 mm)**, and the insulation does not completely fill the cavity, support unfaced blankets mechanically and support faced blankets either mechanically or by taping flanges of insulation to flanges of metal studs.
 6. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward **interior of construction**.

3.6 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation

is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 07253

SNOW GUARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Sections includes:
 - 1. Snow guard Brackets
 - 2. Seam-mounted snow guards
 - 3. Fence-type snow guards

1.03 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for snow guard brackets, seam-mounted snow guards, and fence-type snow guards.
 - 1. Engineering Calculations: For snow-bracket system anchoring and roof system stamped and sealed by an engineer licensed in the Project's jurisdiction.
- B. Shop Drawings: Include roof plans indicating layouts and attachment details of snow guard brackets, seam-mounted snow guards, and fence-type snow guards.
 - 1. Include details of snow guard brackets, seam-mounted snow guards, and fence-type guards.
 - 2. Include calculation of number and location of snow guard brackets, seamed-mounted snow guards, and fence-type snow guards based on ground snow load, roof slope, roof type, components, spacings, and sheathing type.
- C. Samples: Base, bracket, and 12-inche-(300-mm-) long fence.
- D. Delegated Design Submittal: For snow guards, include analysis reports signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Include calculation of number and location of snow guards.

1.04 INFORMATION SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that the engineer is licensed in the state in which the Project is located.
- B. Product Test Reports: For each type of snow guard bracket, seam-mounted snow guard, and fence-type snow guard, for tests performed by a qualified testing agency, indicating load at failure of attachment to roof system identical to roof system used on this Project.

1.05 WARRANTY

- A. Special Warranty on Snow Guard Brackets, Seam-Mounted Snow Guards, and Fence-Type Snow Guards: Manufacturer's standard form in which manufacturer agrees to replace and ship snow guard components that fail to meet engineered design loads within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

1.06 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit adhesive-mounted snow guards to be installed, and adhesive cured, in accordance with adhesive manufacturer's written instructions.

PART 2 – PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design snow guards, including attached to roofing material and roof deck, as applicable for attachment method, based on the following:
 - 1. Roof snow load
 - 2. Roof slope
 - 3. Roof type
 - 4. Roof dimensions
 - 5. Roofing substrate type and thickness
 - 6. Snow guard type
 - 7. Snow guard fastening method and strength

8. Snow guard spacing
9. Coefficient of Friction Between Snow and Roof Surface: 0.
10. Factor of Safety: **2**

B. Performance Requirements: Provide snow guard brackets, seam-mounted snow guards, and fence-type snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

C. Structural Performance: Snow guards shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Snow Loads: As indicated on Drawings.

2.02 RAIL-TYPE SNOW GUARDS

A. Rail-Type, Seam-Mounted Snow Guards:

1. Basis-of-Design Product: Subject to compliance with requirements, provide TRA snow and Sun, Inc.: C21Z Clamp-On Snow Guard or comparable product by one of the following:
 - a. Alpine SnowGuards, a division of Vermont Slate & Copper Service, Inc
 - b. Berger Building Products, Inc
 - c. IceBlox, Inc
 - d. LMCurbs
 - e. PMC Industries, Ltd.
 - f. Rocky Mountain Snow Guards, Inc.
2. Description: Units fabricated from metal with two rail options
3. Seam Clamp Material: Aluminum
4. Pipe Material: ASTM B221 (ASTM B221M) aluminum
 - a. Pipe Tubing Thickness: 0.0510 mil (1.295 um)
5. Finish: Powder coat colors
 - a. Color: Powder coat: RAL color as selected by Architect from manufacturer's full range.

2.03 FASTENERS

A. Aluminum Roof: Use stainless steel for fasteners and anchors recommended by manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation and attachment tolerances of snow guard brackets, seam-mounted snow guards, and fence-type snow guards, and other conditions affecting performance of the Work.
 - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Verify that roofing materials, framing, decking, and fasteners are capable of resisting design forces in accordance with authorities having jurisdiction.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean and prepare substrates for securing snow guard brackets, seam-mounted snow guards, and fence-type snow guards; remove loose and foreign matter that could interfere with installation or performance.
- B. Prime substrates in accordance with snow guard manufacturer's written instructions.

3.03 INSTALLATION

- A. Install snow guards in accordance with manufacturer's written instructions [Space brackets horizontally and in rows as recommended by manufacturer].
 - 1. Bracket fasteners to penetrate a minimum $\frac{3}{4}$ inch (19mm) into the sheathing substrate or go all the way through.
- B. Attachment for Standing-Seam Metal Roofing:
 - 1. Do not use fasteners that will penetrate metal roofing or fastening methods that void metal roofing finish warranty.
 - 2. Rail-Type, Seam-Mounted Snow Guards: Aluminum clamps attached to vertical ribs of standing-seam metal roof panels.
 - a. Install brackets to vertical ribs in straight rows.
 - b. Secure with stainless steel set screws, incorporating round nonpenetrating point, on same side of standing seam.
 - c. Torque set screw in accordance with manufacturer's written instructions.

- d. Install cross members to brackets.

END OF SECTION 07253

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SECTION 07411

STANDING SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Architectural standing-seam metal roof panels.
2. Metal roof accessories.
3. Roof insulation.
4. Miscellaneous metal framing.

- B. Related Sections:

1. Division 05 Section "Structural Steel Framing" for steel roof purlins supporting metal roof panels.
2. Division 05 Section "Cold-Formed Metal Framing" for engineered cold-formed metal roof framing supporting metal roof panels.
3. Division 07 Section "Sheet Metal Flashing and Trim" for field- or shop- formed fasciae, copings, flashings, roof drainage systems, and other sheet metal work not part of metal roof panel assemblies.
4. Division 07 Section "Roof Specialties" for manufactured fasciae, copings, roof drainage systems, and other roof specialties not part of metal roof panel assemblies.
5. Division 07 Section "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

1.3 DEFINITIONS

- A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight roofing system.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal roof panel Installer, metal roof panel manufacturer's representative, substrate Installer, and installers whose work interfaces with or affects metal roof panels including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal roof panel installation, including manufacturer's written instructions.
4. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
5. Review structural loading limitations of substrate during and after roofing.
6. Review flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
7. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
8. Review temporary protection requirements for metal roof panel assembly during and after installation.
9. Review roof observation and repair procedures after metal roof panel installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of roof panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details specific to project, signed and sealed by the qualified professional engineer responsible for their preparation. Distinguish between factory- and field-assembled work.
- C. Accessory Details: Include details of the following items:
 1. Flashing and trim.
 2. Pipe penetration flashings.
 3. Gutters.
 4. Downspouts.
- D. Delegated-Design Submittal: For metal roof panel assembly indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the metal roof panel manufacturer's qualified professional engineer responsible for their preparation. Include the following:

1. Structural analysis data indicating compliance with Performance Requirements Article.

E. Shop Drawings for Snow Guards: By snow guard manufacturer. Show fabrication and installation layouts and attachment to other construction.

F. Samples for Initial Selection: For each type of metal roof panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer, Installer, professional engineer, and manufacturer's technical representative.

1. Submit Installer qualifications in the form of an original letter on manufacturer's letterhead signed by authorized manufacturer representative.

B. Material Certificates: For thermal insulation, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product. Indicate compliance with requirements in Performance Requirements Article:

1. Water Penetration.
2. Hydrostatic-Head Resistance.
3. Wind-Uplift Resistance.

D. Field Quality Control Reports.

E. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal roof panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer of plant-fabricated metal roof panel systems listed in this Section and meeting performance requirements, with a minimum of five years experience providing metal roof panel systems for projects of similar type and scope, offering engineering, warranty, technical inspection, and maintenance inspection services specified.

B. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years experience installing similar work, able to communicate verbally with Contractor, Architect, and employees, and qualified by the manufacturer to furnish warranty of type specified.

1. Manufacturer's On-Site Roll Former Operators: Experienced full-time employees of metal roof panel manufacturer.
- C. Professional Engineer Qualification: A qualified professional engineer licensed in the project state, and experienced in metal roof panel system design similar to that required for Project.
- D. Manufacturer's Technical Representative Qualifications: An authorized full-time employee representative of manufacturer, certified as a Registered Roof Observer by the Roof Consultants Institute, and experienced in the installation and maintenance of the specified roof panel system and qualified to determine Installer's compliance with the requirements of this Project.
- E. Source Limitations: Obtain metal roof panels and accessories and related engineered structural support members from a single source supplied or approved by metal roof panel manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.
- B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect strippable protective covering on metal roof panels from exposure to sunlight and high humidity, except to extent necessary for period of metal roof panel installation.
- E. Protect foam-plastic insulation as follows:
 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.10 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed according to manufacturer's written instructions and warranty requirements.

- B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

1.11 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal roof panels with rain drainage work, flashing, trim, and construction of substrate, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

- A. Warranty, General: Warranties specified shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Roof System Warranty, General: Warranties specified in this Section include the following components and systems specified in other sections supplied by the metal roof panel manufacturer:
 - 1. Manufactured copings, roof edge, counterflashings, and reglets.
 - 2. Roof curbs, hatches, and penetration flashings.
 - 3. Roof expansion joint assemblies.
 - 4. Low slope-roofing system.
 - 5. Metal wall and soffit panels and trim.
 - 6. Penetration flashings.
 - 7. Wall expansion joint assemblies.
- C. Special Warranty for Metal Roof Panels: Written warranty in which Manufacturer agrees to repair or replace metal roof panels that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: 5 years from date of Substantial Completion.
- D. Special System Weathertightness Warranty for Metal Roof Panels: Written warranty in which Manufacturer agrees to repair or replace metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

2. Limit of Warranty Coverage: Not to exceed original installed cost of metal roof panel assembly including labor and materials.
3. Qualified Installer Requirement: Installer must meet requirements in Quality Assurance Article.
4. Installation Inspection Requirement: By manufacturer's technical representative in accordance with requirements of Part 3 Field Quality Control Article.
5. Annual Manufacturer Inspection Requirement: By qualified manufacturer's technical representative, to report maintenance responsibilities to Owner necessary for preservation of Owner's warranty rights. The cost of manufacturer's annual inspections is included in the Contract Sum. Inspections to occur in Years 2, 5, 10, and 15 following Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturers/Products: Subject to compliance with requirements, provide products by one of the following manufacturers comparable to the Basis of Design product specified:
 1. Tremco, Inc., Beachwood, OH, (800) 562-2728, www.tremcoroofing.com.
 2. Substitutions: Approved Equal

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal roof panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Design metal roof panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Structural Performance: Provide metal roof panel assemblies and related engineered structural support members specified in Division 05 Section "Cold-Formed Metal Framing" withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 1. Wind Loads: As indicated on Drawings.
 2. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- D. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 1. Uplift Rating: UL 90.

- E. Hail Resistance: Provide metal roof panel assemblies listed with UL as Class 4 hail resistant panels.
- F. Air Infiltration: Air leakage through assembly of not more than the following when tested according to ASTM E 1680, based upon 16 inch (406 mm) wide panel:
 - 1. Maximum .0001 cfm/sq. ft. (0.001 L/s x sq. m) of roof area at test-pressure difference of -1.57 lbf/sq. ft. (-75.2 Pa).
 - 2. Maximum .0028 cfm/sq. ft. (.014 L/s x sq. m) of roof area at test-pressure difference of -20.00 lbf/sq. ft. (-958 Pa).
- G. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 20.00 lbf/sq. ft. (958 Pa).
- H. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.
- I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.3 ARCHITECTURAL STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
 - 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
- B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Factory-formed with vertical ribs at panel edges and flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, and mechanically seaming panels together.
 - 1. Basis-of-Design Product: Tremco, Inc., TremLock T-238.
 - 2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 50 (Class AZM150 coating designation, Grade 340), with chromate acrylic coating; structural quality.
 - a. Thickness: 0.0236 inch/24 ga nominal thickness.
 - b. Surface: Smooth, flat finish.

- c. Exposed Finish: Exposed metallic coating.
- 3. Clips: Special 1 3/4" offset fixed clips to accommodate thermal movement designed to hold the panel above the ribs of the existing roof system; intermittent or continuous clips as required to meet performance requirements; and with clip bearing plate where required.
 - a. Material: 0.064-inch-nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
 - 4. Joint Type: Field mechanically seamed.
 - 5. Seam Cap: Match panel material and finish; provide with two rows of integral factory hot-applied sealant.
 - 6. Panel Pan Configuration: Pencil Ribbed and Planked.
 - 7. Panel Seam Height: Not less than 2-3/8 inch (60.3 mm).
 - 8. Panel Coverage: 20 inches

2.4 METAL ROOF ACCESSORIES

- A. Metal Roof Accessories, General: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
- B. Panel Sealants: Provide one of the following identical to that used in test panels meeting performance requirements:
 - 1. Sealant Tape: Pressure-sensitive, 99 percent solids, gray polyisobutylene or butyl rubber compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1 inch (25 mm) wide and 1/8 inch (3 mm) thick, with nylon spacer beads to prevent overcompression of the sealant tape.
 - 2. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311, with nylon spacer beads to prevent overcompression of the sealant tape.
- C. Flashing and Trim: Formed from same material as roof panels, prepainted with coil coating, minimum 0.0236 inch thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.
- D. Pipe Penetration Flashings: Flexible boot type, with stainless steel compression ring, and stainless steel pipe strap. Use silicone-type boot at hot pipes.

- E. Gutters: Formed from same material roof panels. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (900 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.
- F. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.
- G. Pipe Penetration Flashing: Premolded EPDM pipe collar with flexible aluminum ring bonded to base and stainless steel pipe clamp to secure collar to pipe.
- H. Snow Guards: Prefabricated, noncorrosive units designed to be installed without penetrating metal roof panels, and complete with predrilled holes, clamps, or hooks for anchoring.
 - 1. Seam-Mounted, Bar-Type Snow Guards: Aluminum rods or bars held in place by stainless-steel clamps attached to vertical ribs of standing-seam metal roof panels.
 - a. Aluminum Finish: High-performance coating to match metal roof panels.
 - b. Products:
 - 1) S-5! Colorguard

2.5 FIELD-INSTALLED THERMAL INSULATION

- A. Expanded Polystyrene: 1 pound density 1 ½" thick, notched on the bottom to fit over the existing roof panel and ½" narrower than the new roof panel.

2.6 MISCELLANEOUS METAL FRAMING

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G60 (Z180) hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated. For engineered structural support members, refer to Division 05 Section "Cold-Formed Metal Framing."
- B. Zee Clips: 0.079-inch (2.01-mm) nominal thickness.
- C. Base or Sill Channels: 0.079-inch (2.01-mm) nominal thickness.
- D. Hat-Shaped, Rigid Furring Channels:
 - 1. Nominal Thickness: As required to meet performance requirements, but not less than 0.025 inch (0.64 mm).

2. Depth: As indicated.

E. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), and depth required to fit insulation thickness indicated.

1. Nominal Thickness: As required to meet performance requirements.

F. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.7 MISCELLANEOUS MATERIALS

A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.8 FABRICATION

A. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal roof panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.

E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

2. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

3. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal roof panel manufacturer for application, but not less than thickness of metal being secured.

2.9 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.
 1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
 2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.
- B. Miscellaneous Framing: Install subpurlins, eave angles, furring, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written instructions.

3.3 THERMAL INSULATION INSTALLATION

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Extend insulation in thickness indicated to cover entire roof. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Seal all joints and penetrations air- and vapor-tight.

3.4 METAL ROOF PANEL INSTALLATION, GENERAL

- A. Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
- B. Thermal Movement. Rigidly fasten metal roof panels to structure at one and only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction. Predrill panels for fasteners.
 - 1. Point of Fixity: Fasten each panel along a single line of fixing located at eave.
 - 2. Avoid attaching accessories through roof panels in a manner that will inhibit thermal movement.
- C. Install metal roof panels as follows:
 - 1. Commence metal roof panel installation and install minimum of 300 sq. ft. (27.8 sq. m.) in presence of factory-authorized representative.
 - 2. Field cutting of metal panels by torch or abrasive saw is not permitted.
 - 3. Install panels perpendicular to supporting purlins.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Provide metal closures at rake edges, rake walls, and each side of ridge and hip caps.
 - 6. Flash and seal metal roof panels with weather closures at eaves, rakes, and perimeter of all openings.
 - 7. Install ridge and hip caps as metal roof panel work proceeds.
 - 8. Install metal flashing to allow moisture to run over and off metal roof panels.
- D. Fasteners:
 - 1. Steel Roof Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized-steel fasteners for surfaces exposed to the interior.
- E. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

- F. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
- G. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.
 - 1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.5 METAL ROOF PANEL INSTALLATION

- A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.
 - 1. Install clips to supports with self-tapping fasteners.
 - 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 - 3. Erection Tolerances: Shim and align metal roof panel units within installed tolerance of 1/4 inch in 20 feet (1:960) on slope and location lines as indicated and within 1/8-inch (3 mm) offset of splices and alignment of matching profiles.
 - 4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
 - 5. Watertight Installation:
 - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
 - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.

3.6 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

- B. Flashing and Trim: Comply with performance requirements and manufacturer's written installation instructions. Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Form trim and transition joints using compressed joints with captive butyl sealant capable of resisting static water pressure. Cleated joints and exposed joint sealants do not meet this requirement.
 - 2. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 - 3. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).
- C. Gutters: Join sections with riveted and soldered or lapped, riveted, and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c. in between.
 - 1. Provide elbows at base of downspouts to direct water away from building.
 - 2. Connect downspouts to underground drainage system indicated.
- E. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.
- F. Bar-Type Snow Guards: Attach bar supports to vertical ribs of standing-seam metal roof panels with clamps or set screws in array recommended by snow guard manufacturer. Do not use fasteners that will penetrate metal roof panels.

3.7 FIELD QUALITY CONTROL

- A. Manufacturer's Technical Representative: Engage a qualified manufacturer's technical representative acceptable to Owner for a minimum of 10 full-time days on site to perform substrate examination, interim observations, and final roof inspections, and to prepare reports.
- B. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.

- C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

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SECTION 07920

JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:
 - 1. Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 2. Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 3. Interior joints in horizontal traffic surfaces.

1.02 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.03 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.

1.04 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 ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
- B. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates according to the method in ASTM C 1193 that is appropriate for the types of Project joints.
- C. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1.05 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: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 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.
- B. Colors of Exposed Joint Sealants: As selected by Engineer from manufacturer's full range.

2.02 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. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Single-Component Pourable Neutral-Curing Silicone Sealant:
 - 1. Type and Grade: S (single component) and P (pourable).
 - 2. Class: 100/50
 - 3. Uses Related to Exposure: NT and T (traffic).
 - 4. Uses Related to Joint Substrates: M, A, and O, as applicable to joint substrates indicated.
- D. Single-Component Acid-Curing Silicone Sealant:
 - 1. Type and Grade: S (single component) and NS (nonsag).

2. Class: 25.
 3. Use Related to Exposure: NT (nontraffic).
 4. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
- E. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant:
1. Type and Grade: S (single component) and NS (nonsag).
 2. Class: 25.
 3. Use Related to Exposure: NT (nontraffic).
 4. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
- F. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant:
1. Type and Grade: S (single component) and NS (nonsag).
 2. Class: 25
 3. Use Related to Exposure: NT (nontraffic).
 4. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

2.03 LATEX JOINT SEALANTS

- A. Latex Sealant: Comply with ASTM C 834, Type O P, Grade NF.

2.04 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) O (open-cell material) B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.05 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

3.01 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.
 - 2. Remove laitance and form-release agents from concrete.
 - a. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates, where 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.

3.02 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.
- 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 bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. 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.
- E. 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.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
- F. 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.

3.03 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior vertical and horizontal nontraffic construction joints in cast-in-place concrete.
1. Joint Sealant: Single-component neutral-curing silicone sealant.
 2. Joint-Sealant Color: Match Adjacent Surfaces.
- B. Joint-Sealant Application: Exterior vertical control and expansion joints in unit masonry.
1. Joint Sealant: Single-component neutral-curing silicone sealant.
 2. Joint-Sealant Color: Match mortar color.
- C. Joint-Sealant Application: Exterior perimeter joints between masonry, concrete and frames of doors windows and louvers.
1. Joint Sealant: Single-component neutral-curing silicone sealant
 2. Joint-Sealant Color: As selected by the Engineer from the manufacturer's available full range of colors.
- D. Joint-Sealant Application: Exterior control and expansion joints in ceilings and other overhead surfaces.
1. Joint Sealant: Single-component neutral-curing silicone sealant.
 2. Joint-Sealant Color: As selected by the Engineer from the manufacturer's available full range of colors.
- E. Joint-Sealant Application: Insert other exterior joints in vertical and horizontal nontraffic surfaces.
1. Joint Sealant: Single-component neutral-curing silicone sealant.
 2. Joint-Sealant Color: As selected by the Engineer from the manufacturer's available full range of colors.
- F. Joint-Sealant Application: Vertical control and expansion joints on exposed interior surfaces of exterior walls.
1. Joint Sealant: Single-component neutral-curing silicone sealant.
 2. Joint-Sealant Color: As selected by the Engineer from the manufacturer's available full range of colors.

- G. Joint-Sealant Application: Interior perimeter joints of exterior openings.
 - 1. Joint Sealant: Single-component neutral-curing silicone sealant
 - 2. Joint-Sealant Color: As selected by the Engineer from the manufacturer's available full range of colors.
- H. Joint-Sealant Application: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
 - 1. Joint Sealant: Single-component mildew-resistant neutral -curing silicone sealant.
 - 2. Joint-Sealant Color: As selected by the Engineer from the manufacturer's available full range of colors.
- I. Joint-Sealant Application: Vertical painted joints on exposed surfaces of interior partitions and perimeter of door, windows and other openings.
- J. Joint-Sealant Application: Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - 1. Joint Sealant: Latex sealant.
 - 2. Joint-Sealant Color: As selected by the Engineer from the manufacturer's available full range of colors.
- K. Joint-Sealant Application: Interior control, expansion, and isolation joints in horizontal traffic surfaces.
 - 1. Joint Sealant: Single-component pourable neutral curing silicon sealant.
 - 2. Joint-Sealant Color: As selected by the Engineer from the manufacturer's available full range of colors.

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SECTION 08113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Interior standard steel doors and frames.
 - 2. Exterior standard steel doors and frames.
- B. Related Requirements:
 - 1. Section 087111 "Door Hardware (Descriptive Specification)" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 - 7. Details of anchorages, joints, field splices, and connections.
 - 8. Details of accessories.
 - 9. Details of moldings, removable stops, and glazing.
- C. Samples for Initial Selection: For hollow-metal doors and frames with factory-applied color finishes.
- D. Samples for Verification:
 - 1. Finishes: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 127 mm).
 - 2. Fabrication: Prepare Samples approximately 12 by 12 inches (305 by 305 mm) to demonstrate compliance with requirements for quality of materials and construction:
 - a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
 - b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.
- E. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.7 INFORMATIONAL SUBMITTALS

- A. Field quality control reports.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Galaxy Metal Products; 2960 Woodbridge Ave. Edison NJ 08837; 1.800.294.8199; www.galexymetalproducts.com
- B. Ceco Door Products; 9159 Telecom Dr. Milan TN. 38358; 1.731.686.8345; www.cecodoor.com
- C. Republic Doors and Frames; 11819 N. Pennsylvania St. Carmel, IN. 46032; 888.868.8943; www.republicdoor.com

2.2 PERFORMANCE REQUIREMENTS

- A. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.38 deg Btu/F x h x sq. ft. (2.16 W/K x sq. m) when tested according to ASTM C518.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Standard-Duty Doors and Frames: ANSI/SDI A250.8, Level 1; ANSI/SDI A250.4, Level C. At locations indicated in the Door and Frame Schedule.
 - 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm).

- c. Face: Metallic-coated steel sheet, minimum thickness of 0.032 inch (0.8 mm).
- d. Edge Construction: Model 2, Seamless.
- e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
- f. Core: [Manufacturer's standard].

2. Frames:

- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
- b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
- c. Construction: Slip-on drywall.

2.4 EXTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B. At locations indicated in the Door and Frame Schedule.

1. Doors:

- a. Type: As indicated in the Door and Frame Schedule.
- b. Thickness: 1-3/4 inches (44.5 mm).
- c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm), with minimum A40 (ZF120) coating.
- d. Edge Construction: Model 2, Seamless.
- e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
- f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
- g. Bottom Edges: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
- h. Core: Manufacturer's standard.

2. Frames:

- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
- b. Construction: Full profile welded.

3. Exposed Finish: Factory.

2.5 BORROWED LITES

- A. Fabricate of metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
- B. Construction: Full profile welded.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.6 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 - 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
 - 3. Postinstalled Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at top of underlayment.
- D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.7 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.
- E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- F. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.
- G. Glazing: Comply with requirements in Section 088000 "Glazing."

2.8 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 - 1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.

1. Provide stops and moldings flush with face of door, and with beveled stops unless otherwise indicated.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

2.9 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
- B. Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, complying with ANSI/SDI A250.3.
 1. Color and Gloss: Custom color As selected by Architect..

2.10 LOUVERS

- A. Provide louvers for interior doors, where indicated, which comply with SDI 111, with blades or baffles formed of 0.020-inch- (0.5-mm-) thick, cold-rolled steel sheet set into 0.032-inch- (0.8-mm-) thick steel frame.
 1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
 2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other.
- B. Form corners of moldings with hairline joints. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with [ANSI/SDI A250.11] [NAAMM-HMMA 840].
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 - 2. Fire-Rated Openings: Install frames according to NFPA 80.
 - 3. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 4. Solidly pack mineral-fiber insulation inside frames.
 - 5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
 - 6. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
 - 1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 - 3. Smoke-Control Doors: Install doors according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 - 1. Fire-Rated Door Inspections: Inspect each fire-rated door according to NFPA 80, Section 5.2.
 - 2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements according to NFPA 101, Section 7.2.1.15.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.4 REPAIR

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- C. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.
- D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

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SECTION 08422

ALL GLASS CONFERENCE ROOM DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior swinging all glass doors to the Operator Building Conference Room.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all-glass system.
- B. Shop Drawings: For all-glass entrances.
 - 1. Include plans, elevations, and sections.
 - 2. Include details of fittings and glazing, including drawings of patch fittings and rail fittings.
 - 3. Door hardware locations, mounting heights, and installation requirements.
- C. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- D. Delegated-Design Submittal: For all-glass systems indicated to comply with performance requirements and design criteria.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For all-glass systems to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.7 WARRANTY

- A. Warranty: Manufacturer agrees to repair or replace components of all-glass systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Deflection Limits: Deflection normal to glazing plane is limited to 1/175 of clear span or 3/4 inch (19 mm), whichever is smaller.
- B. Seismic Performance: All-glass entrances shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Avanti Systems, Inc.; Solare™ acoustic, single-glazed partition system or comparable product by one of the following:
1. DORMA USA, Inc.
 2. Nana Wall Systems, Inc.

2.3 METAL COMPONENTS

- A. Fitting Configuration:
1. Manual-Swinging, All-Glass Entrance Doors: Patch fittings at head and sill on pivot side only Retain "Patch Fittings" Paragraph below for patch fittings.
- B. Patch Fittings: Stainless-steel-clad aluminum.
- C. Rail Fittings:
1. Material: Match patch-fitting metal and finish.
 2. Height:
 - a. Top Rail: 3-1/2 inches (89 mm)
 - b. Bottom Rail: 3-1/2 inches (89 mm)
 3. Profile: Tapered.
 4. End Caps: Manufacturer's standard precision-fit end caps for rail fittings.
- D. Accessory Fittings: Match patch- and rail-fitting metal and finish for the following:
1. Overhead doorstop.
 2. Center-housing lock.
 3. Glass-support-fin brackets.
- E. Anchors and Fastenings: Concealed.

2.4 GLASS

- A. Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), tested for surface and edge compression per ASTM C 1048 and for impact strength per 16 CFR 1201 for Category II materials.
1. Class 1: Clear monolithic.
 - a. Thickness: 1/2 inch (13 mm).
 - b. Locations: Conference Room Entrance Doors.
 2. Exposed Edges: Machine ground and flat polished.

3. Butt Edges: Flat ground.
4. Corner Edges: Lap-joint corners with exposed edges polished.

2.5 ENTRANCE DOOR HARDWARE

- A. General: Heavy-duty entrance door hardware units in sizes, quantities, and types recommended by manufacturer for all-glass entrance systems indicated. For exposed parts, match metal and finish of patch fittings and rail fittings.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Avanti Systems, Inc.; Pivot
- B. Concealed Floor Closers and Top Pivots: Center hung; BHMA A156.4, Grade 1; including cases, bottom arms, top walking beam pivots, plates, and accessories required for complete installation.
 1. Swing: Double acting.
 2. Opening-Force Requirements:
 - a. Accessible Interior Swinging Doors: Not more than 5 lbf (22.2 N) to fully open door.
- C. Concealed Overhead Holder: BHMA A156.8, Grade 1, with dead-stop setting coordinated with concealed floor closer.
- D. Push-Pull Set: As selected from manufacturer's full range.

2.6 FABRICATION

- A. Provide holes and cutouts in glass to receive hardware, fittings, and accessory fittings before tempering glass. Do not cut, drill, or make other alterations to glass after tempering.
 1. Fully temper glass using horizontal (roller-hearth) process, and fabricate so that when glass is installed, roll-wave distortion is parallel with bottom edge of door or lite.
- B. Factory assemble components and factory install hardware and fittings to greatest extent possible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install all-glass systems and associated components according to manufacturer's written instructions.
- B. Set units level, plumb, and true to line, with uniform joints.
- C. Maintain uniform clearances between adjacent components.
- D. Lubricate hardware and other moving parts according to manufacturer's written instructions.
- E. Set, seal, and grout floor closer cases as required to suit hardware and substrate indicated.

3.3 ADJUSTING AND CLEANING

- A. Adjust all-glass entrance doors and hardware to produce smooth operation and tight fit at contact points and weather stripping.
 - 1. For all-glass entrance doors accessible to people with disabilities, adjust closers to provide a three-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch measured to the leading door edge.
- B. Remove excess sealant and glazing compounds and dirt from surfaces.

END OF SECTION 08422

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SECTION 08511

ALUMINUM WINDOWS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes aluminum windows for exterior locations.
- B. Related Requirements:
 - 1. Section 07920 "Joint Sealants" for installation of joint sealants installed with glazed aluminum windows and for sealants to extent not specified in this Section.

1.02 PREINSTALLATION MEETINGS

- A. Pre installation Conference: Conduct Conference at Project Site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching. .
 - 3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
 - 4. Review and discuss the sequence of work required to construct a watertight and watertight exterior building envelope.
 - 5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
- B. Shop Drawings: For aluminum windows.

1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples: For each exposed product and for each color specified, 2 by 4 inches in size.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For manufacturer's warranties.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.
- B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.
- C. Mockups: Build mockups to verify selections made under Sample Submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 1. Build mockup of typical wall area as indicated on Drawings.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Structural-Sealant Glazing: Comply with ASTM C1401 for design and installation of structural-sealant-glazed window systems.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces to prevent damage.
- B. Use of adhesive papers or sprayed coating is unacceptable. Remove if present.

- C. Deliver glass units with manufacturer's labels intact on interior side of glass. Verify that labels indicate glass thickness, unit location, glass strength, and orientation of units in vertical position.
- D. Protect glass edges and corners to prevent chipping, cracking, and other damages.

1.07 WARRANTY

- A. **Manufacturer's Warranty:** Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Failure of insulating glass.
 - 2. Warranty Period:
 - a. Window: Two-years from date of manufacture and transferred to Owner on date of Substantial Completion.
 - b. Glazing Units: Ten-years from date of manufacture and transferred to Owner on date of Substantial Completion.
 - c. Aluminum Finish: Five-years from date of manufacture and transferred to Owner on date of Substantial Completion.
- B. **Special Finish Warranty, Factory-Applied Finishes:** Manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked enamel, powder coat, or organic finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.

- c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Warranty Period: Ten-years from date of manufacture and transferred to Owner on date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

2.02 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more-stringent requirements are indicated.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 1. Minimum Performance Class: Architectural AW.
 2. Minimum Performance Grade: 100.
- C. Air Leakage: Tested as follows:
 1. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.10 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa) when tested in accordance with ASTM E283.
 2. Venting Windows: Whole-window air leakage of not more than 0.1 cfm/sq. ft. (0.50 L/s per sq. m) 6.24 lbf/sq. ft. (300 Pa) when tested in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
- D. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:
 1. No evidence of water penetration when tested in accordance with a minimum static-air-of 15 lbf/sq. ft. (720 Pa).
- E. Structural: Test in accordance with ASTM E330/E33M as follows:
 1. Uniform Load Deflection: At static air pressure of +/-90 psf no member shall deflect more than 1/175 of its span.
 2. Uniform Load Structural Test: at static air pressure difference of +/- 135 psf.

- F. Life Cycle Testing: Test in accordance with AAMA 910.
1. No damage to fasteners, hardware parts, support arms, activating mechanisms, or other dam shall result in inoperable windows at testing conclusion.
 2. Windows to comply with performance requirements after completion of air leakage and water penetration testing.
- G. Resistance to Human Impact: Test in accordance with AAMA 501.8 as follows:
1. Test interior of each unit with a heavy-shot bag swung from a vertical sufficient to generate 2,000 ft. lb. (2713 Joules) of impact energy. Target impact at center-of-glass, corner, hinge, midpoint between locks, and lower jamb locking point. Repeat center-of glass impact if plies break upon impact.
 2. Window to remain intact as barrier to egress after impact testing.
- H. Thermal Transmittance: AAMA1503.1
1. Low-E glazing of [0.30 Btu/sq. ft. x h x deg F (1.71 W/sp. M x K)] [0.56 Btu/sq. ft. x h x deg F (3.18 W/sq. m x k)] **<Insert value>**.
 2. Clear glazing of [0.46 Btu/sq. ft. x h x deg F (2.67 W/sq. m x k)] [0.70 Btu/sq. ft. x h x deg F (3.97 W/sq. m x K)] **<Insert Valve>**.
- I. Solare Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of [0.40] [0.30] [0.27] **<Insert value>**.
- J. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance in accordance with AAMA 1503, showing a CRF of not less than 55.
- K. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change: 120 deg F (67 deg C) ambient; 180 deg F (100 deg C) material surfaces.

2.03 ALUMINUM WINDOWS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Oldcastle Building Envelope, a CRH Company; Signature Series 3375 or comparable product by one of the following:
1. Peerless Products Ins.
 2. Wausau Window and Wall Systems; Apogee Wausau Group, Inc.
 3. EFCO Corporation
- B. Types: Provide the following types in locations indicated on Drawings:
1. Casement: Outswing.
 2. Projected, awning.
 3. Fixed.
- C. Frame and Sash Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Thermally broken.
 2. Frame Depth: 3-3/8 inches (86mm).
 3. Sash Depth: 3-3/8 inches (86 mm).
 4. Sash Design: Overlap
 5. Exterior Glazing System: 1-inch (25-mm) IGU.
 6. Finish: High-performance organic.
 7. Fabrication Method: Shop.
 8. Aluminum: ASTM B221, Alloy 6063-T5 extrusions for framing members; ASTM B209, Alloy 5005-H-16 for sheets; or other alloys and temper recommended by manufacturer for type of use and finish indicated.
 - a. Framing Member Thickness: Minimum 0.065 inch (1.7 mm)
 - b. Sash Member Thickness: Minimum 0.065 inch (1.7 mm)
 9. Steel Reinforcement: As required by manufacturer.
 - a. Shapes and sizes to suit installation.

- D. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
1. Thermally Broken Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.
 - a. Nylon Thermal Barrier: Crimped-in-place glass reinforced polyamide 6/6 nylon struts.
- E. Insulating -Glass Units (IGU): ASTM E2190.
1. Glass: ASTM C1036, Type 1, Class 1, q3.
 - a. Tint: [Clear]
 - b. Kind: Fully tempered where indicated on Drawings.
 2. Lites: Two.
 3. Filling: Fill space between glass lites with **air**.
 4. Low-E Coating: [Pyrolytic on second surface] [Sputtered on second surface] [Sputtered on third surface] [Sputtered on second or third surface] <Insert coating>.
- F. Glazing System: Manufacture's standard factory-glazing system that produces weathertight seal.
- G. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
- H. Casement and Project Window Hardware:
1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested in accordance with ASTM E405, Method A. Provide operators that function requiring the removal of interior screens or using screen wickets.
 - a. Type and Style: As selected by Architect from manufacturer's full range of types and styles.

2. Hinges: Non-friction type, not less than two per sash.
 3. Lock: Lever handle and cam-action lock with keeper.
 4. Pole Operators: Tubular-shaped anodized aluminum; with rubber-capped lower end and standard push-pull hook at top to match hardware design; of sufficient length to operate window without reaching more than 60 inches (1500 mm) above floor; one pole operator and pole hanger per room that has operable windows more than 72 inches (1800 mm) above floor.
- I. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
 - J. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
 - K. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.04 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash.
 1. Operation: Flat.
 2. Type and Location: Full, inside for outswing Full, inside for project, awning sashes.
- B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
 1. Tubular Framing Sections and Cross Braces: Extruded aluminum shapes.
- C. Aluminum Wire Fabric: 19-by16 (1.1-by-1.3-mm) mesh of 0.011-inch-(0.28-mm-) diameter, coated aluminum wire.
 1. Wire-Fabric Finish: Charcoal gray.

2.05 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze aluminum windows in the factory.

- C. Weather strip each operable sash to provide weathertight installation.
- D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.06 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.07 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As selected by Architect from full range of industry colors and color densities.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight windows installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.
- B. 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 to produce weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.03 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
 - 1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed in accordance with AAMA 502.
 - 2. Air-Infiltration Testing:
 - a. Testing Pressure: That required to determine compliance with AMMA/WDMA/SCA 101/I.S.2/A440 performance class indicated.
 - b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WSMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.

3. Water-Resistance Testing:
 - a. Test Pressure: Two-thirds time test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
 - b. Allowable Water Infiltration: No water penetration.
4. Testing Extent: Three windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
5. Test Reports: Prepared in accordance with AAMA 502.

C. Windows will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.04 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately in accordance with manufacturer's written instructions.

END OF SECTION 08511

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SECTION 08710

FINISH HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

- A. Furnish and deliver finish hardware as listed, specified and required.
- B. Related Work Specified Elsewhere:
 - 1. Hollow Metal Doors and Frames-Division 8.

1.02 REFERENCES

- A. Documents and Institutes that shall be used in estimating, detailing and installing the items specified:
 - 1. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People. CABO/ANSI A117.1-1999
 - 2. NFPA 80 - Fire Doors and Windows. 1999 Edition.
 - 3. NFPA 101 - Life Safety Code. 2000 Edition
 - 4. NFPA 105 - Installation of smoke-control door assemblies 1993 Edition
 - 5. Local and state building codes.
 - 6. UL Labeled for Rated Doors.
 - 7. DHI - Door and Hardware Institute.
 - 8. SDI - Steel Door Institute.
 - 9. AWI - Architectural Woodwork Institute.

1.03 SUBMITTALS

- A. Comply with pertinent provisions of Section 01300.
- B. Hardware Schedule: Final hardware schedule shall be submitted in the manner indicated below. Coordinate hardware with doors, frames and related work to insure proper size, thickness, hand, function and finish of hardware. The schedule is to be in a vertical form, organized into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

1. Type, style, function, size and finish of each hardware item.
 2. Name and manufacturer of each item.
 3. Fastenings and other pertinent information.
 4. Location of hardware set cross-referenced to indications on drawings both on floor plans and in door and frame schedules.
 5. Explanation of all abbreviations symbols and codes contained in schedules.
 6. Mounting locations for hardware.
 7. Door and frame sizes and materials.
 8. Keying schedule.
- C. Product Data: Product data shall be provided, in the form of, manufacturer's technical product fact sheets for each item of hardware. Include whatever information may be necessary to show compliance with requirements, including instructions for installation and for maintenance of operating parts and finish.
- D. Samples: Samples shall be provided as requested by owner or Engineer. All samples shall be returned to the finish hardware supplier when construction is completed.
- E. Templates: Templates of finish hardware items to be supplied are to be furnished to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware.
- F. Keying Schedule: A keying schedule shall be submitted using keyset symbols referenced in DHI manual "Keying Systems and Nomenclature". The keying schedule shall be indexed by door number, keyset, hardware heading number, cross keying instructions and special key stamping instructions.
- G. Wiring Diagrams: Coordinate installation of the electronic hardware with the project electrical engineer and provide installation and technical data, including wiring diagrams, to the project electrical engineer and electrical sub-contractor. Upon completion of the electrical hardware installation, verify that all components are working properly and state in the required guarantee that this inspection has been performed.
- H. Operations and maintenance data: At the completion of the job, furnish to the owner two copies of an owner's operation and maintenance manual. The manual shall consist of a labeled hardcover three ring binder with the following technical information:

1. Maintenance instructions for each item of hardware.
2. Catalog pages for each product.
3. Parts list for each product.
4. Copy of final hardware schedule.
5. Copy of final keying schedule.

1.04 QUALITY ASSURANCE

- A. Substitutions: Manufacturers and model numbers listed are to establish a standard of quality and design. The Engineer must approve all product substitutions. Any request for substitutions must be submitted 10 days before bid date, to allow sufficient time for addendum to be added to the bid document. In accordance with Section 01600, required data and physical samples must be provided.
- B. Supplier Qualifications: Suppliers shall be recognized architectural finish hardware suppliers, with warehousing facilities, who have been furnishing hardware in the projects vicinity for a period of not less than 2 years and who is or employs a DHI Certified A.H.C., who is available at reasonable times during the course of the work for consultation about products hardware requirements, to owner, Engineer and contractor.
- C. Fire-rated openings: Fire-rated openings shall be provided with fire-rated hardware in compliance with NFPA Standard No. 80 and local building code requirements. Provide only hardware tested and listed by U/L, for types and sizes of doors required and complying with requirements of door and doorframe labels.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Marking and Packaging: Mark each item or package separately, with identification related to hardware set number, door number and keyset symbol.
- B. Delivery
 1. Deliver individually packaged and properly marked finish hardware at the proper time and location to avoid any delays in construction or installation.
 2. At time of delivery, inventory hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- C. Storage

1. A secure, dry lock-up with strong and sufficient shelving shall be provided for hardware delivered to the project, to protect the material and the finishes.
2. Control handling and installation of hardware items, which are not immediately replaceable, so that completion of the work will not be delayed by hardware losses, both before and after installation.

1.06 WARRANTY

- A. All finish hardware products shall be covered by a 1-year factory warranty against defects in material and workmanship from the date of substantial completion of the project.
- B. Supply warranty verification to the owner for products that provide factory warranties for periods longer than one year. Locksets and exit devices shall have a 5-year factory warranty, door closers a 10-year factory warranty.

1.07 MAINTENANCE

- A. Extra Materials
 1. Furnish 3-dozen extra screws and other fasteners of each size, type, and finish used with the hardware items provided. These screws and fasteners are to be delivered to the hardware installer for use during installation. All extra screws and fasteners and all special installation tools furnished with the hardware shall be turned over to the owner at the completion of the job.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. List of manufacturers represented in this section:
 1. Corbin-Russwin, 800-543-3658, www.yalesecurity.com
 2. Door Controls International, 800-742-3634, www.doorcontrols.com
 3. McKinney Products Co., 800-541-1073, www.mckinneyhinge.com
 4. Norton Door Controls, 800-438-1951, www.yalesecurity.com
 5. Rixson-Firemark, Inc., 800-457-5670, www.rixsondoorcontrols.com

2.02 MATERIALS

- A. Screws and Fasteners

1. Closers and exit devices provided for wood doors are to be furnished with thru-bolts.
2. All finish hardware shall be installed to manufacturer's recommendations, using screws, attachments and installation tools provided with the hardware. No other screws or attachments are acceptable.

B. Hinges

1. Template: Provide template units only.
2. All hinges shall be heavy weight (.180 or .190 ga.), stainless steel, five knuckle, four ball bearing, full mortise type with a stainless steel non-removable pin.
3. Size: Provide 4 1/2" x 4 1/2" hinges on doors up to 3'0" in width. Provide 5" x 4 1/2" hinges on doors from 3'2" to 4'0" in width.
4. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges for door leaf for doors 90" or less in height and one additional hinge for each 30" of additional height.

Supply from the following list of domestic manufacturers:

- i. Hager.
- ii. McKinney.

C. Flush Bolts

1. As codes and conditions permit, provide on the inactive door of pairs, extension flush bolts at top and bottom of the doors. Provide all necessary strikes, shims and guides to insure proper installation. Supply 12" length unless scheduled differently in the hardware sets. Provide DCI or approved equal.
2. Dust Proof Strikes: As conditions allow, provide dust proof strikes with each bottom flush bolt. Provide DCI or approved equal.

D. Locks

1. All locks and latch sets shall be mortise type with wrought steel case, 8" x 1 1/4" armor front, with 3/4" throw, two-piece stainless-steel latch bolts.
2. Locks and latch sets shall meet ANSI A156.13, Series 1000, Grade 1.
3. Furnish and install dust boxes with all strikes.

4. Provide Non-Ferris lock cases where listed.
5. Supply Corbin-Russwin ML2000 series or approved equal.

E. Lock Trim

1. All mortise trim shall have thru-bolted installation and meet the guidelines for ADA and requirements for UFAS and ANSI 117.1, which require ease of accessibility for the handicapped and disabled.
2. The lever trim shall have cast levers with reinforced forged roses.
3. Supply Corbin-Russwin LSA or approved equal.

F. Exit Devices: (BHMA types 2 and 6)

1. Exit device to be concealed vertical rod.
2. Supply Corbin-Russwin ED5000 or approved equal.

G. Surface Door Closers

1. All surface closers shall be full rack and pinion type with full molded cover and shall project no more than 2 1/8" from the mounting surface. Closers shall be non-handed and be provided with non-gumming and non-freezing hydraulic fluid. Closers shall have two valves, hex-key adjusted to independently regulate closing and latch speed. Closers shall have two valves, hex-key adjusted to independently regulate back check cushioning and back check position.
2. All closers shall also have multi-size spring power adjustment to permit setting of power from size 2 thru 6 (size 1 thru 4 on barrier free closers).
3. Supply from the following list of domestic manufacturers
 - a. Yale 4400 Series.
 - b. Norton 7500 Series.
4. Surface closers for all exterior and high traffic openings, where floor closers are not provided, shall be provided with a combination door closer, doorstop and shock absorber. The

shock absorber shall provide heavy-duty springs to smoothly decelerate the door as it reaches the positive stop point.

5. Supply from the following list of domestic manufacturers:
 - a. Yale UNI-4400 Series
 - b. Norton UNI-7500 Series
6. Options: As dictated by codes or indicated in the drawings or hardware sets provide arm and feature options such as, corrosion resistant, adjustable delayed action, barrier free, positive stop and/or hold open arms, low profile arms, rigid parallel arm and special mounting brackets and plates.
7. All closers shall be installed with thru-bolts.

H. Door Stops and Holders

1. Wall and Floor Stops: Supply wall stops where needed to protect doors or door hardware. When wall conditions do not permit use of wall stop provide floor stops with risers as needed to adjust for floor conditions.
2. Overhead Stops: Where wall or floor stops are not applicable provide surface overhead stops. Supply overhead stops/holders with extruded bronze channels arms and brackets. All stops shall be supplied and installed with thru-bolts. Provide Rixson #9 Series.

I. Thresholds, Weather strip and Gasket

1. Aluminum Thresholds: All thresholds shall conform to state and local handicap codes.
2. Provide Zero 8878AA weather seal on all exterior frames.

J. Silencers

1. Provide Silencers on all doorframes that do not have gasket or weather strip specified.
2. Install 2 silencers on pairs and 3 silencers on single openings.

2.03 FINISHES

- | | | |
|----|-------------|-----|
| 1. | Hinges | 630 |
| 2. | Flush Bolts | 626 |
| 3. | Locks | 630 |

- | | | |
|----|------------------------------|---------|
| 4. | Surface Door Closers | 689 |
| 5. | Door Stops and Holders | 626-630 |
| 6. | Weather strip and Thresholds | 689 |

2.04 KEYING

- A. General: Supplier will meet with owner to finalize keying requirements and supply grand master key system for the project.
- B. Security: Provide all exterior doors with hi-security interchangeable core cylinders. The interior cylinders shall have an interchangeable core system compatible with the exterior system but not hi-security type. Both systems shall be 6-pin with cylinder parts from brass/bronze, stainless steel or nickel silver.
- C. Keys: Provide nickel silver keys only. Furnish 4 change keys for each lock; 5 control keys; 5 master keys for each master system and 5 grandmaster keys for each grandmaster system. Deliver all keys to the owners' representative.
- D. Construction Keying: Provide all cylinders with temporary construction cores. The temporary construction cores are to be removed by the contractor after each section of the project is completed and replaced with the permanently keyed cores in the presence of the owner. Furnish 12 construction master keys and 3 removal tools and deliver to the contractor.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine doors, frames and related items for conditions that would prevent the proper application of any finish hardware items. Do not proceed with installation until all defects are corrected.

3.02 INSTALLATION

- A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by the Engineer.
- B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces, which are later to be painted or finished in another way, coordinate removal, storage and

reinstallation or application of surface protections with finishing work specified in the Division-9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.

- C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Drill and countersink units, which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant.

3.03 FIELD QUALITY CONTROL

After installation has been completed, obtain the services of a qualified hardware consultant to check for proper application of finish hardware, according to the finish hardware schedule and keying schedule. In addition, check all hardware for adjustment and proper operation.

3.04 ADJUST AND CLEAN

- A. Adjust, clean and inspect all hardware, to ensure proper operation and function of every opening. Replace items, which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Final adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- D. Instruct owner's personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.
- E. Continued Maintenance: Approximately six months after the acceptance of hardware in each area, the installer, accompanied by the contractor, shall return to the project and re-adjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items, which have deteriorated or failed due to faulty materials or installation of hardware units. Prepare a written report of current and predictable problems in the performance of the hardware.

3.05 PROTECTION

The contractor shall use all means at his disposal to protect all finish hardware items from abuse, corrosion and other damage until the owner accepts the project as complete.

3.06 HARDWARE SCHEDULE

Hardware Set # (HW)	Hardware (each door)	Door Description
HW-1	Hinges Lockset 1 Exit Device 1 Closer 1 Threshold and Weatherseal	Exterior Egress (Single)
HW-2	Hinges Lockset 2 Exit Device 2 Closer 1 Threshold and Weatherseal	Exterior Egress (Double)
HW-3	Hinges Lockset 1 Exit Device 1 Closer	Interior Egress (Single)
HW-4	Hinges Lockset 2 Exit Device (lever handle at conference room) 2 Closer	Interior Egress (Double)
HW-5	Hinges Lockset (Office) w/ lever handle Door Stop Silencers	Office
HW-6	Hinges Lockset (Privacy) w lever handle Closer	Privacy (Restroom Unisex)
HW-7	Hinges Lockset (Utility) w/ lever handle Silencers	Utility/ Storage

A. Reference is made to the construction plans for location of hardware. Hardware items listed in the hardware sets are listed in the catalogs of the following manufacturers:

- | | | |
|-----|------------------------|----------------------|
| 1. | Hinges | McKinney (MCK) |
| 2. | Flush Bolts | DCI (DCI) |
| 3. | Cylinders & Keys | Corbin/Russwin (C/R) |
| 4. | Locksets, Latch sets | Corbin/Russwin (C/R) |
| 5. | Surface Closers | Norton (NOR) |
| 6. | Overhead Stops/holders | Rixson (RIX) |
| 7. | Wall & Floor Stops | DCI (DCI) |
| 8. | Thresholds | DCI (DCI) |
| 9. | Weather strip | DCI (DCI) |
| 10. | Silencers | DCI (DCI) |

END OF SECTION 08710

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SECTION 09123
INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Wood.
 - 2. Gypsum board.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Label each coat of each Sample.
 - 3. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Indicate VOC content.

1.4 CLOSEOUT SUBMITTALS

- 1. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets,

care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: **1 gal. (3.8 L)** of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least **100 sq. ft. (9 sq. m)**.
 - b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacturer's label with the following information:

1. Product name and type (description).
2. Batch date.
3. Color number.
4. VOC content.
5. Environmental handling requirements.

6. Surface preparation requirements.
7. Application instructions.

B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

C. Lead Paint: It is not expected that lead paint will be encountered in the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company or approved equal.

B. Comparable Products: Comparable products of approved manufacturers will be considered in accordance with Section 016000 "Product Requirements," and the following:

1. Products are approved by manufacturer in writing for application specified.
2. Products meet performance and physical characteristics of basis of design product including published ratio of solids by volume, plus or minus two percent.

C. Source Limitations: Obtain paint materials from single source from single listed manufacturer.

1. Manufacturer's designations listed on a separate color schedule are for color reference only and do not indicate prior approval.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall provide materials that comply with VOC limits of authorities having jurisdiction and for interior paints and coatings applied at Project site, the following VOC limits exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 150 g/L.
 3. Primers, Sealers, and Undercoaters: 200 g/L.
 4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 5. Floor Coatings: 100 g/L.
 6. Shellacs, Clear: 730 g/L.
 7. Shellacs, Pigmented: 550 g/L.
- C. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small Scale Environmental Chambers."
- D. Colors: As selected by Architect from manufacturer's full range.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 2. Testing agency will perform tests for compliance with product requirements.
 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance

of the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.

1. Report, in writing, conditions that may affect application, appearance, or performance of paint.

B. Substrate Conditions:

1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Wood: 15 percent.
 - b. Gypsum Board: 12 percent.
2. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

C. Proceed with coating application only after unsatisfactory conditions have been corrected; application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
 - 1. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- A. Wood Substrates: Including exposed wood items not indicated to receive shop-applied finish.

- 1. Latex System:

- a. Prime Coat: Primer sealer, latex, interior:

- 1) S-W PrepRite ProBlock Primer Sealer, B51-620 Series, at 4.0 mils (0.102 mm) wet, 1.4 mils (0.036 mm) dry.

- b. Intermediate Coat: Latex, interior, matching topcoat.

- c. Topcoat: Latex, interior, semi-gloss:

- 1) S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series, at 4.0 mils (0.102 mm) wet, 1.6 mils (0.041 mm) dry, per coat.

- B. Gypsum Board Substrates:

- 1. Latex System:

- a. Prime Coat: Primer, latex, interior:

- 1) S-W ProMar 200 Zero VOC Latex Primer, B28W2600, at 4.0 mils (0.102 mm) wet, 1.0 mils (0.025 mm) dry.

- b. Intermediate Coat: Latex, interior, matching topcoat.

- c. Topcoat: Latex, interior, flat:

- 1) S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series, at 4.0 mils (0.102 mm) wet, 1.6 mils (0.041 mm) dry, per coat.

- d. Topcoat: Latex, interior, low sheen:

- 1) S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series, at 4.0 mils (0.102 mm) wet, 1.6 mils (0.041 mm) dry, per coat.

- e. Topcoat: Latex, interior, eggshell:

- 1) S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series, at 4.0 mils (0.102 mm) wet, 1.7 mils (0.043 mm) dry, per coat.

END OF SECTION 099123

SECTION 09221

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DEFINITIONS

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior partitions.

1.03 ACTION SUBMITTALS

- A. Product Data : For each type of product

1.04 INFORMATION SUBMITTALS

- A. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.05 QUALITY ASSURANCE

- A. Cod-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft.

2.02 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: hot-dip galvanized unless otherwise indicated.
- B. Studs and Tracks: ASTM C 645.
 - 1. Steel Studs and Tracks:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1). CEMCO; California Expanded Metal Products Co.
 - 2). Custom Stud.
 - 3). MarinoWARE
 - 4). Telling Industries.
 - b. Minimum Base-Metal Thickness: As required by performance requirements for horizontal deflection.
 - c. Depth: As indicated on Drawings.
- C. Clip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 2-inch minimum vertical movement.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1). CEMCO; California Expanded Metal Products Co.
 - 2). ClarkDietrich Building Systems.
 - 3). Fire Trak Corp.
 - 4). MarinoWARE.
 - 5). SCAFCO Steel Stud Company

- 6). Steel Network, Inc. (The).
 - 7). Super Stud Building Products.
2. Single Long-Leg Track System: ASTM C 645 top track with 2-inch deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 3. Double-Track System: ASTM C 645 top outer tracks, inside track with 2-inch deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
 4. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1). Blazeframe Industries
 - 2). CEMCO; California Expanded Metal Products Co.
 - 3). ClarkDietrich Building Systems.
 - 4). MarinoWARE.
 - 5). MBA Building Supplies.
 - 6). Metal-Lite.
 - 7). Perfect Wall, Inc.
 - 8). SCAFCO Steel Stud Company
 - 9). Steel Network, Inc. (The).
 - 10). Telling Industries.
- D. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movements of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Blazeframe Industries.
 - b. CEMCO: California Expanded Metal Products Co.
 - c. ClarkDietrich Building Systems.
 - d. Fire Trak Corp.
 - e. MarinoWARE.
 - f. Metal-Lite
 - g. Perfect Wall, Inc.
 - h. SCAFCO Steel Stud Company.
 - i. Steel Network, Inc. (The).
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ClarkDietrich Building Systems.
 - b. MarinoWare.
 - c. MRI Steel Framing, LLC.
 - d. SCAFCO steel Stud Company
- F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch wide flanges.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ClarkDietrich Building Systems.
 - b. MarinoWare.
 - c. MRI Steel Framing, LLC.
 - d. SCAFCO Steel Stud Company.
 2. Depth: 1-1/2 inches.
 3. Clip angle: Net less than 1-1/2 by 1-1/2 inches, 0.068-inch thick, galvanized steel.

- G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ClarkDietrich Building Systems.
 - b. MarinoWare.
 - c. MRI Steel Framing, LLC.
 - d. SCAFCO Steel Stud Company.
 - 2. Depth: 1-1/2 inches

2.03 INTERIOR GYPSUM BOARD

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, type I (No. 15 asphalt felt), nonperforated.
 - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8-inch thick, in width to suit steel stud size.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLYING AND FINISHING PANELS, GENERAL

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other

provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.03 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true in line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.04 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
 - 2. Multilayer Application: AS required by horizontal deflection performance requirements unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum ½-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

- a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

END OF SESSION 09221

SECTION 09290
GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Exterior gypsum board for ceilings and soffits.
3. Tile backing panels.

B. Related Requirements:

1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
2. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Gypsum wallboard.
2. Gypsum ceiling board.
3. Exterior gypsum soffit board.
4. Glass-mat, water-resistant backing board.
5. Cementitious backer units.
6. Interior trim.
7. Exterior trim.
8. Joint treatment materials.
9. Sound-attenuation blankets.
10. Acoustical sealant.

B. Samples for Initial Selection: For each type of [trim accessory] [and] [textured finish] indicated.

C. Samples for Verification: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

1.3 QUALITY ASSURANCE

- A. Mockups: Build mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C1396/C1396M.

1. Basis-of-Design Product: Subject to compliance with requirements, provide CertainTeed Gypsum; Saint-Gobain; Regular Gypsum Board or comparable product by one of the following:
 - a. Georgia-Pacific Gypsum LLC.
 - b. National Gypsum Company.
 - c. USG Corporation.
2. Thickness: 1/2 inch (12.7 mm).
3. Long Edges: Tapered.

B. Gypsum Ceiling Board: ASTM C1396/C1396M.

1. Basis-of-Design Product: Subject to compliance with requirements, provide CertainTeed Gypsum; Saint-Gobain; Interior Ceiling Board or comparable product by one of the following:
 - a. Georgia-Pacific Gypsum LLC.
 - b. National Gypsum Company.
 - c. USG Corporation.
2. Thickness: 1/2 inch (12.7 mm).
3. Long Edges: Tapered.

2.4 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

A. Exterior Gypsum Soffit Board: ASTM C1396/C1396M, with manufacturer's standard edges.

1. Basis-of-Design Product: Subject to compliance with requirements, provide CertainTeed Gypsum; Saint-Gobain; Exterior Soffit Board or comparable product by one of the following:
 - a. Georgia-Pacific Gypsum LLC.
 - b. USG Corporation.
2. Core 5/8 inch (15.9 mm).

2.5 TILE BACKING PANELS

A. Water-Resistant Gypsum Backing Board: ASTM C1396/C1396M, with manufacturer's standard edges.

1. Basis-of-Design Product: Subject to compliance with requirements, provide CertainTeed Gypsum; Saint-Gobain; M2Tech® Mold and Moisture Board or comparable product by one of the following:
 - a. Georgia-Pacific Gypsum LLC.
 - b. National Gypsum Company.
 - c. Panel Rey SA.
 - d. USG Corporation.
2. Core: 1/2 inch (12.7 mm), regular type.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Basis-of-Design Product: Subject to compliance with requirements, provide CertainTeed Gypsum; Saint-Gobain; NO-COAT Structural Laminate Drywall Corner Trim.
3. Material: Paper-plastic-paper copolymer mud-applied corner trim.
4. Shapes:
 - a. Outside Inside 90-degree corner profile.
 - b. L-trim corner profile.
 - c. Cornerbead.

B. Exterior Trim: ASTM C1047.

1. Material: Hot-dip galvanized-steel sheet, plastic, or rolled zinc.
2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.

C. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Flannery, Inc.
 - b. Fry Reglet Corporation.
 - c. Gordon, Inc.
 - d. Pittcon Industries.
 - e. Tamlyn.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221 (ASTM B221M), Alloy 6063-T5.

3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
 1. Interior Gypsum Board: Paper.
 2. Exterior Gypsum Soffit Board: Paper.
 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 4. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide CertainTeed Gypsum; Saint-Gobain; Ready Mixed Joint Compound or comparable product.
 2. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 3. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 4. Fill Coat: For second coat, use setting-type, sandable topping compound.
 5. Finish Coat: For third coat, use setting-type, sandable topping compound.
 6. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.
- D. Joint Compound for Exterior Applications:
 1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
 2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.
- E. Joint Compound for Tile Backing Panels:
 1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
 2. Cementitious Backer Units: As recommended by backer unit manufacturer.
 3. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.8 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
 - 1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide CertainTeed Gypsum; Saint-Gobain; CertainTeed CertaPro Acousta Therm Batts or comparable product.
 - 2. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- D. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."
- E. Vapor Retarder: As specified in Section 072600 "Vapor Retarders."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Wallboard Type: Vertical surfaces unless otherwise indicated
 - 2. Ceiling Type: [As indicated on Drawings].
 - 3. Mold-Resistant Type: As indicated on Drawings.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.

2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLATION OF EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

- A. Apply panels perpendicular to supports, with end joints staggered and located over supports.
 1. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or structural penetrations.
 2. Fasten with corrosion-resistant screws.

3.5 INSTALLATION OF TILE BACKING PANELS

- A. Water-Resistant Backing Board: Install where indicated with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.

3.6 INSTALLATION OF TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim in accordance with manufacturer's written instructions.
- B. Control Joints: Install control joints in accordance with ASTM C840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners unless otherwise indicated.
 2. Bullnose Bead: Use at outside corner
 3. U-Bead: Use at exposed panel edges.
- D. Exterior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners.
- E. Aluminum Trim: Install in locations indicated on Drawings.

3.7 FINISHING GYPSUM BOARD

- A. General: 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. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and in accordance with ASTM C840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile
 - 3. Level 3:
 - 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
 - 5. Level 5:
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- E. Glass-Mat Gypsum Sheathing Board: Finish in accordance with manufacturer's written instructions for use as exposed soffit board.
- F. Glass-Mat Faced Panels: Finish in accordance with manufacturer's written instructions.
- G. Cementitious Backer Units: Finish in accordance with manufacturer's written instructions.

3.8 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 09511

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes acoustical panels and exposed suspension system for interior ceilings.

1.02 ACTION SUBMITTALS

- A. Preinstallation Conference: Conduct conference at Project Site.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

1.04 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, and coordinated with each other, using input from installers of the items involved.
- B. Product test reports.
- C. Research reports.
- D. Field quality-control reports.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 – PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Class A according to ASTM E1264.
 - 2. Smoke-Developed Index: 50 or less.

2.02 ACOUSTICAL PANELS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Ceiling & Wall Solutions; Armstrong CIRRUS Series or comparable product by one of the following:
 - 1. CertainTeed Corporation.
 - 2. USG Corporation.
- B. Acoustical Panel Standard: Manufacturer's standard panels according to ASTM E1264.
- C. Classification: 2'x2' Square Lay in.
- D. Color: White
- E. Light Reflectance (LR): .85.
- F. Ceiling Attenuation Class (CAC): 170.
- G. Noise Reduction Coefficient (NRC): 0.75.
- H. Articulation Class (AC): 170.
- I. Edge/Joint Detail: Square.
- J. Thickness: 7/8 inch (22 mm).
- K. Modular Size: 24 by 24 inches.

2.03 METAL SUSPENSION SYSTEM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Ceiling & Wall Solutions; INTERLUDE 9/16" Dimension Tee or comparable product by one of the following:
 - 1. CertainTeed Corporation.
 - 2. USC Corporation.

2.04 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table, "Direct Hun," unless otherwise indicated. Comply with seismic design requirements.
- B. Hold-Down Clips: Manufacturer's standard hold-down.

- C. Impact Clips: Manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite of each ceiling. Avoid using less-than-half width panels at borders unless otherwise indicated.
- B. Layout openings for penetrations centered on the penetrating items.

3.02 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C636/C636M, and manufacturer's written instructions.
- B. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
 - 3. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.

3.03 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform inspections.
 - 1. Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7.

END OF SESSION 09511

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SECTION 09651

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Vinyl base

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.01 VINYL BASE

A. Product Standard: ASTM F1861, Type TV (vinyl, Thermoplastic).

1. Group: I (**solid, homogeneous**).

2. Style and Location:

- a. Style B, Cove: **Provide in areas with resilient floor coverings.**

B. Minimum thickness: **0.125 inch (3.2 mm)**.

C. Height: **4 inches (102 mm)**.

D. Lengths: **Coils in manufacturer's standard length.**

E. Outside Corners: **Preformed.**

F. Inside Corners: **Preformed.**

G. Colors and Patterns: Chosen from manufacturer's full line.

2.02 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formation provided or approved by resilient-product manufacturer for applications indicated.

- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products manufacturer for applications indicated.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Preparation substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.02 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.

END OF SECTION 09651

SECTION 09652
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Vinyl composition floor tile.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of project.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Product Data: For chemical-bonding compounds, indicating VOC content.
4. Laboratory Test Reports: For chemical-bonding compounds, indicating compliance with requirements for low-emitting materials.
5. Product Data: For sealants, indicating VOC content.
6. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.
7. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.
8. Health Product Declaration: For each product.
9. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

C. Shop Drawings: For each type of resilient floor tile

1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

- D. Samples: Full-size units of each color, texture, and pattern of floor tile required.

1.03 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.04 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.05 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.07 DELIVERY, STORAGE, AND HANDLING

- A, Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.07 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F (18 deg C) or more than 85 deg F (29 deg C), in spaces in receive floor tile during the following periods:
 - 1. 48 hours before installation
 - 2. During installation
 - 3. 48 hours after installation

- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).
- C. Close spaces to traffic during floor tile installation.
- D. close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 – PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products in accordance with ASTM E648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.02 VINYL COMPOSITION FLOOR TILE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Flooring; Standard Excelon Multicolor or comparable product by one of the following.
 - 1. American Biltrite
 - 2. Congoleum Corporation
 - 3. Johnsonite; a Tarket Company
- B. Tile Standard: ASTM F1066, Class 2, through pattern.
- C. Wearing Surface: Smooth
- D. Thickness: [0.125 inch (3.2 mm)] [0.09375 inch (2.2 mm)].
- E. Size: 12 by 12 inches.
- F. Colors and Patterns: As chosen by Architect from Manufacturer's full range.

2.03 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
 - 1. Adhesives shall have a VOC content of 50 g/L or less.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Prepare substrates in accordance with floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare in accordance with ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more the 9 pH.

- C. Access flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.
- D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- E. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

3.03 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles are opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tils at perimeter.
 - 1. Lay tiles square with room axis.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain direction alternating in adjacent tile (basket-weave pattern).
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor times to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids,

raining and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

- I. Resilient Terrazzo Accessories: Install in accordance with manufacturer's written instructions.

3.04 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 1. Remove adhesive and other blemishes from surfaces
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.
- E. Sealers and Finish Coats: Remove soils, visible adhesive, and surface blemishes from resilient terrazzo floor tile surfaces before applying liquid cleaners, sealers, and finish products.
 1. Sealer: Apply two base coats of liquid sealer.
 2. Finish: Apply two coats of liquid floor finish.
- F. Cover floor tile until Substantial Completion.

END OF SESSION 09652

SECTION 10280
WASHROOM ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Washroom Accessories:
 - 1. Automatic hand dryers.
 - 2. Soap dispensers.
 - 3. Commercial lavatory faucets.
 - 4. Combination towel dispenser and waste receptacle units.
 - 5. Sanitary napkin disposal units.
 - 6. Toilet tissue dispensers.
 - 7. Mirrors.
 - 8. Shower rods and curtains.
 - 9. Folding shower seats
 - 10. Soap dishes.
 - 11. Grab bars.
 - 12. Towel bars.
 - 13. Hooks.
 - 14. Custodial/janitorial accessories.

1.2 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry, coordination with blocking.
- B. Section 092000 - Plaster and Gypsum Board, coordination with blocking.

- C. Section 093000 - Tiling, coordination with layout and installation.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's data sheets for each product specified, including the following:
 - 1. Installation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Cleaning and maintenance instructions.
 - 4. Replacement parts information.
- B. Schedule: Submit a toilet accessory schedule, indicating the type and quantity to be installed in each washroom. Use room numbers as indicated on the Drawings.
- C. Country of Origin: Manufacturer must supply, with first submittal, Country of Origin information for each type of washroom accessory for this project.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Provide products manufactured by a company with a minimum of 10 years successful experience manufacturing similar products.
- B. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.
- C. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.

- D. Hazardous Materials: Comply with EU Directive “Restrictions of Hazardous Substances (RoHS) requirements.”

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

1.6 WARRANTY

- A. Manufacturer's Warranty for Washroom Accessories: Manufacturer's standard 1 year warranty for materials and workmanship.
- B. Manufacturer's Warranty for Electric Hand Dryers: Manufacturer's standard 5 year warranty on parts, except 3 year warranty on motor brushes from date of purchase.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design Manufacturer: Bobrick Washroom Equipment, Inc., which is located at: 6901 Tujunga Ave.; North Hollywood, CA 91605-6213; Tel: 818-764-1000; Fax: 818-503-1930; Contact us: <https://www.bobrick.com/contact/>; Web: <https://www.bobrick.com/>
- B. American Standard
- C. Bradley

2.2 AUTOMATIC HAND DRYERS

A. Surface-Mounted ADA QuietDry Series Dryers:

1. Basis of Design: Bobrick TrimDry Model B-7120 115V.
 - a. Cover: 22-gauge, zinc-plated steel with high-gloss white epoxy finish.
 - b. Power: 115V AC, 15 amp, 1725 watts, 50/60 Hz, single phase, cULus Listed.
2. Basis of Design: Bobrick TrimDry Model B-7128 115V.
 - a. Cover: 22-gauge galvanized steel with exposed surface, Type 304 stainless steel with vertical grain No. 4 satin finish.
 - b. Power: 115V AC, 15 amp, 1725 watts, 50/60 Hz, single phase, cULus Listed.
3. Compliance:
 - a. Dryer cover projects 4 inches (100mm) from wall to comply with universal/accessibility design, including ADA-ABA and ICC/ANSI.
 - b. Comply with EU Directive "Restrictions of Hazardous Substances (RoHS) requirements."
4. Trim: UL 94-5VA black plastic trim.
5. Air Inlet/Outlet: Vandal-resistant grilles.
6. Air Outlets: Dual air outlets that provide a swirling circulation of airflow.
7. Motor: 1/7 hp; universal type on resilient mounting with sealed ball bearing at drive-shaft end; self-lubricating sleeve bearing at nondrive end; equipped with automatic thermal-overload switch.
8. Heating Elements: Located on outlet side of fan, heats air without hot spots, is inaccessible to vandals, and is protected by an automatic thermal-overload switch.
9. Automatic Function: Infrared sensor.
 - a. Turns off automatically if an inanimate object is placed over sensor.
 - b. After inanimate object is removed, electronic sensor resets itself and dryer automatically resumes normal operation.

2.3 SOAP DISPENSERS

A. Surface-Mounted Vertical Soap Dispensers:

1. Basis of Design: Bobrick ClassicSeries Model B-2111.
2. Compliance: Valve is operable with one hand, without tight grasping, pinching or twisting of the wrist and with less than 5 pounds of force (22.2 N) to comply with universal/accessibility design, including ADA-ABA and ICC/ANSI.
3. Container:
 - a. Materials: 18-8, Type 304, 22 gauge (0.8mm) stainless steel with satin finish.
 - b. Construction: Body is drawn, one-piece, seamless construction.
4. Valve: Corrosion-resistant, black molded plastic push button and spout, antibacterial-soap-resistant plastic cylinder; soap head-holding mushroom valve, stainless steel spring, U-packing seal and duckbill. Valve dispenses commercially marketed all-purpose hand soaps.
5. Mounting: Vandal-resistant, concealed wall plate; back plate with mounting bracket.
6. Filling: Locked, hinged stainless steel lid for top filling opens with key provided. To prevent corrosion of tank, use only chloride-free pH-neutral liquid soaps.
7. Refill Indication: Clear acrylic refill-indicator window.
8. Capacity: 40 fl oz (1.2 L).

2.4 COMMERCIAL LAVATORY FAUCETS

A. Solid Brass, Automatic Lavatory Faucets: electronic-sensor operated:

1. Basis of Design: Bobrick Washroom Equipment:
 - a. B-8878: Automatic, battery-powered with Polished Chrome finish.
2. Standard:
 - a. ASME A112.18.1/CSA B125.1
 - b. NSF/ANSI 61

3. General: Include hot and cold water indicators; coordinate faucet inlets with supplies and fixture hole punching's, coordinate outlet with spout and fixture receptor.
4. Body: Commercial, solid brass.
 - a. 8 inch (203 mm) Centerset.
 - b. Single hole.
5. Finish: Polished Chrome Plate.
6. Maximum Flow Rate:
 - a. 0.5 gpm (standard)
 - b.
7. Mounting Type: Deck, concealed.
8. Spout Type: Rigid.
9. Spout Outlet: Aerator.
10. Operation:
 - a. Hidden infrared convergence-type proximity sensor lens.

2.5 WASTE RECEPTACLES

- A. Floor-Standing Waste Receptacles:
 1. Basis of Design: Bobrick Model B-2250.
 - a. Top: Included with unit.
 - b. Capacity: 13 gallons (49.2 L).
 2. Basis of Design: Bobrick Model B-2250 with Bobrick Part No. 2250-3 Reusable Vinyl Liner.
 - a. Top: Included with unit.
 - b. Capacity: 13 gallons (49.2 L).
 - c. Reusable Liner: Heavy gauge vinyl with added reinforcement for grommet holes at top.

2.6 COMBINATION TOWEL DISPENSER AND WASTE RECEPTACLE UNITS

A. Surface-Mounted Paper Towel Dispenser and Waste Receptacles:

1. Basis of Design: Bobrick ClassicSeries Model B-3699.
2. Basis of Design: Bobrick ClassicSeries Model B-3699 with Bobrick Part No. 3944-130 TowelMate Accessory.
 - a. Bobrick TowelMate Accessory: Dispenses one paper towel at a time without towels sagging or falling through the towel tray opening. Round nylon rod and stainless steel rod screws support stack of paper towels.
3. Cabinet: All-welded, 18-8, Type 304, 22 gauge (0.8mm) stainless steel with satin finish on exposed surfaces.
4. Flange: Drawn and beveled, one-piece, seamless, 18-8, Type 304, 22 gauge (0.8mm) stainless steel with satin finish.
5. Door: 18-8, Type 304, 22 gauge (0.8mm) stainless steel with satin finish. Secured to cabinet with a full-length stainless steel piano-hinge.
6. Hinge: Full-length stainless steel piano-hinge.
7. Latching: Knob-latch.
8. Skirt: 18-8, Type 304, 22 gauge (0.8mm) stainless steel with satin finish.
9. Towel Dispenser: 18-8, Type 304, 22 gauge (0.8mm) stainless steel with satin finish.
10. Towel Dispensing: Hemmed towel tray opening dispenses towels without tearing.
11. Towel Capacity: 350 C-fold or 475 multifold towels.
12. Waste Receptacle: Removable, 18-8, Type 304, heavy gauge stainless steel with satin finish with top and bottom edges hemmed; friction catch.
13. Waste Capacity: 2 gallons (7.6 L).

2.7 SANITARY NAPKIN DISPOSAL UNITS

A. Surface-Mounted Sanitary Napkin Disposal Units:

1. Basis of Design: Bobrick ClassicSeries Model B-254.
2. Cabinet: All-welded, 18-8, Type 304, heavy gauge stainless steel with satin finish on exposed surfaces.
3. Door: 18-8, Type 304, 22 gauge (0.8mm) stainless steel with satin finish; equipped with a tumbler lock keyed like other washroom accessories.
4. Door Hinge: Full-length stainless steel piano-hinge.
5. Disposal Panel: 18-8, Type 304, 22 gauge (0.8mm) stainless steel with satin finish; hemmed bottom edge hemmed.
6. Disposal Panel Hinge: Spring-loaded, full-length stainless steel piano-hinge; with an international graphic symbol identifying sanitary napkin disposal.
7. Waste Receptacle: Removable, leak-proof, rigid molded polyethylene.
8. Capacity: 1.2 gallons (4.6 L).

2.8 TOILET TISSUE DISPENSERS

A. Surface-Mounted Toilet Tissue Dispensers For Two Rolls:

1. Basis of Design: Bobrick ClassicSeries Model B-76867.
 - a. Finish: Satin.
 - b. Spindle: Chrome-plated plastic with heavy-duty internal spring.
2. Flanges and Support Arms: All-welded, 18-8, Type 304, 22 gauge (0.8mm) stainless steel with concealed, 16 gauge (1.6mm) mounting bracket; secured to wall plates with stainless steel setscrews.
3. Concealed Wall Plate: 18-8, Type 304, 16 gauge (1.6mm) stainless steel.
4. Capacity: Accommodates two standard toilet tissue roll up to 5-1/2 inch (140mm) diameter (1800 sheets).

2.9 MIRRORS

- A. Stainless Steel Channel Frame Mirrors with Shelf:
- a. Overall Size: 24 inches (610mm) W x 36 inches (910mm) H.
 2. Channel Frame: One-piece, Type 430 stainless steel channel-frame, 1/2 inch x 1/2 inch x 3/8 inch (13mm x 13mm x 9.5mm), with 1/4 inch (6mm) return, 90 degree mitered corners; bright polished finish on exposed surfaces.
 3. Mirror: No. 1 quality, 1/4 inch (6mm) float glass, guaranteed for 15 years against silver spoilage.
 - a. Corners: Protected by friction-absorbing filler strips.
 - b. Back of Mirror: Protected by full-size, shock absorbing, water-resistant, nonabrasive, 3/16 inch (5mm) thick polyethylene padding.
 4. Shelf:
 - a. Materials: Type 304, stainless steel with satin finish.
 - b. Construction: 22 gauge (0.8mm) shelf welded to mirror frame and reinforced by concealed 16 gauge (1.6mm) stainless steel brackets; with 3/8 inch (10mm) return edges on front and sides with hemmed front edge.
 5. Fasteners: No exposed rivet-heads, screws, or fasteners exposed on frame or shelf.
 6. Mounting: Removable; galvanized steel back with integral horizontal hanging brackets located near top and bottom to prevent the bottom of the mirror from pulling away from the wall for mounting on concealed rectangular wall hanger; locking devices secure mirror to concealed wall hanger.

2.10 SHOWER RODS AND CURTAINS

- A. Shower Curtain Hooks:
1. Basis of Design: Bobrick Part No. 204-1 Shower Curtain Hook.
 2. Materials: 18-8, Type 304, 0.09 inch (2mm) diameter stainless steel.

3. Operation: Can be used with 1 inch and 1-1/4 inch (25 and 32mm) diameter rods.

B. Vinyl Shower Curtains:

1. Basis of Design: Bobrick Model 204-2.
 - a. Width: 42 inch (1065mm), requires 7 hooks (not included).
2. Basis of Design: Bobrick Model 204-3.
 - a. Width: 72 inch (1780mm), requires 12 hooks (not included).
3. Curtain: Opaque, matte white, 0.008 inch (0.2mm) thick vinyl containing antibacterial and flame-retardant agents; hemmed bottom and sides.
4. Grommets: Nickel-plated brass, along top edge every 6 inches (150mm).
5. Height: 72 inch (1830mm).

C. Shower Curtain Rods:

1. Basis of Design: Bobrick ClassicSeries Model B-6107 x 72.
 - a. Length: 72 inch (1830mm).
2. Curtain Rod: 18-8, Type 304, 20 gauge (1.0mm) stainless steel tubing with satin finish.
3. Outside Diameter: 1 inch (25mm).
4. Flanges: One-piece, die-formed, 18-8, Type 304, 20 gauge (1.0mm) stainless steel with satin finish.

2.11 FOLDING SHOWER SEATS

A. Reversible Folding Shower Seats:

1. Basis of Design: Bobrick Model B-5181.
2. Compliance: Universal/accessibility design, including ADA-ABA and ICC/ANSI. for structural strength; clearance between back of shower seat and wall is 1-1/2 inches (38mm).

- a. Capacity: Designed to support 360 lbs (163 kg) in compliant installations.
3. Seat: One-piece, 1/2 inch (13mm) thick, solid phenolic with matte-finish, ivory-colored, melamine surfaces and black phenolic-resin core, integral slots for water drainage; secured to frame with stainless steel carriage bolts and acorn nuts, reversible for left- or right-hand installation in the field. Folds against wall when not in use.
4. Seat Supports: Do not come into contact with floor.
5. Frame: 18-8, Type 304 stainless steel with satin finish; 16 gauge (1.6mm), 1-1/4 inch (32mm) square members, 18 gauge (1.2mm), 1 inch (25mm) diameter tubing.
6. Mounting Flanges: 18-8, Type 304, 3/16 inch (5mm) thick stainless steel with satin finish; 3 inch (76mm) diameter with three mounting screw holes.
7. Baseplate: 18-8, Type 304, heavy gauge stainless steel.
8. Spring: 17-7, Type 301, 24 gauge (0.6mm) stainless steel, spot-welded to baseplate. Holds seat against wall.
9. Guide Bracket: 18-8, Type 304, 16 gauge (1.6mm) stainless steel with satin finish.

2.12 SOAP DISHES

- A. Surface-Mounted Soap Dishes:
 1. Basis of Design: Bobrick Model B-680.
 - a. Finish: Bright polished finish.
 2. Soap Dish: Drawn, one-piece, seamless, welded to support arm, 18-8, Type 304, 22 gauge (0.8mm) stainless steel; two drain holes and two ridges support bar of soap.
 3. Flange and Support Arm: 18-8, Type 304, 22 gauge (0.8mm) stainless steel.
 4. Mounting: Concealed bracket, all-welded, 16 gauge (1.6mm) stainless steel; secured to wall plate with stainless steel setscrew.
 5. Wall Plate: Concealed, 18-8, Type 304, 16 gauge (1.6mm) stainless steel.

2.13 GRAB BARS

A. Stainless Steel Grab Bars: With snap flange covers.

1. Satin Finish:
 - a. Basis of Design: Bobrick Model B-5806 x 18.
 - 1) Length: 18 inches (457mm).
 - b. Basis of Design: Bobrick Model B-5806 x 24.
 - 1) Length: 24 inches (610mm).
 - c. Basis of Design: Bobrick Model B-5806 x 30.
 - 1) Length: 30 inches (762mm).
 - d. Basis of Design: Bobrick Model B-5806 x 36.
 - 1) Length: 36 inches (914mm).
 - e. Basis of Design: Bobrick Model B-5806 x 42.
 - 1) Length: 42 inches (1067mm).
 - f. Basis of Design: Bobrick Model B-5806 x 48.
 - 1) Length: 48 inches (1219mm).
2. Compliance: Universal/accessibility design, including ADA-ABA and ICC/ANSI. for structural strength.
 - a. Capacity: Designed to support 900 lbs (408 kg) in compliant installations.
3. Description: Grab bar with 90 degree return to flange. Clearance between grab bar and finished wall is 1-1/2 inches (38mm).
4. Grab Bar Materials: 18-8, Type 304, 18 gauge (1.2mm) stainless steel tubing with satin finish, ends of grab bar pass through flanges and are heliarc welded to flanges to form one structural unit, outside diameter 1-1/4 inches (32mm).
5. Mounting Flanges: Concealed, 18-8, Type 304, 1/8 inch (3mm) thick, stainless steel plate.

- a. End Flanges: 2 inches x 3-1/8 inches (50mm x 80mm) with two holes for attachment to wall.
 - b. Intermediate Flanges: 2-5/8 inches x 3-1/8 inches (65mm x 80mm) wide x 3-1/8 inch (80mm) diameter.
6. Snap Flange Covers: 18-8, Type 304, 22 gauge (0.8mm) drawn stainless steel with satin finish, 3-1/4 inch (85mm) diameter x 5/8 inches (16mm) deep; snap over mounting flange to conceal mounting screws.
7. Mounting Accessories: Provide the following optional mounting accessories as scheduled and indicated on the Drawings and as required for complete installation.
- a. Mounting Kits: Provide optional Bobrick Part No. 252-30 Mounting Kit; 3 Type 304 stainless steel, Phillips round-head, sheet-metal screws for each flange.
 - b. Grab Bar Fasteners: Provide optional Bobrick Part No. 251-4 WingIt Grab Bar Fastener; round-head, Phillips 18/8 stainless steel screws and grab bar fastener for each flange.
 - c. Anchor Devices: Provide optional Bobrick Part No. 2586 Optional Mounting Kit; for 1/2 inch (13mm) panels for each flange.

2.14 TOWEL BARS

- A. Towel Bars with Concealed Mounting:
1. Basis of Design: Bobrick Model B-545 x 24.
 - a. Finish: Satin-Finish.
 - b. Length: 24 inch (610mm).
 2. Description: Towel bar with 90 degree return to flange. Clearance between towel bar and finished wall is 1-1/2 inches (38mm).
 3. Capacity: Designed to support 900 lbs (408 kg) in compliant installations.
 4. Towel Bar Materials: 18-8, Type 304, 18 gauge (1.2mm) stainless steel tubing, ends of towel bar pass through flanges and are heliarc welded to flanges to form one structural unit, outside diameter 1 inches (25mm).

5. Mounting Flanges: Concealed, 18-8, Type 304, 1/8 inch (3mm) thick, stainless steel plate; 2 inches x 3-1/8 inches (50mm x 80mm) with two holes for attachment to wall.
6. Snap Flange Covers: 18-8, Type 304, 22 gauge (0.8mm) drawn stainless steel with bright polished finish; 3-1/4 inch (85mm) diameter x 5/8 inches (16mm) deep; snap over mounting flange to conceal mounting screws.
7. Mounting Accessories: Provide the following optional mounting accessories as scheduled and indicated on the Drawings and as required for complete installation.
 - a. Mounting Kits: Provide optional Bobrick Part No. 252-30 Mounting Kit; 3 Type 304 stainless steel, Phillips round-head, sheet-metal screws for each flange.
 - b. Grab Bar Fasteners: Provide optional Bobrick Part No. 251-4 WingIt Grab Bar Fastener; round-head, Phillips 18/8 stainless steel screws and grab bar fastener for each flange.
 - c. Anchor Devices: Provide optional Bobrick Part No. 2586 Optional Mounting Kit; for 1/2 inch (13mm) panels for each flange.

2.15 HOOKS

- A. Vandal-Resistant Clothes Hooks:
 1. Basis of Design: Bobrick Model B-983.
 2. Mounting: Secured from front.
 3. Projection from Wall: 2-1/8 inch (54mm).
 4. Faceplate: Drawn, one-piece, seamless construction 14 gauge (2mm), 18-8, Type 304 stainless steel with satin finish on exposed surfaces.
 5. Hooks: Snap down for safety if excessively loaded.
 6. Fasteners: Tamper-resistant, flat-head, hex-socket, stainless steel machine screws.
- B. Utility Hooks:
 1. Basis of Design: Bobrick Model B-670.

- a. Finish: Bright polish.
2. Basis of Design: Bobrick Model B-6707.
 - a. Finish: Satin.
3. Configuration: Single hook.
4. Projection from Wall: 2 inch (50mm).
5. Flange and Support Arm: All-welded, 18-8, Type 304, 22 gauge (0.8mm) stainless steel.
6. Mounting: Concealed bracket, 18-8, Type 304, 16 gauge (1.6mm) stainless steel; secured to wall plate with a stainless steel setscrew.
7. Concealed Wall Plate: 18-8, Type 304, 16 gauge (1.6mm) stainless steel.
8. Cap: 18-8, Type 304, 10 gauge (3.6mm) stainless steel; welded to support arm.

2.16 CUSTODIAL/JANITORIAL ACCESSORIES

- A. Utility Shelf With Mop and Broom Holders and Rag Hooks:
 1. Basis of Design: Bobrick Model B-224 x 36 with 4 mop/broom holders and 3 rag hooks.
 2. Shelf: 18-8, Type 304, 18 gauge (1.2mm) stainless steel with satin finish; 8 inches (203mm) deep, 1-1/2 inch (38mm) return edge.
 3. Length: 36 inches (915mm).
 4. Mounting Brackets: Welded to shelf, 18-8, Type 304, 18 gauge (1.2mm) stainless steel with satin finish.
 5. Mop and Broom Holders: Replaceable, spring-loaded rubber cams with anti-slip coating; accommodates handles from 7/8 inch to 1-1/4 inch (20mm to 30mm) in diameter; with plated steel retainers.
 6. Rag Hooks: 18-8, Type 304, 16 gauge (1.6mm) stainless steel with satin finish; secured to shelf with rivets.
 7. Drying Rod: 18-8, Type 304, 1/4 inch (6mm) diameter stainless steel with satin finish.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
 - 1. Verify blocking has been installed properly.
 - 2. Verify location does not interfere with door swings or use of fixtures.
 - 3. Comply with manufacturer's recommendations for backing and proper support.
 - 4. Use fasteners and anchors suitable for substrate and project conditions.
 - 5. Install units rigid, straight, plumb, and level, in accordance with manufacturer's installation instructions and approved shop drawings.
 - 6. Conceal evidence of drilling, cutting, and fitting to room finish.
 - 7. Test for proper operation.

3.2 CLEANING AND PROTECTION

- A. Clean exposed surfaces of compartments, hardware, and fittings using methods acceptable to the manufacturer.
- B. Touch-up, repair or replace damaged products until Substantial Completion.

END OF SECTION – 102800

SECTION 10511
METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Knocked-down corridor lockers.
2. Locks.
3. Locker benches.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **Project site**.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker **and bench**.

B. Shop Drawings: For metal lockers.

1. Include plans, elevations, sections, and attachment details.
2. Show locker trim and accessories.
3. Include locker identification system and numbering sequence.

C. Samples: For each color specified, in manufacturer's standard size.

D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.

E. Samples for Verification: For the following products, in manufacturer's standard size:

1. Lockers and equipment.
2. Locker benches.

F. Product Schedule: For lockers.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. The following metal locker hardware items equal to **10** percent of amount installed for each type and finish installed, but no fewer than **five** units:
 - a. Locks.
 - b. Blank identification plates.
 - c. Hooks.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.
- B. Deliver [**master and control keys**] [**combination control charts**] to Owner by registered mail or overnight package service.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.9 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of latches and other door hardware.
 - 2. Damage from deliberate destruction and vandalism is excluded.
 - 3. Warranty Period for Welded Metal Lockers: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain metal lockers, **locker benches**, and accessories from single source from single locker manufacturer.
 - 1. Obtain locks from single lock manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: For lockers **and locker benches** indicated to be accessible, comply with applicable provisions in **the USDOJ's "2010 ADA Standards for Accessible Design"**.

2.3 KNOCKED-DOWN CORRIDOR LOCKERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide ASI Storage Solutions, an ASI Group company; **Traditional** Collection or comparable product by one of the following:
 - 1. AJW Architectural Products.
 - 2. Hadrian Manufacturing Inc.
- B. Size: 12"x15"x72"
- C. Doors: One piece; fabricated from **0.075-inch** nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.

1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than **15 inches (381 mm)** wide; welded to inner face of doors.
 2. Stiffeners: Manufacturer's standard full-height stiffener fabricated from **0.060-inch (1.51-mm)** nominal-thickness steel sheet; welded to inner face of doors.
 3. Door Style: Vented panel as follows:
 - a. Louvered Vents: No fewer than **six louver openings at top and bottom for single-tier** lockers.
- D. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
1. Bottoms: **0.060-inch (1.52-mm)** nominal thickness, with single bend at sides.
 2. Tops, Backs, and Sides: **0.024-inch (0.61-mm)** nominal thickness, with full-height, double-flanged connections.
 3. Shelves: **0.024-inch (0.61-mm)** nominal thickness, with double bend at front and single bend at sides and back.
- E. Frames: Channel formed; fabricated from **0.060-inch (1.52-mm)** nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
- F. Hinges: Attached to door and door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
1. Continuous Hinges: Manufacturer's standard, steel, full height.
- G. Recessed Door Handle and Latch: Stainless steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in key locks, or padlocks; positive automatic latching and prelocking.
 - a. Latch Hooks: Equip doors **48 inches (1219 mm)** and higher with three latch hooks and doors less than **48 inches (1219 mm)** high with two latch hooks; fabricated from **0.105-inch (2.66-mm)** nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
 - b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

2. Single-Point Latching: Nonmoving latch hook designed to engage bolt of built-in combination, cylinder lock, and steel padlock loop that projects through recessed cup and is finished to match metal locker body.
 - a. Latch Hook: Equip each door with one latch hook, fabricated from **0.105-inch (2.66-mm)** nominal-thickness steel sheet; welded midway up full-height door strike; with resilient silencer.
- H. Locks: [**Combination padlocks**] [**Built-in combination locks**] [**Digital keypad locks**].
- I. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least **3/8 inch (9 mm)** high.
- J. Hooks: Manufacturer's standard ball-pointed hooks, aluminum or steel; zinc plated.
- K. Coat Rods: **Manufacturer's standard**.
- L. Legs: **6 inches** high; formed by extending vertical frame members with rear legs fastened.
 1. Closed Front and End Bases: Fabricated from **0.048-inch** nominal-thickness steel sheet.
- M. Recess Trim: Fabricated from **0.048-inch** nominal-thickness steel sheet.
- N. Filler Panels: Fabricated from manufacturer's standard thickness, but not less than **0.036-inch** nominal-thickness steel sheet.
- O. Boxed End Panels: Fabricated from **0.048-inch** nominal-thickness steel sheet.
- P. Finished End Panels: Fabricated from **0.024-inch** nominal-thickness steel sheet to cover unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.
- Q. Center Dividers: Fabricated from **0.024-inch** nominal-thickness steel sheet.
- R. Materials:
 1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
 2. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with **A60 (ZF180)** zinc-iron, alloy (galvannealed) coating designation.
- S. Finish: Powder coat; minimum **2 mils** thick.
 1. Color: **As selected by Architect from manufacturer's full range**.
 2. Color of Concealed Components: Almond.

2.4 LOCKS

- A. Combination Padlock: **[Key-controlled, three-number dialing combination locks; capable of five combination changes] [Provided by Owner].**
- B. Built-in Combination Lock: Key-controlled, three-number dialing combination locks; capable of at least five combination changes made automatically with a control key.
 - 1. Bolt Operation: **[Manually locking deadbolt] [or] [automatically locking spring bolt].**
- C. Digital Keypad Lock: Battery-powered electronic keypad with reprogrammable manager and owner codes that override access. Three consecutive incorrect code entries shall disable lock for three minutes.
 - 1. Designed for permanently assigned access via entry of user's four-digit code.
 - 2. Designed for shared or temporary access by multiple users, with user-defined code to lock and unlock. Provide LED indicator to show when lock is in use.

2.5 LOCKER BENCHES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide ASI Storage Solutions, an ASI Group company; Locker Benches or comparable product by one of the following:
 - 1. AJW Architectural Products.
 - 2. Hadrian Manufacturing Inc.
- B. Provide bench units with overall assembly height of **17-1/2 inches**.
- C. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.
 - 1. Size: Minimum **9-1/2 inches (241 mm)** wide by **1-1/4 inches** thick **except provide 20- to 24-inch- wide tops where accessible benches are indicated.**
 - 2. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides.
- D. Movable-Bench Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top, complete with fasteners, and as follows:
 - 1. Stainless Steel:
 - a. **2-inch-** diameter steel tubing, **0.060-inch-** thick stainless steel tube, shaped into trapezoidal form. Bottom **14 inches** wide with four mounting holes.
 - b. Finish: No. 4, brushed.
- E. Materials:

1. Stainless Steel Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 304.
2. Steel Tube: ASTM A500/A500M, cold rolled.
3. Composite Wood Products: Products to be made without urea formaldehyde.
4. Composite Wood Products: Products to be made without urea formaldehyde.
5. Particleboard: ANSI A208.1, Grade M-2.
6. Solid Plastic: High-density polyethylene.
7. Phenolic: Phenolic composite panel.

2.6 FABRICATION

- A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.
- C. Equipment: Provide each locker with an identification plate and the following equipment:
 1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
 2. Coat Rods: **In lieu of ceiling hook for metal lockers 24 inches high or more.**
- D. Knocked-Down Construction: Fabricate metal lockers by **assembling at Project site**, using manufacturer's nuts, bolts, screws, or rivets.
- E. Accessible Lockers: Fabricate as follows:
 1. Locate bottom shelf no lower than **15 inches** above the floor.
 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than **48 inches** above the floor.
- F. Continuous Zee Base: Fabricated in lengths as long as practical to enclose base and base ends; finished to match lockers.
- G. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.
- H. Boxed End Panels: Fabricated with **1-inch-** wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.
- I. Finished End Panels: Fabricated to conceal unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.
 1. Provide one-piece panels for double-row (back-to-back) locker ends.
- J. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

2.7 ACCESSORIES

- A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- B. Anchors: Material, type, and size required for secure anchorage to each substrate.
 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.
 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and floors or support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install lockers level, plumb, and true; shim as required, using concealed shims.
 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than **36 inches** o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
 2. Anchor single rows of metal lockers to walls near top **of lockers and to floor**.
 3. Anchor back-to-back metal lockers to floor.

- B. Knocked-Down Lockers: Assemble with manufacturer's standard fasteners, with no exposed fasteners on door faces or face frames.
- C. Equipment:
 - 1. Attach hooks with at least two fasteners.
 - 2. Attach door locks on doors using security-type fasteners.
 - 3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
 - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
 - b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.
- D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 - 1. Attach recess trim to recessed metal lockers with concealed clips.
 - 2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
 - 3. Attach sloping-top units to metal lockers, with closures at exposed ends.
 - 4. Attach boxed end panels using concealed fasteners to conceal exposed ends of nonrecessed metal lockers.
 - 5. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.
- E. Movable Benches: Place benches in locations indicated on Drawings.

3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. **Verify that integral locking devices operate properly.**

3.4 PROTECTION

- A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

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SECTION 10520
FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This Section includes all labor, materials, equipment, and incidentals required to provide and install wall-mounted portable fire extinguishers, as specified herein. Contractor shall furnish and install fire extinguishers at all locations shown in the Contract Drawings.

1.02 SUBMITTALS

- A. Submit in accordance with Section 01300.
- B. At a minimum the submittal shall include the following:
 - 1. Product Data: For each type of product indicated.
 - 2. Material cut sheets
 - 3. Installation Manual
 - 4. O&M Manual

PART 2 - PRODUCTS

2.01 FIRE EXTINGUISHERS

- A. Fire extinguishers shall be wall-mounted, steel cylinder, nitrogen pressurized, dry chemical, multi-purpose type, with 5 lbs. capacity minimum for Class ABC fires; J. L. Industries Cosmic 5E Multi-Purpose Dry Chemical, Amerex Model B402, or approved equal.
- B. All firefighting devices must comply with the provisions of the Occupational Safety and Health Act of 1974 (OSHA), Part 1926. Fire extinguisher shall be UL-approved.
- C. Fire extinguishers shall be furnished with an approved type wall mounting bracket, designed to mount fire extinguisher provided.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install firefighting extinguishers in accordance with manufacturer's written instructions. Coordinate all built-in items with masonry work.

- B. Mounting height to top of bracket shall be 4'-8".

END OF SECTION 10520

SECTION 11301
RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Cooking appliances.
 - 2. Kitchen exhaust ventilation.
 - 3. Refrigeration appliances.
- B. Related Requirements:
 - 1. Section 224100 "Residential Plumbing Fixtures" for kitchen sinks, dishwasher air-gap fittings, waste (garbage) disposers, and instant hot-water dispensers.

1.3 ALLOWANCES

- A. Furnish residential appliances as part of residential appliance allowance.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard size.

- C. Product Schedule: For appliances. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For each type of appliance.
- C. Field quality-control reports.
- D. Sample Warranties: For manufacturers' special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Maintains, within 20 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

1.9 WARRANTY

- A. Special Warranties: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period except as qualified below:
 - 1. Warranty Period: Five years from date of Substantial Completion.
- B. Electric Range: Full warranty, including parts and labor for on-site service on surface-burner elements.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Microwave Oven: Full warranty, including parts and labor for on-site service.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- D. Refrigerator/Freezer, Sealed System: Full warranty, including parts and labor, for on-site service on the product.
 - 1. Warranty Period for Sealed Refrigeration System Five years from date of Substantial Completion.
 - 2. Warranty Period for Other Components: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain residential appliances from single source and each type of residential appliance from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in [the DOJ's 2010 ADA Standards for Accessible Design] [the ABA standards of the Federal agency having jurisdiction] [and] [ICC A117.1] <Insert requirement>.
- C. Electric Range: Slide-in range with one oven(s) and complying with AHAM ER-1.
 - 1. Basis of Design: GE Profile Model # PYE22PYNFS Stainless Steel.
 - 2. Width: 30 inches.
 - 3. Electric Burner Elements: Four.
 - a. Radiant Type: Two 1500 W and two 2000 W
 - b. Controls: Digital panel controls, located on front.
 - 4. Anti-Tip Device: Manufacturer's standard.
 - 5. Electric Power Supply: 240 V, 60 Hz, 1 phase, 30 A.
 - 6. Material: Stainless steel with manufacturer's standard cooktop.

2.3 MICROWAVE OVENS

- A. Microwave Oven:
 - 1. Basis of Design: GE Profile Model #PES7227SLSS
 - 2. Mounting: Base cabinet.
 - 3. Type: Conventional.
 - 4. Dimensions:
 - a. Width: 24 inches.
 - b. Depth: 19-1/2 inches.
 - 5. Capacity: 2.2 cu. ft.
 - 6. Oven Door: Door with observation window and pull handle.
 - 7. Microwave Power Rating: Manufacturer's standard.
 - 8. Electric Power Supply: 120 V, 60 Hz, 1 phase, 15 A.
 - 9. Controls: Digital panel controls and timer display.

10. Material: Stainless steel.

2.4 KITCHEN EXHAUST VENTILATION

A. Overhead Exhaust Hood:

1. Basis of Design: GE Profile Model #PVX7300SJSS
2. Type: Wall-mounted exhaust-hood system.
3. Dimensions:
 - a. Width: 30 inches (762 mm).
 - b. Depth: 30 inches (762 mm).
4. Exhaust Fan: Variable-speed fan built into hood with manufacturer's standard capacity.
 - a. Venting: Vented to outside with weatherproof roof cap, backdraft damper, and rodent-proof screening.
 - b. Fan Control: Wall-mounted fan switch, with separate hood-light control switch.
5. Duct Type: Manufacturer's standard.
6. Finish: Stainless steel.
7. Features:
 - a. Permanent, washable aluminum-mesh filter(s).
 - b. Built-in LED lighting.

2.5 REFRIGERATOR/FREEZERS

A. Refrigerator/Freezer: Two-door refrigerator/freezer with freezer on bottom and complying with AHAM HRF-1.

1. Basis of Design: GE Profile Model PYE22PYNFS
2. Type: Freestanding.
3. Dimensions:
 - a. 36 inches.
 - b. Height: 70 inches.
4. Refrigerator Features:
 - a. Interior light in refrigeration compartment.
 - b. Compartment Storage: vegetable crisper and meat compartment.
5. Freezer Features: One freezer compartment(s) configured as pull-out drawer(s).
 - a. Automatic defrost.

- b. Interior light in freezer compartment.
 - c. Automatic icemaker and storage bin.
- 6. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
 - 7. Front Panel(s): Stainless steel
 - 8. Appliance Color/Finish: Stainless steel.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.
- C. Examine walls, ceilings, and roofs for suitable conditions where overhead exhaust hoods will be installed.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install appliances according to manufacturer's written instructions.
- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.

- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- D. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections :
 - 1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 - 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After installation, start units to confirm proper operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- B. An appliance will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION 11301

SECTION 12320

MANUFACTURED PLASTIC-LAMINATE CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Manufactured plastic-laminate casework and accessories.

1.2 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry.
- B. Section 08 71 00 - Door Hardware.
- C. Section 09 65 13 - Resilient Base and Accessories.
- D. Division 15 - Plumbing.
- E. Division 15 - Heating, Ventilating, and Air-Conditioning.
- F. Division 16 - Electrical.

1.3 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI A161.2 - Decorative Laminate Countertops, Performance Standards For Fabricated High Pressure.
 - 2. ANSI A208.1 - Particleboard Standard.
- B. Builders Hardware Manufacturers Association (BHMA): BHMA A156.9 - Cabinet Hardware.
- C. Forest Stewardship Council (FSC).
- D. National Electrical Manufacturers Association (NEMA): NEMA 3 LD - High-Pressure Decorative Laminates.
- E. Scientific Equipment and Furniture Association (SEFA): SEFA 8PL - Recommended Practices.
- F. American Woodwork Institute (AWI): American Woodwork Standards (AWS).

1.4 DEFINITIONS

- A. Exposed: In casework, surfaces visible when drawers and opaque doors are closed; behind clear glass doors; bottoms of cabinets 42 inches (1067 mm) or more above finished floor; and tops of cabinets less than 78 inches (1981 mm) above finished floor.

- B. Semi-Exposed: In casework, surfaces that become visible when opaque doors are open or drawers are extended; bottoms of cabinets more than 30 inches (762 mm) or tops of cabinets less than 42 inches (1067 mm) above finished floor.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data:
 - 1. Manufacturer's data sheets on each product to be used.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Typical installation methods.
- C. Shop Drawings: Illustrate products, installation; and how relationship with adjacent construction, including materials, construction finish, anchorage, and accessories. Submit drawings in accordance with manufacturer's requirements for lead time and approvals.
 - 1. Include manufacturer's catalog numbers and specifications.
 - 2. Finishes, hardware, construction options.
 - 3. Small scale floor plan showing casework in relation to the building.
 - 4. Large scale elevations and plan views.
 - 5. Cross-sections; service runs; locations of blocking within walls
 - 6. Rough-in requirements and sink centerlines.
- D. Samples:
 - 1. Selection Samples: Two representative units of each type, material, and color.
 - 2. Verification Samples: Two representative units of each type, material, and color.
 - 3. Small Scale base cabinet.
- E. Closeout Submittals: Operation and Maintenance Data.
- F. Quality Control Submittals: Manufacturer qualification statement.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.
- B. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.
- C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.
- D. Field Verification: Verify critical building dimensions prior to fabrication.
- E. Manufacturer shall be a member of and licensed by Architectural Woodwork Institute AWI and Quality Certification Program QCP certified.
- F. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's

review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.

1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
3. Retain mock-up during construction as a standard for comparison with completed work.
4. Do not alter or remove mock-up until work is completed or removal is authorized.
5. Full-Size Casework:
 - a. Base cabinet.
 - b. Wall cabinet
6. Countertop: 4 ft (1219 mm) long.
7. Countertop: ___ ft (___ mm) long.
8. Approved mockups may remain as part of the Work.

1.7 PRE-INSTALLATION CONFERENCE

- A. Attendance: Architect, Contractor, Installer, and related trades.
 1. Additional Attendees:
 - a. Owner.
 - b. Construction Manager.
 2. Review: Project conditions, manufacturer requirements, delivery and storage, staging and sequencing, and protection of completed work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
 1. Deliver casework once painting, and similar requirements have been completed that will not damage casework. This includes ensuring spaces are enclosed and weather tight.
 2. All casework shall be blanket wrapped or covered with cardboard and foam for protection during shipping.
- B. Protect from damage due to weather, excessive temperature, and construction operations.
 1. Casework must be protected from dust, dirt and/or other trades
 2. Countertops are stacked, properly supported and spaced evenly to avoid warping. Large pieces are stacked first on pallets with shorter pieces stacked on top.

1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.
- B. Do not deliver or install the casework until concrete, masonry, and drywall plaster work is dry; ambient relative humidity is maintained between 25 - 55 percent prior to

delivery and throughout the life of installation; and the temperature is controlled above 55 degrees F (13 degrees C).

- C. If ambient conditions are not met at the time of delivery, manufacturer reserves the right to void the warranty.

1.10 WARRANTY

- A. **Manufacturer's Warranty:** Provide manufacturer's standard limited warranty made out to the original Owner against defects in materials and workmanship. Non-casework items supplied, but not made by manufacturer; including but not limited to sinks, fixtures, apparatus, fume hoods, keyboard trays, lights, power outlets, and power strips shall be covered under the original manufacturer's warranty.
 - 1. **Warranty Period:** For casework, 5 year warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. **Basis of Design Manufacturer:** Case Systems, Inc., which is located at: 2700 James Savage Rd.; Midland, MI 48642; Tel: 989-496-9510; Email: [request info \(marketing@casesystems.com\)](mailto:request_info@casesystems.com); Web: <https://www.casesystems.com>
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 MATERIALS

- A. **Plastic Laminate Faced Cabinets:**
 - 1. **Core Type:** Particleboard. Particleboard. Grade M-2 or higher, meeting or exceeding ANSI A208.1.
 - a. **Modulus of Rupture:** 2176 psi (15000 kPa).
 - b. **Modulus of Elasticity:** 362600 psi (2500000 kPa).
 - c. **Internal Bond:** 73 psi (500 kPa).
 - d. **Linear Expansion:** 0.40 percent.
 - e. **Thickness Tolerance:** Plus or minus 0.008 inches (0.2 mm).
 - f. **Face Screw Holding:** 225 pounds (102 kg) minimum.
 - 2. **Core Type:** Particle Board. Moisture resistant, interior-grade MR/FSC, meeting or exceeding ANSI A208.1.
- B. **Cabinet Joinery:**
 - 1. **Concealed Interlocking Mechanical Fasteners or Dowel Construction:** For cabinet body components. Manufacturers discretion on best suited joinery method for project.
 - 2. **Construction:** Meets requirements in AWS Manual, Edition 2, including errata and appendix section.
- C. **Surfacing:** NEMA LD-3 and ANSI A161.2.
 - 1. Vertical surface decorative grade; VGS.
 - 2. General purpose decorative grade; HGS.
 - 3. Cabinet decorative liner grade; CLS.
 - 4. Non-decorative backer grade; BKH.

5. Decorative thermally fused laminate. White in color.
- D. Edge Banding: PVC, applied utilizing hot melt adhesive and radiused by automatic trimmer.
1. Adhesives: PVA type, ULEF, zero VOC, mechanically applied.

2.3 FABRICATION

- A. Compliance with AWI Grade Requirements: Premium.
- B. Compliance with AWI Grade Requirements: Custom.
- C. General Cabinet Body Construction:
1. Joinery: Concealed interlocking fasteners or dowel construction at manufacturer's discretion.
 2. Panels manufactured with balanced construction.
 3. Cabinet Box Style: Reveal overlay; standard.
 4. Structural Components: 3/4 inch (19 mm) thickness for bottoms and ends of cabinets, tops of tall cabinets, and tops and bottoms of wall cabinets.
 5. Fixed Interior Components: 3/4 inch (19 mm) thick for fixed shelves, dividers, and cubicle compartments; attached with concealed interlocking mechanical fasteners.
 6. Cabinet Body Exterior Surfaces: VGS; standard.
 7. Cabinet Body Exterior Surfaces: Tango decorative thermally fused.
 8. Cabinet Body Interior Surfaces:
 - a. Closed Cabinets: VGS cabinet grade.
 - b. Closed Cabinets: HGS cabinet grade.
 - c. Closed Cabinets: CLS.
 - d. Closed Cabinets: BKH.
 - e. Open Cabinets: VGS cabinet grade.
 - f. Open Cabinets: HGS cabinet grade.
 - g. Open Cabinets: CLS.
 - h. Open Cabinets: BKH.
 9. Laminate grain direction: Combination grain.
 10. Cabinet Body Front Edge: xx inch (1 mm) PVC; standard.
 11. Cabinet Body Front Edge: 0.12 inches (3 mm) PVC.
 12. Cabinet Body Mounting: Stretchers are 3/4 inch (19 mm) thick structural components fastened to end panels and back by mechanical fasteners and are concealed by the cabinet back.
 13. Exposed Laminate Back Panels: A separate, finished 3/4 inch (19 mm) thick back panel when rear of a cabinet is exposed.
 14. Cabinet Backs: 1/2 inch (13 mm) thick, surfaced both sides, fully captured on both sides and bottom.
 15. Hole Pattern: 3/16 inch (5 mm) diameter row hole pattern 1-1/4 inches (32 mm) on center bored in cabinet ends for adjustable shelves, for hardware mounting and replacement and relocation of cabinet components.
- D. Base Cabinet Construction:
1. Base Cabinet Sub-Top: Solid 3/4 inch (19 mm) thick sub-top of core for base cabinets, except sink cabinets; fastened between the ends with interlocking mechanical fasteners.

2. Split Removable Back Panels for sink cabinets:
 - a. Front Braces: Formed metal, powder coated black.
 - b. Steel Corner Gussets: At corners.

- E. Tall Cabinet Construction:
 1. Intermediate Shelves: Fixed.
 2. Intermediate Stretchers: Located behind the back panel.
 - a. Thickness: 3/4 inch (19 mm).
 - b. Secured between cabinet ends with mechanical fasteners.
 - c. Secured to the shelf through the back with No. 8 x 2 inches (51 mm) plated flat head screws.

- F. Wall Cabinet Construction:
 1. Lower Stretchers: Located behind the back panel.
 - a. Thickness: 3/4 inch (19 mm).
 - b. Attached between the end panels with mechanical fasteners.
 - c. Secured through the back and into the cabinet bottom.
 - d. Wall cabinets over 36 inches (914 mm) in width receive a fixed intermediate partition.
 2. Exterior Bottoms: Match exterior surface.

- G. Tall, Wall and Hutch Cabinets Exterior Top Finish:
 1. Top Materials: HPL to match exterior surface.

- H. Base, Tall, Wall and Hutch Upper Door Reveals:
 1. Reveal between Doors and Drawers: 3mm.
 2. Reveal above Top Drawer, Base, Wall, Tall, and Hutch Doors: 15mm.

- I. Cabinet Toe Bases:
 1. Construction:
 - a. Bases support and carry the load of the end panels, and the cabinet bottom, directly to the floor.
 - b. Bases are let in from the sides and back of the cabinet to allow cabinets to be installed tightly together and tight against a wall, and to conceal the top edge of applied vinyl base molding (not supplied by casework manufacturer).
 - c. Center Support: Front to back center support for bases over 30 inches (762 mm) wide.
 2. Individual Bases, Materials: Particleboard, factory applied; standard.
 3. Toe Bases, Height: 3-25/32 inches (96 mm); standard.
 4. Toe Base Type: Attached; standard.

- J. Drawer Fronts and Solid Doors: Surfaced on both sides.
 1. Core Materials: Particleboard; standard.
 2. Core Thickness: Standard.
 3. Component Materials: HPL door interior and exterior; both sides match front surface color; standard.
 4. Surfaces: HPL grade VGS; standard.
 5. Doors: Standard.
 6. Door and Drawer Front Edges: 1/8 inch (3 mm) PVC; standard.

- K. Drawer Boxes:
1. Core Materials: Particleboard; standard.
 2. Construction: Non-racking, non-deflecting platform bottom that is carried directly by L shaped, bottom mount drawer glides.
 3. Drawer Boxes with Finished Interiors: Surface to match standard interior; standard.
 4. Slides: Secured with 1-1/4 inches (32 mm) long screws driven through the platform and into the sides.
 5. Drawer Box Sides, Backs, Sub-fronts, and Bottoms: 1/2 inch (13 mm) thick.
 6. Top Edges: Nominal 1 mm PVC, matching the drawer color.
 7. Drawer Box Corners: Joined with fluted hardwood dowels and glue spaced at a minimum of (1-1/4 inches) 32 mm on center.
 8. Drawer Box Fronts: Removable and attached to drawer box sub-front with screws from inside of drawer.
 9. Horizontal Parting Rails Between Drawers: 3/4 inch (19 mm) thick core, with balanced surfaces, secured to and further reinforcing cabinet ends.
- L. Cabinet Doors:
1. Construction: Solid doors, 3/4 inch (19 mm) thick core; standard.
- M. Shelves:
1. Adjustable Shelves: Finished on both sides.
 - a. Core Materials: Particleboard; standard.
 - b. Thickness of Adjustable Shelves in Closed Cabinets:
 - 1) For Shelves Under 36 Inches (914 mm) Wide: Standard, 3/4 inch (19 mm) thick.
 - c. Adjustable Shelf Edges on Closed Cabinets: 0.020 inch (0.5 mm) match edge at front; standard.
 - d. Adjustable Shelf Surfaces on Closed Cabinets: Match interior; standard.
 - e. Setback for Adjustable Shelves: 19/32 inch (15 mm) from the front; standard.
 2. Fixed Shelves:
 - a. Core Materials: Particleboard; standard.
 - b. Thickness of Fixed Shelves: 3/4 inch (19 mm) thick, 1 inch (25 mm) at opens; standard.
 - c. Fixed Shelf Surfaces on Closed Cabinets: Match interior; standard.
 3. Lockers:
 - a. Fixed Shelves: 3/4 inch (19 mm) thick.
 - b. Locker Top Finishes: Unfinished; standard.
 - c. Locker Top Finishes: Finished edge and surface
 - d. Locker Top Finishes: As scheduled and indicated on Drawings.
 4. Countertops:
 - a. High-Pressure Decorative Laminate:
 - 1) Compliance: Conforming to NEMA Standard LD3 and ANSI A161.2.
 - 2) Backing: Grade BKL.
 - 3) Core Thickness: 3/4 inch (19 mm), solid.
 - 4) Horizontal Surfaces: HGS; standard.
 - 5) Laminate Substrate: 1 inch (25 mm) or 1-1/8 (29 mm) solid core

thickness on particleboard or 1 inch (25 mm) solid core on plywood core; standard.

- 6) Laminate Adhesive: PVA rigid adhesives.
- 7) Joints: Secured with biscuits for alignment and tight joint fastening.
- 8) Backsplashes: 4 inches (102 mm) high backsplashes with thickness matching countertop thickness at ends abutting walls and adjacent cabinets and in locations scheduled and indicated on Drawings.
- 9) Edges: 1/8 inch (3 mm); standard.
- 10) Maximum Lengths of HPL Buildup Particleboard Tops: 12 feet (3658 mm).
- 11) Maximum Lengths of HPL Buildup Plywood Tops: 8 feet (2438 mm).

2.4 ACCESSORIES

A. Hardware:

1. Hinges: Concealed type.
 - a. Hinge Design: Fully concealed, nickel-plated, self-closing, European style with six way adjustment.
 - b. Compliance: Minimum of Grade 2 per ANSI/BHMA A156.9.
 - c. Door Swing: 170 degrees without binding.
 - d. Doors Under 48 inches (1219 mm) in Height: Two hinges.
 - e. Doors 49 inches (x mm) - 66 inches (x mm) in Height: Three hinges.
 - f. Doors Over 67 inches (x mm) in Height: Four hinges.
2. Pulls: One pull located at the centerline of the drawer, regardless of width.
 - a. Pull Design: Anodized aluminum wire pulls, 5/16 inch (8 mm) diameter with 3-25/32 inches (96 mm) on center mounting holes.
3. Drawer Slides:
 - a. Drawer Slides for Standard Drawers: Side-mount, ball bearing.
 - b. Design: Full-extension.
 - c. Compliance: 100 lbs (45 kg) load rating, meets Grade 1 requirements per ANSI A156.9/BHMA.
4. Coat Hooks: Zinc plated, single prong and double prong.
5. Closet Rods: Chrome plated oval rod, (15 x 30 mm).
6. Locks:
 - a. Lock Locations: No locks; standard.
7. Catches:
 - a. Chain Pulls: Zinc plated; spring loaded door catches hold doors shut.
 - b. Chain Stops: Zinc plated, looped chains limit door swing.
 - 1) Mounting Plates: At ends of chain, four #7 x 5/8 inch (16 mm) screws secure mounting plates to cabinet doors and end panels.
 - 2) Chain Stop Locations: On cabinets at adjoining walls and where casework and countertops can interfere with door swing of tall cabinets.
 - c. Elbow Catches: Chrome plated; spring loaded catches hold non-locking door securely shut.
 - d. Roller Catches: Heavy-duty, spring-loaded roller, with molded plastic bumper mounted at door top to keep door securely shut.

- e. Magnetic Catches: White plastic housing with two 1-1/4 inches (32 mm) spaced, elongated holes for screw-attachment to allow adjustability.
- f. Catch Types: Magnetic at base and wall cabinets, single roller at tall cabinets.
- g. Catch Types: Single roller at base, wall and tall cabinets.
- h. Catch Types: Magnetic at base and wall cabinets, two rollers at tall cabinets.
- i. Catch Types: Single roller at base and wall cabinets, two rollers at tall cabinets.
- j. Catch Types: None for three-knuckle or concealed hinges at base, wall and tall cabinets.
- k. Catch Types: As scheduled and indicated on Drawings.

2.5 FINISHES

A. Plastic Laminate Casework Colors:

- 1. High Pressure Laminate:
 - a. Finish: Custom, _____.
 - b. Finish: Wilsonart, 60 matte finish.
 - c. Finish: Wilsonart, 38 matte finish.
 - d. Finish: Nevamar in a T textured finish.
 - e. Finish: Formica in a 58 finish.
 - f. Finish: Pionite in an SD finish.
 - g. Finish: As scheduled and indicated on Drawings.
- 2. Cabinet Liners: High-pressure cabinet liners.
 - a. Thickness: 0.020 inch (0.5 mm)
 - b. Compliance: Conforming to ANSI/NEMA 3 LD, Grade CLS.
 - c. Texture: Surface texture shall be similar to exterior finish.
 - d. Color: Matching cabinet interior.
 - e. Color: Light beige.
 - f. Color: Fashion grey.
 - g. Color: Frosty white.
 - h. Color: As scheduled and indicated on Drawings.

B. Plastic Laminate Countertops:

- 1. Color: _____.
- 2. Color: Wilsonart in a 60 matte finish.
- 3. Color: Nevamar in a T textured finish.
- 4. Color: Formica in a 58 finish.
- 5. Color: Pionite in an SD finish.
- 6. Color: As scheduled and indicated on Drawings.

C. Accessories:

D. Round Grommets:

- 1. Finish: Black.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly constructed and prepared.
- B. Verify blocking and concealed supports are in place.
- C. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean substrates thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions, approved submittals and Shop Drawings, and in proper relationship with adjacent construction.
 - 1. Anchor to wall blocking, not to plaster lath or wallboard.
 - 2. Test components for proper operation and adjust until satisfactory results are obtained.

3.4 CLEANING AND PROTECTION

- A. Clean products in accordance with the manufacturer's recommendations.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 12320

SECTION 15400

PLUMBING

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. This Section consists of potable hot and cold water systems, sanitary drainage and vent systems, plumbing fixtures, traps, drains, and accessories as required for complete installations as indicated on the Drawings, and in accordance with the Specifications.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 1 - General Requirements
- B. Division 5 - Metals
- C. Section 09900 - Painting
- D. Section 11100 – General Process Mechanical Requirements
- E. Division 15 - Mechanical Construction

1.03 REFERENCES

- A. ANSI - American National Standard Institute
- B. ASTM - American Society for Testing and Materials
- C. PDI - Plumbing and Drainage Institute
- D. PPI - Plastic Pipe Institute
- E. AGA - American Gas Association
- F. SME Boiler and Pressure Vessel Code
- G. ARI (Air Conditioning and Refrigeration Institute)
- H. National Sanitation Foundation Standard
- I. Safe Drinking Water Act
- J. ASHRAE
- K. ASSE

- L. Equipment, materials and installations shall conform to the most recent editions with latest revisions, supplements, and amendments of the applicable codes and standards listed in Division Nos. 1, 11 and 15 of these Specifications.

1.04 GENERAL INFORMATION AND DESCRIPTION

- A. Furnish all labor, materials, equipment and services and perform all work in connection with the plumbing and drainage system(s) as indicated and specified.
- B. The Contractor shall be responsible for compliance with all laws and ordinances governing this work, and hold Owner harmless from all damage or expense arising from any violation thereof.
- C. Prior to commencing work, the Contractor shall verify all measurements at the building site. Submit all discrepancies to the Engineer for clarification before proceeding with the work.
- D. Drawings are to be considered diagrammatic; not necessarily showing in detail or to scale all of the equipment or minor items.
- E. The Contract Documents shall be considered supplementary to each other so that the materials and equipment indicated, called for or implied by one and not the other shall be supplied and installed as though specifically called for by both. All auxiliaries, piping, connections, valves or other apparatus required for complete and properly functioning systems shall be furnished whether or not specified.
- F. Specifications are sectionalized for convenience only and shall not be used to define divisions of construction responsibility. The Contractor is responsible for learning the design loadings of the various floors and roofs in the building and shall not overload any floor or roof.
- G. Arrange piping containing fluids to drain at the lowest point so the entire system may be emptied. Pitch condensate lines in the direction of the flow.
- H. Install all piping with proper slope and in the most direct straight and mechanical manner possible, true to line, plumb and level without sags, traps or pockets, with a minimum of bends, turns and elbows.
- I. Protect installation from damage and foreign objects with plugs, caps, and covers. Similarly close open ends of pipe at end of each day's work.
- J. Ream pipe ends after cutting and remove dirt, scale, etc., before using. Use plugs or caps to keep pipe clean before use.
- K. Make all connections to floor and equipment drains with 45-degree wye, or with 45-degree wye bend and straight pieces of pipe.
- L. Locate and install valves for easy service, access and operation.

1. Stemmed valves shall not be installed with stems below horizontal, or in a position where parts of the building structure prevents their operation.
 2. Check valves shall be installed at sufficient distance from building structure to allow for service.
- M. The Contractor shall inform himself fully regarding the peculiarities and limitations of the space available for the installation of all materials and equipment. He shall see that all of his equipment such as valves, traps, cleanouts and similar items shall be readily accessible and wherever required, he shall provide a suitable sized Milcor access door . The foregoing shall also apply in general to all parts of the systems that require access from time to time for maintenance and operation.
- N. All plumbing above drop ceilings, exposed plumbing, and plumbing above electrical gear shall be insulated.

1.05 SUBMITTALS

- A. The Contractor shall submit shop drawings of all equipment, accessories and appurtenances, operation and maintenance instructions and other required information to the Engineer for review as specified in Section 01300, Submittals.
- B. Data to be submitted shall include, but not be limited to:
1. Catalog Data consisting of specifications, illustrations and a parts schedule that identifies the materials to be used for the various plumbing components and accessories. The illustrations shall be in sufficient detail to serve as a guide for assembly and disassembly.
 2. Complete layout and installation drawings with clearly marked dimensions. Piece numbers which are coordinated with the tabulated pipe layout schedule shall be clearly marked. Scale and size of the drawings shall conform to the Specifications in the General Conditions and Division 1, General Requirements. Piping layout drawings shall indicate the following information; pipe supports, location, support type, hanger rod size, insert type and the load on the hanger in pounds.
 3. Weight of all component parts.
 4. Design calculations where specified.
 5. Tabulated pipe layout schedule which shall include the following information for all pipe and fittings, service, pipe size, working pressure, wall thickness, and piece number.
- C. The Contractor shall obtain from the manufacturer and submit to the Engineer copies of the certified shop tests in accordance with the General Conditions and Division 1.

- D. The Contractor shall obtain from the manufacturer and submit to the Engineer copies of certified letters of compliance in accordance with the Section 01300, Submittals.

1.06 QUALITY ASSURANCE

- A. Contractor shall be responsible for compliance with all laws and ordinances governing his work. He shall have, at all times, a competent representative on the site. He shall lay out work such as lines of piping, sleeves and similar work in accordance with the drawings and in ample time so that all chases or other openings in walls which may be required to accommodate his work may be built in advance to avoid cutting. He shall, at all times, take proper precautions to protect his work from damage and disfigurement

1.07 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor is responsible for compliance with all local, State, and Federal laws and ordinances governing the work; for accuracy of layout, grades and elevations; for setting sleeves and openings, and for protecting work and equipment from damage.
- B. Lines shall include standard reducers for pipe size reductions. Bushings shall not be used for pipe size reduction.
- C. Clean the inside of all pipe and ducting of all dirt, dust and other foreign material.
- D. While cast and ductile iron pipe is suspended, inspect for defects and ring with a light hammer to detect cracks. All defective, damaged or unsound pipe shall be replaced.
- E. Arrange piping and ducts parallel to column rows and floors and to dimensions where indicated. Arrange piping to drain at the lowest possible point so the entire system may be emptied.
- F. Install all piping in the most direct, straight and mechanical manner possible, true to line, plumb or level, without sags, traps or pockets, with a minimum of bends, turns and elbows. Install piping with joints and flanges carefully faced and properly caulked, screwed, bolted, soldered, brazed, or welded without piping being subject to unnecessary or excessive strains.
- G. Welding and fabrication performed under this contract shall be in complete accordance with the specifications, ANSI B31.1, and all applicable state and local codes.
 - 1. Welding and fabrication coming under the jurisdiction of the ASME Boiler and Pressure Vessel Code shall be handled in conformance with that code in addition to the above.
 - 2. Imperfect welds will be judged unacceptable by the Engineer and shall be repaired in accordance with the codes.

- H. Install unions and flanges in pipelines, whether shown or not, so lines may be broken for maintenance, valves may be removed, equipment disconnected and future connections made. Install in lines which are erected without unions or flanges and which, in the opinion of the Engineer, cannot be properly maintained.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Materials and equipment shall be new, free from defects and of the best quality available in each specified grade, class or type.

2.02 PIPING MATERIALS

- A. Cold water pipe, hot water pipe, condensate pipe, drainage, waste and vent piping shall be as specified herein and shall conform to the requirements of Division 15 of the Specifications. Water lines larger than 3 inches shall meet requirements of Division 15.
- B. This Contractor shall form all holes; furnish and install all concrete inserts, flashings and sleeves in existing floors, walls, equipment foundations, ceilings, and roofs as required for the erection, installation, and support of all pipe and tubing.
 - 1. Provide sleeves and flashings for all pipes and tubing, etc., furnished which passes through existing walls, intermediate floors, partition walls and roofs.
 - 2. Install concrete inserts, sleeves and flashings required, as indicated, or in a manner acceptable to the Engineer.
 - 3. All holes missed by the Contractor, but required for the installation of the piping systems, shall be made in the walls, floors, roof and by the Contractor at no additional expense to the Owner by core drilling or saw cutting methods only.
 - 4. Provide escutcheons around pipes in all areas. Use chromium plated escutcheons on pipe penetrations exposed in finished rooms or areas.
- C. Potable cold and hot water systems shall be installed as specified herein and as shown on the Drawings.
 - 1. Interior service piping shall be copper ASTM-B88 Type K above ground and underground. No joints under slab.
 - 2. Fittings shall be wrought copper solder joint fittings per ANSI B16.22 or cast solder joint fittings per ANSI B16.18.
 - 3. Use no-lead solder only on all copper water piping.

- D. Drainage, waste and vent pipes shall be CISP bell and spigot joints with neoprene seal for sanitary drainage, waste and vent piping..
- E. Materials and methods shall be approved by local code authorities.
- F. Installation of pipe and fittings shall be per manufacturer's recommendations. Changes in horizontal directions shall be long radius fittings only.
- G. Ball valves shall be provided to isolate sections of pipe and fixtures for repairs and in the following locations if not indicated:
 - 1. On risers and main branches at point of take off from their supply mains.
 - 2. On supplies to individual fixtures and other equipment which are not furnished with their own shutoff valves.
- H. The Contractor shall make nipples of the same material and weight as the pipe being connected to. The use of close nipples is prohibited. When the length of the unthreaded part of standard weight nipple is less than 1-1/2 inches extra strong pipe Schedule nipples shall be used.
- I. In general, unions and couplings shall be of the same material as the pipe on which they are used.
 - 1. Unions on drainage pipes, on fixture side of traps may be slip flanged joints with soft rubber gaskets.
 - 2. Unions in pipes larger than 2 inches shall be flanged unions with gaskets acceptable to the Engineer.
 - 3. Unions in copper and brass pipes shall be all brass and shall have ground joints. Copper unions shall be Nibco No. 733.
 - 4. Dielectric unions or couplings shall be used between all ferrous and non-ferrous pipe. Dielectric unions shall be #3001 by Watts Regulator Co. Provide dielectric insulating type unions with threaded nylon insulator wherever joining steel pipe to copper pipe.

2.03 PIPE SLEEVES AND ESCUTCHEONS

- A. Sleeves shall be provided for all piping passing through masonry or concrete walls and floors. Sleeves for walls and floors shall be indicated, made watertight and extend above floor lines. Sleeves shall conform to the requirements of Division 15.
- B. Escutcheon plates shall be polished chrome. Provide for all wall penetrations in finished areas.

2.04 PLUMBING FIXTURES AND EQUIPMENT

- A. Provide and install plumbing fixtures and equipment specified and indicated. Fixtures shall bear the manufacturer's name and trademark and quality or class of fixture. All exposed trim piping, etc., shall be chromium plated brass and all "P" traps shall be provided with shutoffs, either separate or incorporated into the flushing device. The Contractor shall check the Architectural and Plumbing Drawings for details and dimensions prior to roughing in for fixtures.
- B. Lavatories shall be Kohler Greenwich K-2031, K-15265-4 Faucet. Lavatory shall have 4 inch center faucet holes, front overflow, self-rimming with adhesive strips.
- C. Handicapped water closets shall be Kohler Model #K-4302. Watercloset shall have vitreous china, 1.6 gallons per flush cycle, siphon jet flushing action, 1-1/2 inch top spud, and a 17 inch rim height.
 - 1. Flush valves for handicapped water closets shall be Sloan Royal.
 - 2. Standard water closets shall be Kohler Model #K-4302. Water closets have vitreous china, 1.6 gallons per flush cycle, siphon jet flushing action, 1-1/2 inch top spud, and 18 inch high elongated bowl.
 - 3. Flushing valves for standard water closets shall be Sloan Royal.
 - 4. Carriers shall be Josam #18000 series, exact model number to match job site conditions (copper, PVC adapter, on-stock, back-to-back, etc.)
- D. The Contractor shall provide cleanouts in soil, waste and vent lines, as indicated, at the end of each branch drainage line, at each change of direction of horizontal lines otherwise without a cleanout, and at intervals of not more than 75 feet. All cleanouts shall be so located and installed that they may be readily accessible and removable for cleaning the lines.
 - 1. Cleanouts shall be Josam 56050 with Nikaloy Top. Exterior cleanouts shall be encased in concrete at grade.
- E. Stop valves shall be polished chrome-plated, loose-keyed angle stop having 1/2 inch inlet and 3/8 inch O.D. x 12 inch long flexible tubing outlet, and wall flange and escutcheon.
- F. All fixtures and floor drains shall be provided with traps to comply with the local regulations and shall be set true and level.
 - 1. Traps for lavatories and sinks shall be cast brass, polished chrome finish, adjustable "P" trap with clean out plug and tubing outlet. Size to match fixture tailpiece.
 - 2. For other drains, fixtures and equipment traps shall be full size and of same material, weight, and class as line piping.

- G. Shock absorbers shall be Zurn Z-1700 and comply with P.D.I. Standard WH201. Shock absorber shall be an all stainless steel construction.
1. Provide on all hot and cold water piping systems.
- H. Water heaters shall be a glass lined statesman premium heavy duty commercial electric Model SSE-40-15-IFE as manufactured by State Heater. Heaters shall be constructed in accordance with ASME code, and shall be listed with underwriters' laboratories and approved by National Sanitation Foundation. All internal surfaces of the tank shall be glass-lined with an alkaline borosilicate composition that has been fused-to-steel by firing at a temperature of 1600 degrees. Tank shall be cathodically protected with adequate extruded magnesium rod. The entire vessel is to be enclosed in a round steel enclosure with baked enamel finish. Control components to be hinged and shall house 120 volts control circuit transformer, transformer fusing, magnetic contactors, immersion style operating thermostats, high limit thermostats, element fusing per N.E.C., and commercial grade incoloy sheathed flange mounted elements with prewired terminal leads. Temperature controls include limiting switch, which will require resetting manually in the event the temperature reaches 190 degrees. Foam insulation shall exceed latest requirements of ASHRAE 90.1b-1999 for heat loss efficiency. Heaters shall include ASME T&P relief valve and drain valve.
- I. Backflow preventer shall be a testable reduced pressure (RP) principle type, Series 900 as manufactured by Watts, or equal, installed with double check valves on water supply line.
- J. Ball valves shall be lead free full port brass valves, Series LFFBV-4 as manufactured by Watts, or equal.
- K. Hose bibbs shall be all brass or bronze construction with wheel handle and non-removable vacuum breaker complying with ASSE Standard 1011.
- L. Use teflon tape for threaded pipe joints in PVC and copper piping.
1. Use non-hardening lubricant for cold and hot screwed steel water pipe.
 2. Apply tape or compound to male threads only.
 3. Threads shall be American Standard, tapered, cut to full length.
 4. Use sheet metal pans beneath pipe threading equipment to protect the floor.
 5. Water service PVC pipe joints shall be solvent cement ASTM D2564.
 6. Water service copper pipe joints shall be solder type, ASTM B32, Grade 95-5 tin-antimony solder with no lead.

7. For joint transitions between metallic and PVC piping, use adapters, slip joints and similar fittings made for this purpose and conforming to the standards, codes and regulations as specified for fittings.

2.05 POTABLE WATER SYSTEMS

- A. Provide cold and hot water supply systems in the buildings as indicated, making connections to all fixtures and equipment requiring hot and/or cold water.
- B. The Contractor shall provide swing or swivel joints on connections from mains to risers and from risers to branches.

2.06 SANITARY DRAINAGE AND VENT SYSTEMS

- A. Roof stack terminals shall be flashed in accordance with roofing manufacturer's recommendations, see Section 074113.
- B. Roof drain strainer/dome assemblies shall be constructed from stainless steel or spun aluminum.

PART 3 - EXECUTION

3.01 PIPE INSTALLATION

- A. Horizontal piping shall be installed as high as possible without sags. Install 3 inches and larger horizontal drain and waste piping to 1/8 inch per foot slope. Piping 2 inches and smaller shall be installed at a slope of 1/4 inch per foot.
- B. Concealed piping shall be installed in time so as not to delay work of other trades and to allow ample time for tests and inspection.
- C. Before beginning installation work, check plumbing Drawings with architectural, structural, mechanical, civil, air conditioning and electrical Drawings and make accurate layouts of plumbing piping. Coordinate with other trades and report all interferences, discrepancies, or proposed changes to the Engineer for approval prior to beginning installation work.
- D. Underground piping shall be firmly bedded on solid ground as specified in Division 2. Soil and vent stacks shall be supported at the base by means of piers or hangers close to the bottom of the riser and at the floor by means of riser clamps.
 1. Each horizontal length of cast or ductile iron pipe and PVC DWV pipe shall be firmly fastened to wall, or otherwise suitably supported.
 2. All water risers shall be properly anchored with allowance made for expansion.

3. Hangers, support and anchors shall be installed as required to adequately support the lines without interfering with their inherent flexibility.
- E. Should the Contractor fail to accurately locate and lay out all necessary openings in new construction in sufficient time to incorporate same in the structure, then the Contractor shall, at no extra cost to the Owner, cut such holes as may be required and replace at his own expense all completed work which may have been damaged or destroyed by the cutting of the holes. All such cutting shall be done under the direction and with the permission of the Engineer.

3.02 TESTING

- A. Notify Owner and Engineer one week in advance that the items are ready for testing.
1. Perform testing before work is concealed with construction or insulation, or before backfilling if piping is to be buried.
 - a. Concealed piping shall be installed in time so as not to delay work of other trades and to allow ample time for tests and inspection.
 2. Any pipe or system that fails or leaks during testing shall be repaired or replaced as directed by the Engineer and then retested. The cost of all tests required by the Owner, County, State, and Underwriter authorities shall be borne by the Contractor.
 3. Furnish all necessary equipment and materials, including pump, gauges, and all portable instruments.
 4. The Contractor shall conduct the tests of all systems and appurtenances in a safe manner, and correct any deficiencies.
 5. The Contractor shall obtain necessary approvals, acceptances, and permits.
- B. Test pressures shall be in accordance with ANSI B31.1 Code for Pressure Piping, Paragraphs 121(a), (b), and (c).
1. Test pressures shall be as follows:
 - a. Cold Water System - 100 psig hydrostatic.
 - b. Compressed Air Water System - 100 psig hydrostatic.
 - c. Drainage, Waste, and Vent - 15 psig hydrostatic.

2. All tests shall be held for at least 4 hours and until each joint has been inspected.
 3. At conclusion of testing remove special test fittings, caps, blanking plates, etc. and replace damaged gaskets and place systems in operation.
- C. If inspection or tests show defects or failure, such defective work, materials or failure shall be replaced without delay and inspection and tests repeated. Repairs to piping and equipment shall be repaired or replaced with new material or equipment. Caulking of screw joints or plugging leaks shall not be permitted.
- D. All water piping shall be hydraulically tested at 100 psig and proven tight for a period of not less than 4 hours with no loss of pressure. Tests for each section shall be repeated at no additional cost to the Owner until the piping is proven tight at the specified test pressure. Upon completion of work, inspection shall be made by the Engineer. All corrections, changes or removal of defective work shall be made by the Contractor at no cost to the Owner prior to approval of installation.
- E. Water and DWV Pipe Testing: Shall be hydrostatic as follows, except where more stringent tests are required by the codes.
1. Slowly fill with water each valved section in pipe, and apply the specified test pressure by means of a portable positive displacement pump connected to the piping in an acceptable manner.
 2. Make taps if necessary, at points of highest elevation, and plug tightly afterwards.
 3. Carefully examine all exposed pipe, fittings, valves and joints during the tests.
 4. Where joints show seepage or slight leaks repair as requested.
 5. Remove and replace any cracked or damaged pipe, fittings, valves, or other defective materials discovered during the test.
 6. After replacements and repairs have been made, repeat tests until work is satisfactory and approved.
- F. All drainage and vent piping shall be tested before fixtures are installed, by capping or plugging the openings and filling the entire system with water and allowing it to stand thus filled for three hours.
- G. All water supply piping shall be tested before fixtures or faucets are connected.
- H. Each fixture shall be tested for soundness, stability of support and satisfactory operation of all its parts.

3.03 DISINFECTION

- A. All pipe and fitting connected to and forming a part of a potable water supply shall be disinfected in accordance with the procedures described in AWWA C 601. Disinfection shall also be in accordance with the requirements of the Georgia Division of Environmental Health and the Owner.

- B. Disinfection shall be accomplished after the pipe has been flushed, if applicable, and passed the hydrostatic test. Such piping shall be filled with 50 parts per million (PPM) of chlorine and held in contact for not less than 24 hours. Final tests after 24 hours contact time shall show a minimum residual chlorine content of 10 ppm in all parts of the system. Disinfection shall be repeated as often as necessary, and as directed by the Engineer and/or NCDEH and/or the Owner until the minimum residual chlorine content of 10 ppm has been reached. The Contractor shall obtain certificates of satisfactory bacteriological tests and furnish them to the Owner before the request is made for acceptance of the work. The Contractor shall furnish and install, at his own expense, all means and apparatus necessary for performing the disinfection. The chlorine solution shall be thoroughly flushed out prior to placing the sections of pipe in service. The Contractor is cautioned that the spent chlorine solution must be disposed of in such a way as not to be detrimental to animal, plant, or fish life. Chlorine residual tests will be made after flushing to assure that residual is not in excess of 1 ppm at any point in system.

END OF SECTION 15400

SECTION 15500

BASIC HVAC REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Contractor shall furnish all labor, equipment and material for the complete installation of the heating, ventilation, air conditioning, piping, etc. as indicated on the drawings and specified herein.
- B. Air conditioning systems shall be furnished and installed to operate as a system. The Contractor shall coordinate all requirements between manufacturers to insure unit responsibility and compatibility of the systems.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 5 - Metals
- B. Division 9 - Painting
- C. Division 16 - Electrical
- D. Division 17 - Control and Instrumentation Systems

1.03 SUBMITTALS

- A. The Contractor shall submit shop drawings on all equipment, accessories and appurtenances and all fabrication work or other mechanical and air conditioning work required, all in accordance with the requirements of Section 01300, Submittals.
- B. Data to be submitted shall include but not be limited to:
 - 1. Catalog data consisting of specifications, illustrations and a parts schedule that identifies the materials to be used for the various parts and accessories. The illustrations shall be in sufficient detail to serve as a guide for assembly and disassembly.
 - 2. Complete assembly, and installation drawings with clearly marked dimensions. This information shall be in sufficient detail to serve as a guide for assembly and disassembly and for ordering parts.
 - 3. Weight of all component parts and assembled weight.
 - 4. Electrical characteristics, wiring, diagrams, etc.
 - 5. Sample data sheet of equipment nameplate(s) including information contained thereon.

6. Insulation materials, coating, jackets, detail density, thermal conductivity and thickness of all insulation materials to be furnished.
 7. Details of special fasteners and accessories.
 8. Type of adhesives, binders, joint cement, mastics.
 9. Proposed insulation procedures and installation methods.
 10. Spare parts list
 11. Special tools list
- C. The Contractor shall obtain from the manufacturer and submit to the engineer copies of the results of all certified shop tests.
- D. The Contractor shall obtain from the manufacturer and submit to the engineer copies of certified letters of compliance in accordance with the Specifications.

1.04 OPERATION AND MAINTENANCE MANUALS

- A. The Contractor shall submit operation and maintenance manual in accordance with the procedures and requirements set forth in the General Conditions and Division 1.
- B. Operation and Maintenance Manuals shall be submitted for all equipment.
- C. The manufacturer's efficiency of each piece of HVAC equipment must be documented and included in the O&M Manual.

1.05 MANUFACTURER'S INSTRUCTIONS

- A. Installation of all equipment shall be in accordance with manufacturer's data.
- B. All changes from the installation procedures in manufacturers' data shall be submitted for approval in accordance with the requirements for shop drawings.
- C. Keep all manufacturers' data provided in a secure manner at the job site at all times. Catalog and index this data for convenient reference.
- D. Manufacturers' data shall be available for the information of the Owner, Engineer, and the use of other trades.
- E. Turn over all data to the Owner through the Owner's representative at completion of the Work and final testing.

- F. Furnish Owner, indexed and bound in loose-leaf binders, three (3) complete sets of Operating and Maintenance Instructions and pertinent manufacturers' literature and information on all of the apparatus and equipment under this Division of the Specifications.
- G. Submit all instruction books and manuals in accordance with Division 1.

1.06 CODES, PERMITS AND STANDARDS

- A. The Contractor shall obtain and pay for all permits and shall comply with all laws and codes that apply to the Work.
- B. The Contractor shall be responsible for all added expense due to his choice of equipment, materials or construction methods.
- C. All work and materials shall be in full accordance with the latest State rules and regulations or publications including those of the State Fire Marshall, the Uniform Plumbing Code, and all local codes. Nothing in the Plans and/or Specifications shall be construed to permit work not conforming to the above codes, rules and regulations.
- D. All equipment, materials and installations shall conform to the requirements of the most recent edition with latest revisions, supplements and amendments of the following, as applicable:

Air Conditioning and Refrigeration Institute (ARI)

Air Diffusion Council (ADC)

Air Moving and Conditioning Association (AMCA)

American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE)

American National Standards Institute (ANSI)

American Society for Testing and Materials (ASTM)

American Society of Mechanical Engineers (ASME)

Factory Mutual (FM)

National Electric Code (NEC)

NFPA 90A - Air Conditioning and Ventilation Systems

Occupational Safety and Health Standards (OSHA)

Sheet Metal & Air Conditioning Contractors National Association (SMACNA)

Standard Building Code - latest edition

Standard Mechanical Code - latest edition

Standard Plumbing Code - latest edition

State and local codes, ordinances and statutes

Underwriters Laboratories (UL)

Others as designated in the specifications.

- E. The Contractor shall install ENERGY STAR-qualified heating, ventilating and air-conditioning (HVAC) and water heating products that meet or exceed American Society of Heating, Refrigerating and Air Conditioning Engineers (ASRAE) 90.1-2019 minimum efficiency requirements. This includes heat pumps, boilers, central air conditioners, unitary equipment, packaged air conditioning equipment, chillers, water heaters, gas furnaces and room air conditioners.

1.07 QUALITY ASSURANCE

- A. All material and equipment shall be the latest design, new, undeteriorated, and the first quality standard product of manufacturers regularly engaged in the production of such material and equipment.
- B. When two or more units of the same class of material or equipment are required, they shall be products of a single manufacturer.
- C. All work shall be performed in a neat and workmanlike manner by workers skilled in their respective trades, and all materials and equipment shall be installed as recommended by the manufacturers and in accordance with specified codes and standards.
- D. Touch up and/or repaint to match original finishes all factory finished or painted equipment and materials, which are scratched or marred during shipment or installation.

1.08 IDENTIFICATION MARKERS

- A. Provide manufacturer's standard laminated plastic, color coded duct markers. Conform to the following color codes:

Yellow/Green: Supply air

Blue: Exhaust, outside, return and mixed air

Nomenclature: Include the following:
Direction of airflow.
Duct service (supply, return, exhaust, etc.)

1.09 GASKETS AND CONNECTORS

- A. Provide new gaskets wherever gasketed mating equipment items or pipe connections have been dismantled. Gaskets shall be in accordance with manufacturer's recommendations.

- B. Replace all assembly bolts, studs, nuts and fasteners of any kind which are bent, flattened, corroded or have their threads, heads or slots damaged.
- C. Furnish all bolts, studs, nuts and fasteners for make-up of all connections to equipment and replace any of these items damaged in storage, shipment or moving.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Each item of equipment shall be furnished and installed complete with all supports, mounting frames, duct work, piping, louvers, panels, grilles, electric drive units and controls, mechanical equipment, electrical work, insulation and appurtenances ready for operation.
- B. All equipment and appurtenances shall be anchored or connected to supporting members as specified or as indicated on the Plans.
- C. All mechanisms or parts shall be amply proportioned for the stresses, which may occur during operation, or for any other stresses, which may occur during fabrication and erection. Individual parts furnished which are alike in all units shall be alike in workmanship, design, and materials and shall be interchangeable. All equipment shall be of the manufacturer's top line, industrial-commercial grade.
- D. The Contractor shall ascertain that all chassis, shafts, and openings are correctly located, otherwise he shall cut all new openings required at his own expense. Cutting of new openings shall be coordinated with other trades. Proposed new cutting shall be submitted to the Engineer for review and acceptance prior to cutting.
- E. The Plans shall be taken as diagrammatic. The Contractor shall check the Structural Plans and sections for detail dimensions and clearances. Sizes of ducts and their locations are indicated, but not every offset, fitting, or structural obstruction is shown.
- F. Alignment of ducts may be varied where necessary to account for slight architectural changes or to avoid conflict with the Work of other trades without additional expense to the Owner.
- G. All supports required for the proper installation of the equipment, but not forming an integral part of the building structure, shall be provided, unless specifically noted otherwise. Equipment shall be supported on spring-type vibration isolators.

END OF SECTION 15500

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SECTION 15521

HVAC DUCT INSULATION

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall furnish and install all duct insulation and accessories as shown on the Drawings and in accordance with the Specifications.
- B. This Section includes semirigid and flexible duct, plenum, and breeching insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 15500 – Basic HVAC Requirements

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Without limiting the generality of other requirements of the Specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.
 - 1. ASTM E84
 - 2. ASTM C533
 - 3. NFPA 255
 - 4. ASTM C921
 - 5. ASTM C1071

1.04 SUBMITTALS

- A. The Contractor shall submit manufacturer's technical product data and installation instructions for each type of insulation.
- B. Submit schedule showing manufacturer's product number, thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

1.05 COORDINATION

- A. Coordinate clearance requirements with duct Installer for insulation application.

1.06 SCHEDULING

- A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Mineral-Fiber Insulation:
 - a. CertainTeed Manson.
 - b. Knauf FiberGlass GmbH.
 - c. Owens-Corning Fiberglas Corp.
 - d. Schuller International, Inc.

2.02 INSULATION MATERIALS

- A. Mineral-Fiber Board Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IB, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

2.03 FIELD-APPLIED JACKETS

- A. General: ASTM C 921, Type 1, unless otherwise indicated.
- B. Canvas: 8 ounce:
- C. Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitor-discharge welding and galvanized speed washer. Pin length sufficient for insulation thickness indicated.
 - 1. Welded Pin Holding Capacity: 100 lb. for direct pull perpendicular to the attached surface.

2.04 VAPOR RETARDERS

- A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.02 GENERAL APPLICATION REQUIREMENTS

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.
- B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct system.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- E. Keep insulation materials dry during application and finishing.
- F. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- G. Apply insulation with the least number of joints practical.
- H. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
- I. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.
- J. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- K. Apply insulation with integral jackets as follows:
 - 1. Pull jacket tight and smooth.
 - 2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
 - 3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

- M. Install vapor-retarder mastic on ducts and plenums scheduled to receive vapor retarders.
 - 1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.
 - 2. Ducts without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.
- N. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.
 - 1. Seal penetrations with vapor-retarder mastic.
 - 2. Apply insulation for exterior applications tightly joined to interior insulation ends.
 - 3. Seal insulation to roof flashing with vapor-retarder mastic.
- O. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.
- P. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.
- Q. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.
 - 1. For insulation indicated to have vapor retarders, taper termination and seal insulation ends with vapor-retarder mastic.

3.03 MINERAL-FIBER INSULATION APPLICATION

- A. Board Applications for Ducts and Plenums: Secure board insulation with adhesive and anchor pins and speed washers.
 - 1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.
 - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 - 3. Space anchor pins as follows:
 - a. On duct sides with dimensions 18 inches and smaller, along

- longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
- b. On duct sides with dimensions larger than 18 inches. Space 16 inches o.c. each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
 - c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not over compress insulation during installation.
4. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 5. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with ½-inch staples, 1 inch o.c., and cover with pressure-sensitive tape having same facing as insulation.
 6. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches o.c.
 8. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

3.04 FIELD-APPLIED JACKET APPLICATION

- A. Apply canvas jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.
 1. Apply jacket smooth and tight to surface with 2-inch overlap at seams and joints.
 2. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

3.05 DUCT SYSTEM APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
- B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.
- C. Insulate the following plenums and duct systems:
 - 1. Indoor supply-, return-, and outside-air ductwork.
- D. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
 - 1. Fibrous-glass ducts.
 - 2. Metal ducts with duct liner.
 - 3. Factory-insulated flexible ducts.
 - 4. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
 - 5. Flexible connectors.
 - 6. Vibration-control devices.
 - 7. Testing agency labels and stamps.
 - 8. Nameplates and data plates.
 - 9. Access panels and doors in air-distribution systems.

3.06 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE

- A. Service: Supply-air ducts.
 - 1. One layer of 2-inch mineral fiberboard, with field applied canvas jacket in all exposed areas, and vapor retarder.
- B. Service: Return-air ducts of cooling and heating units.
 - 1. One layer of 2-inch mineral fiberboard, with field applied canvas jacket in all exposed areas, and vapor retarder.
- C. Service: Outside-air ducts.
 - 1. One layer of 2-inch mineral fiberboard with field applied canvas jacket, in all

exposed area, and vapor retarder.

END OF SECTION 15521

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SECTION 15597

METAL DUCTWORK

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall furnish and install all ductwork, fittings, and accessories as shown on the Contract Drawings and in accordance with the Specifications.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 5 - Metals

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Shall be as specified in Section 01090, Reference Standards.

1.04 SUBMITTALS

- A. Shall be as specified in Section 15500, Basic HVAC Requirements.

PART 2 - PRODUCTS

2.01 METAL DUCTWORK

- A. The Contractor shall furnish and install the metal ductwork as shown on the Contract Drawings, as specified, and reasonably implied for a complete first class job. It is not the intention of the Contract Drawings to show all offsets, bends and fittings, which may be required. All such devices required for complete operation of the system shall be provided.
- B. Metal ductwork shall be constructed entirely of galvanized sheet steel as indicated on the Contract Drawings, and of adequate strength and rigidity to meet the conditions of the service and installation requirements, and shall be properly protected where subject to mechanical injury. Galvanized sheet steel shall comply with ANSI/ASTM A 527, lockforming quality, with ANSI/ASTM A 525, G90 zinc coating.
- C. All ducts shall be made reasonably tight throughout and shall have no openings other than those required for the proper operation and maintenance of the systems.
- D. Minimum thickness for metal ducts as follows:

DIAMETER OF STRAIGHT DUCTS	U.S. STANDARD GAUGE FOR STEEL DUCTS
Up to 12-inches	26
Over 13-inches to 30-inches	24
Over 30-inches	22

- E. All ducts shall be thoroughly braced where required and substantially supported.
- F. Changes in size of ducts shall be by means of a taper transformation piece, the included angle of the taper being not more than 30 degrees. All duct work joints shall be sealed.
- G. The weight of material used for ducts and stiffeners, the fabrication methods, cross breaking of flat duct surfaces, and assembling of the ductwork shall conform to the Duct Manual and Sheet Metal Construction for Ventilating and Air Conditioning Systems published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. Beaded duct construction shall not be used.
- H. Vertical ducts shall be supported at 4-ft. intervals by means of angle brackets anchored to the structure.
- I. Suitable access doors shall be located in ducts for maintenance of dampers of equipment not otherwise accessible.
- J. Sheet-metal duct connections to masonry or sheet metal openings shall be airtight.
- K. Where indicated on the Contract Drawings, or where necessitated by physical conditions, duct turns shall be installed. Duct turns or turning vanes shall be of acceptable air-foil design.

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE AND HANDLING

- A. Protect shop-fabricated and factory-fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling.
- B. Prevent end damage and prevent dirt and moisture from entering ducts and fittings. Where possible, store ductwork inside and protect from weather. If necessary to store outside, store above grade and enclose with waterproof wrapping.

3.02 INSTALLATION OF METAL DUCTWORK

- A. Examine areas and conditions under which metal ductwork is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

- B. Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight (5% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each indicated service.
- C. Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth.
- D. Support ducts rigidly with suitable ties, braces, hangers and anchors of type, which will hold ducts true-to-shape, and to prevent buckling. Support vertical ducts at every floor.
- E. Field Fabrication: Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements.
- F. Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct useable space or block access for servicing building and its equipment.
- G. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings.
- H. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

3.03 EQUIPMENT CONNECTIONS

- A. Connect metal ductwork to equipment as indicated; provide flexible connection for each ductwork connection to equipment mounted on vibration isolators, and/or equipment containing rotating machinery. Provide access doors as indicated.

3.04 ADJUSTING AND CLEANING

- A. Clean ductwork internally, unit by unit as it is installed, of dust and debris. Clean external surfaces of foreign substances, which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.
- B. At ends of ducts, which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering, which will prevent entrance of dust and debris until time connections are to be completed.

END OF SECTION 15597

SECTION 15606

AIR INLETS AND OUTLETS

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall furnish and install all air inlets and outlets and accessories as shown on the Drawings and in accordance with the Specifications.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 15000 - Basic Mechanical Requirements
- B. Section 15500 - Basic HVAC Requirements

PART 2 - PRODUCTS

2.01 AIR DISTRIBUTION DEVICES

- A. Select grilles, diffusers, and registers with neck velocities and noise ratings equal to or less than those used for design. Shall be Greenheck, Titus, Metalaire or approved equal.
- B. All supply air devices shall be designed to diffuse the specified air quantities uniformly throughout the conditioned space with a 25°F degrees cooling temperature differential between average room temperature and supply air temperature.
- C. Devices shall not create air velocities in excess of 50 fpm in the 5-foot zone of occupancy, with a maximum temperature differential of 1-1/2°F degrees between the 50 fpm terminal air and an average room temperature of 75 °F to 77°F, while supplying air at the supply air temperatures listed in the unit schedule on the drawings.
- D. Ratings shall be certified and tested in accordance with Air Diffusion Council Test Code 1062R2, or another approved test procedure.
- E. Submit laboratory air distribution performance tested and rated in accordance with ASHRAE-36B Standard for sound power measurement.
- F. Location of air distribution devices installed in ceilings shall be as indicated. See plans and coordinate with other trades.
- G. Opposed blade volume dampers shall have removable adjusting key or wrench.

- H. All air distribution devices shall be aluminum with colors as selected by the Engineer. Grilles in all equipment rooms and all unfinished areas shall have unpainted aluminum anodized finish.
- I. Interiors of perforated face devices shall be flat black.

2.02 SUPPLY AIR REGISTERS

- A. Supply registers shall be of aluminum construction with built-in, fully adjustable air pattern controllers to adjust flow patterns as indicated.
- B. Air pattern controllers shall not damper airflow, flow rates and sound levels regardless of air pattern setting. Pattern controllers shall be completely concealed from sight.
- C. Face shall be hinged for easy access to pattern and volume controllers.
- D. Provide duct adapters as required for indicated duct sizes and as shown in Section 15390, Schedules.
- E. Provide aluminum opposed blade dampers for all supply registers. Provide model, size and type as required and shown in the schedule.
- F. Unless noted otherwise, registers shall be Greenheck, Titus, or Metalaire.

2.03 RETURN AIR REGISTERS

- A. Return registers shall be the same material as supply registers.
- B. Registers shall be Greenheck, Titus or Metalaire unless noted otherwise. Color as selected by the Engineer. Grilles in all equipment rooms and all unfinished area shall have unpainted aluminum anodized finish.

PART 3 - EXECUTION

3.01 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver air outlets and inlets wrapped in factory-fabricated fiberboard type containers. Identify on outside of container type of outlet or inlet and location to be installed. Avoid crushing or bending and prevent dirt and debris from entering and settling in devices.
- B. Store air outlets and inlets in original cartons and protect from weather and construction work traffic. Where possible, store indoors. When necessary to store outdoors, store above grade and enclose with waterproof wrapping.

- C. Examine areas and conditions under which air outlets and inlets are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended functions.
- B. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.
- C. Locate ceiling air diffusers, registers, and grilles, as indicated on the Drawings. Unless otherwise indicated, locate units in center of acoustical ceiling modules.
- D. Furnish to Owner, with receipt, 3 operating keys for each type of air outlet and inlet that require them.

END OF SECTION 15606

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SECTION 15700

HEAT PUMP SYSTEM

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall furnish and install all ductwork, fittings, and accessories as shown on the Contract Drawings and in accordance with the Specifications.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 5 - Metals

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Shall be as specified in Section 01090, Reference Standards.

1.04 SUBMITTALS

- A. Shall be as specified in Section 15500, Basic HVAC Requirements.

PART 2 - PRODUCTS

2.01 AC/HEAT PUMP SYSTEM

A. HEAT PUMP

1. Manufacture and Certifications

- a. Units shall be manufactured in an ISO 9001 certified facility.
- b. Units shall be certified by CSA to UL 1995 / CSA 22.2 and performance certified to ANSI/AHRI Standard 210/240.
- c. Units shall be sound tested according to ANSI/AHRI Standard 270.
- d. Certified matched system ratings shall be available for download from the AHRI online directory at www.ahridirectory.org.
- e. Unit packaging shall be marked, "Assembled in the USA".
- f. System shall be rated for 2.5-Ton load, 15 SEER, using R-410A refrigerant and operating on 208-230V, 1 ϕ , 60 Hz power supply.
- g. Heat pump unit shall be Trane, model 4TWR5030H1000A or engineer approved equal.

2. Unit Application

- a. Units shall be approved for heating operation between -20°F and 75°F without modification.
- b. Units shall have the following operating modes:

- Defrost
 - Cooling Operation
 - Heating Operation
 - Emergency Heat
- c. Units shall be approved for linesets up to 50 feet equivalent length without modification.
- d. Units shall be designed to 74dBA or less to minimize sound pollution.
3. Unit Access
- a. Units shall have a removable fan guard that can be removed independently of the top for interior access through the top of the unit without damaging the coil.
 - b. Units shall have two removable stamped extruded louver steel coil guards for exterior coil access.
 - c. Units shall have a separate compartment for electrical controls that can be accessed without disturbing the unit airflow.
 - d. Units shall have a blockoff panel that can be removed to provide interior unit access through the side of the unit.
 - e. Units shall have a removable blockoff panel and a swing away removable electrical
4. Unit Construction
- a. Units shall be shipped completely wired, piped and assembled. Wiring pigtails shall be provided for field control wiring connections. Service valves shall be provided for field refrigerant line connections.
 - b. Units shall be factory leak checked, run tested, and shipped with a holding charge of R-410A refrigerant.
 - c. Unit cabinet components shall be G90 equivalent steel finished with powder-coat paint rated at a minimum of 750 hours under ASTM B117 testing.
 - d. Units shall have a single corner post opposite the electrical control box and two independently removable steel coil guard panels to optimize cabinet strength and serviceability.
 - e. Units shall have L-shaped stamped extruded louver sheet metal coil guards with for maximum panel durability and stiffness.
 - f. Units shall have a factory installed filter-drier for faster installation and improved system reliability.

- g. Unit base valves shall be mounted diagonally on the unit base pan with service ports that provide sufficient clearance for low-loss hose fittings.
- h. Units shall provide a service port mounted in the base pan such that panels can be removed without moving the service port.
- i. Units shall be constructed with a high pressure switch and a low pressure switch for system protection.
- j. Units shall be constructed with all badging and labels applied at the factory.

5. Unit Components

- a. Units shall be constructed of rotary or scroll compressors paired with an inverter drive.
- b. Condenser fan shall be direct drive with vertical air discharge for low sound levels.
- c. Condenser fan blades are designed to minimize sound.
- d. Condenser fan motor shall be ECM construction with permanently lubricated ball bearing motors approved for vertical shaft applications.
- e. Condenser coil shall be air cooled and constructed of enhanced aluminum fins mechanically bonded to internally enhanced Ø 7mm copper tubing.

6. Unit Warranties

- a. Unit manufacturer shall provide a 10-Year compressor warranty without a requirement for unit registration.
- b. Unit manufacturer shall provide a 5-Year parts warranty without a requirement for unit registration.

7. Accessories

- a. Provide the following accessories:
 - Support feet kit
 - Anchor bracket kit
 - Touch-up paint matching color of unit

B. AIR HANDLER

1. Manufacturer and Certifications

- a. Units shall be manufactured in an ISO 9001 certified facility.
- b. Units shall be tested to UL 1995 / CSA 22.2 standards up to 0.30"wc external static pressure.
- c. Air handler shall be load matched to the heat pump unit, operating on same voltage power supply.

- d. Air handler shall be Trane model TAM9A0B30V31DA or engineer approved equal.

2. Unit Components

- a. Insulated Cabinet – Air handler cabinet shall be thermally insulated with ¾” foil faced insulation to prevent sweating.
- b. Factory Sealed – Total airflow leakage rate shall be less than 2%.
- c. Finish – Air handler casings shall be made of pre-painted galvanized steel which provides a better paint to steel bond that resists corrosion and rust creep. All internal coil sheet metal parts shall be made of G60 galvanized or prepainted G30 galvanized.
- d. Filters – Air handler shall have internal filter racks provided for use with 1” thick standard size filters.
- e. Electric Heat Kit – Air handler shall be equipped with a 5.0kW electric heat kit.
- f. Blower Motor – Air handler shall use a high efficiency brushless DC motor to provide cooling SSER rating enhancement.

3. Unit Warranties

- a. Unit manufacturer shall provide a 10-Year compressor warranty without a requirement for unit registration.
- b. Unit manufacturer shall provide a 5-Year parts warranty without a requirement for unit registration.

- C. THERMOSTAT

1. Manufacturer and Certifications

- a. Thermostat shall comply with Part 15 of the FCC Rules.
- b. Thermostat shall be Trane XL 802 Series or engineer approved equal.

2. Unit Components and Features

- a. Thermostat shall have a backlit LCD display that displays the following information:
 - Clock with day of the week, which indicates the current time and day. The clock is also used to program the time period schedules.
 - Mode indicators, which selects the operational mode of the equipment. Operational modes include heat, cool, heat & cool, and off.
 - Program icon indicating that Time Period Programming is running or is enabled to be set.
 - Room temperature display, indicating the current room temperature and displays the outdoor temperature when selected.

- Outdoor icon, indicating the temperature displayed is from the optional outdoor sensor.
- Desired set temperature, indicating the desired room temperature(s). Unit shall also display the highest and lowest temperatures for the day.
- Morning, Day, Evening, & Night icons, indicating the day part of the time period program.
- Setup step icon, indicating the step number when the thermostat is in the setup mode.
- 2nd and 3rd stage icons, indicating what stage of cooling or heating is currently energized.
- “Lock” icon, indicating the keypad has been locked.
- “AuxHeat” icon, indicating 2nd stage electric heat is being used when the thermostat is programmed for Heat Pump operation. Only the “Aux” icon will appear during Cool to Dehumidify to indicate Reheat operation.
- “Lo” icon, indicating the lowest recorded outdoor temperature for the day.
- “Hi” icon, indicating the highest recorded outdoor temperature for the day.
- “Fan On” icon, indicating constant, continuous fan operation. When “Fan On” is not lit – indicates the fan will only operate when necessary to heat or to cool.

- b. “Cooler” button
- c. “Warmer” button
- d. “Mode” button

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install the equipment as indicated on the Contract Drawings and in accordance with the manufacturer’s instructions.
- B. Provide and connect accessories and power as required to ensure a complete operable unit.

3.02 MECHANICAL PERFORMANCE TESTING

Place the equipment into initial operation to demonstrate correct alignment, smooth operation, freedom from noise, vibration, overheating, and all controls and mechanical functions.

3.03 EQUIPMENT ACCEPTANCE

Adjust, repair, modify or replace any components which fail to perform as specified and rerun the tests; make final adjustments to the equipment under the direction of the manufacturer’s representative and to the satisfaction of the Engineer.

END OF SECTION 15700

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SECTION 16010

ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. All items of labor, materials, and equipment necessary for the complete installation and proper operation of work described or implied, shall be furnished and installed.
2. Test all electrical conductors, after completion of installation of wiring and apparatus, to insure continuity, proper splicing, freedom from grounds, except "made grounds" and those required for protection and insulation resistance. Use testing instruments, i.e. megger. Activation of each circuit will be required as final test. Testing shall be done at no additional expense to the Owner.
3. Drawings are indicative of work to be installed but do not indicate all bends, fittings, boxes, etc. that will be required in this Contract. The structural and finished conditions of the project shall be investigated prior to construction.
4. Coordinate work with other trades to avoid interference between piping, ducts, equipment, architectural or structural features. In case of interference, the Engineer decides which work is to be relocated, regardless of which is first installed.
5. Visit the site to determine actual conditions. No extra compensation will be allowed by failure to determine existing conditions.

B. Additional Circuits:

1. A sum of money shall be included in the Base Bid for the Contract for five (5) additional circuits. Each additional circuit shall include the following:
 - a. 50' of 3/4" electrical metallic tubing, and associated fasteners and connectors.
 - b. 150' of #12 THHN/THWN wire
 - c. (1) cast outlet box
 - d. Final connections to motor, receptacle, lighting control switch, or power wiring circuit, etc.
2. The additional circuits shall be included in the Contractor's Schedule of Values.

1.02 QUALITY ASSURANCE

A. Regulations, Standards and Publications:

ANSI	American National Standards Institute, Inc
ASTM	American Society for Testing and Materials
BOCA	Building Officials and Code Administrators
IEEE	Institute of Electrical and Electronic Engineers
ISA	International Society of Automation
IPCEA	Insulated Power Cable Engineers Association
NEC	National Electrical Code of National Fire Protection Association
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
UL	Underwriters' Laboratories

1. The installation must comply with all Federal and State, municipal or other authority's laws, rules and/or regulations.
2. Inspections by the required authorities shall be made. Original final wiring certificates with two copies shall be submitted to the Owner.
3. The electrical inspections shall be made by the Middle Department Inspection Agency, or other inspection agency approved by the County.
4. All electrical equipment and its components and materials shall meet all applicable UL criteria and bear the appropriate label of the Underwriters' Laboratory.
5. All electrical equipment or apparatus of any one system shall be of the same quality as produced by one or more manufacturers, suitable for use in a unified system. The term "manufacturer" shall be understood as applying to a reputable firm who assumes full responsibility for its products.

1.03 SUBMITTALS

A. General:

1. Submit in accordance with the General Requirements of the Contract.

B. Shop Drawings:

1. All shop drawings shall be submitted to the Engineer for review. All shop drawing submittals shall clearly indicate, using arrows and/or

highlighting on all copies, which item(s) are being submitted and that each item being submitted complies with all requirements of the drawings and in these specifications.

2. All pertinent specification and drawing requirements shall be indicated on the shop drawings. If incorrect, they shall be resubmitted in quantity according to Contract conditions until satisfactory.
3. Work shown on shop drawings shall not be executed until such drawings are approved. Electrical items shall not be installed until final approval of the shop drawings has been given by the Engineer.
4. See specific sections for a breakdown of shop drawing items.
5. Submit certification that all equipment is UL listed.
6. Shop drawings shall indicate adequate clearance for operation, maintenance and replacement of operating equipment devices.
7. The Engineer reserves the right to request additional shop drawings.

C. Installation, Operation and Maintenance Manuals:

1. Submit required number of installation, operation and maintenance manuals for all equipment being provided for the electrical system. These manuals shall be submitted electronically in pdf format, and in 3-ring loose-leaf binders. The manuals shall be complete, neat, orderly, and indexed.
2. The installation, operation and maintenance manuals shall include a copy of the approved shop drawings for all electrical items installed on the project.

1.04 PRODUCT DELIVERY, HANDLING AND STORAGE

A. Product Handling:

1. Deliver all materials in good condition. Store in dry place, off ground, and keep dry at all times.

PART 2 - PRODUCTS

2.01 SEE SPECIFIC SECTIONS FOR PRODUCTS

PART 3 - EXECUTION

3.01 INSTALLATION

A. Protection of Installation:

1. All unfinished installations, construction materials and equipment shall be protected during construction. All damaged equipment caused by noncompliance with this requirement shall be repaired at no expense to the Owner.

B. Openings and Chases:

1. Determine locations of chases and openings prior to construction so that same may be provided where required. If openings or chases are made after building construction is accomplished, such cutting and repairing of the building shall be made by this Contractor in complete coordination with other trades on the job site to match original conditions in quality, color and type of materials used, and at no additional expense to the Owner.

C. Position of Outlets and Equipment:

1. The Engineer shall determine the position of all relocated outlets and equipment if the required location differs from that indicated on the drawings.

D. Moving Equipment:

1. The Owner reserves the right to move any equipment or outlets a distance of ten feet before roughing in, at no additional expense.

E. Methods and Materials:

1. All work shall be installed in a first-class, neat and workmanlike manner by skilled mechanics. All materials shall be new. Firmly support all materials and equipment.

F. Cutting, Repairing and Finishing:

1. All cutting, repairing, finishing, and painting required for the installation of work under this Contract shall be performed under this Contract.
2. All disturbed surfaces shall be repaired and finished to match adjacent surfaces by skilled mechanics working in their respective fields.

- G. Excavation and Backfilling:
1. Excavation and backfilling shall be in accordance with the requirement of Division 2 and as required to complete the work according to details on drawings.
- H. Concrete:
1. Concrete work shall be in accordance with the requirements of Division 3 and as required to complete the work according to details on drawings.
- I. Cutting and Patching of Concrete Areas:
1. Openings in concrete required for Electrical construction shall be made by taking extreme precautions to prevent excessive damage to existing facilities. Prior to completion, all disturbed areas shall be closed, restored to normal and finished to match surrounding areas.
- J. Access:
1. Install all conduit, wire, cable, wiring devices and equipment to preserve access to all equipment installed under this Contract.
- K. Layout of Wiring:
1. The layout of wiring as shown on the drawings shall not be considered as absolute. It shall be subject to changes where necessary to overcome obstacles in construction. Where a major deviation from the plans is indicated by practical consideration, shop drawings shall be submitted showing all deviations in detail to clearly indicate the necessity or desirability for the change.
- L. Miscellaneous Supports:
1. Furnish and install all necessary angles, beams, channels, hanger rods or other supports for equipment and piping furnished under this Contract requiring support or suspension from building structure.
- M. Grounding:
1. Grounding system shall comply with the current edition of the National Electrical Code, the current edition of the National Electrical Safety Code, and as specified herein.
 2. All ground conductors shall be copper and sized according to the requirements of the NEC, Table 250-66 and Table 250-122 as applicable.

3. All conduits shall be furnished with a separate ground conductor. Conduits shall not be used as a ground conductor.
4. Ground conductors shall be green, insulated stranded type where installed in conduit.
5. All metallic conduits shall be bonded to the equipment ground terminal, ground wire or ground bus using an insulated ground bushing and jumpers sized as required by the NEC. A bond shall be provided at all conduit terminations.
6. Ground rods shall be 3/4" diameter x 10'-0" long copper clad steel. The exterior shall be electrolytic copper metallurgically bonded to a round one-piece carbon steel rod. Install a ground rod at each corner of the ground grid. Electrodes shall be driven straight down, perpendicular to the finished grade.

N. Continuity of Service:

1. Uninterrupted electrical service shall be maintained to the water treatment plant during the entire time required for complete installation of the work proposed under these specifications and drawings.
2. Temporary equipment, cable and whatever else is necessary shall be provided as required to maintain electrical service. Temporary service facilities, if required at any time, shall not be disconnected or removed until new services are placed in proper operation.
3. If any service or system must be interrupted, the Contractor shall request permission in writing stating the date, time, etc. the same will be interrupted and the areas affected. This request shall be made in sufficient time for proper arrangements to be made.

O. Clean Up:

1. Upon completion of all work under electrical specifications, furnish labor, materials and incidentals to accomplish the following: remove all dirt, foreign materials, stains, fingerprints, etc. from all lighting fixtures, glassware, panelboards, motor control centers, control panels, wall plates, system equipment, floors, walls and ceilings adjacent to the above equipment and leave the electrical work in such a condition that no cleaning will be required by the Owner.
2. The complete system shall be subject to inspection and approval by the Owner.

3.02 SMOKE DETECTOR SYSTEM

A. Installation:

1. Furnish and install a complete smoke detector system in the New Operator Building consisting of smoke detectors, wiring, and programming. The smoke detectors shall be wired to the existing Notifier NFW-50X fire alarm panel located in the Treatment Building Lab. Furnish and install all required wiring, and hardware in the existing fire alarm panel, to add the smoke detectors to the panel.
2. The smoke detectors shall be Notifier FSP-951 Series Addressable Photoelectric Smoke Detectors. Color shall be white. Coordinate smoke detectors with existing fire alarm panel.
3. Submit shop drawings on the smoke detector system.
4. The smoke detector system shall be furnished and installed by Fireline. Telephone number is 410-247-1422.

END OF SECTION 16010

SECTION 16050

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. All items of labor, materials, and equipment necessary for the complete installation and proper operation of work described or implied, shall be furnished and installed.

1.02 QUALITY ASSURANCE

A. Regulations, Standards and Publications:

ANSI	American National Standards Institute, Inc.
ASTM	American Society for Testing and Materials
BOCA	Building Officials and Code Administrators
IEEE	Institute of Electrical and Electronic Engineers
IPCEA	Insulated Power Cable Engineers Association
ISA	International Society of Automation
NEC	National Electrical Code of National Fire Protection Association
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
UL	Underwriters' Laboratories

B. Qualification of Manufacturers:

1. Various materials specified herein shall be as supplied by manufacturers listed under PRODUCTS.

C. Quality Control:

1. All equipment shall be new and limited to products regularly produced and recommended for service ratings in accordance with engineering data or other comprehensive literature made available and in effect at time of bidding. In all cases where device, or devices, or part of equipment is herein referred to in singular, reference shall apply to as many items as required to complete installation.

1.03 SUBMITTALS

A. Shop Drawings:

1. Submit in accordance with General Requirements. Shop drawings shall be complete in all respects and shall indicate all dimensions, installation methods, size, weight, capacity, ratings, integral controls and types of materials, elevations, and sections.
2. All shop drawing submittals shall clearly indicate, using arrows and/or highlighting on all copies, which item(s) are being submitted and that each item being submitted complies with all requirements on the drawings and in these specifications. All pertinent specification and drawing requirements shall be indicated on the manufacturer's drawings.
3. Submit manufacturer's latest publications for the following items:
 - a. Conduit and Fittings
 - b. Wire
 - c. Fiber Optic Cable
 - d. Ethernet Cable
 - e. Outlet Boxes
 - f. Junction Boxes
 - g. Pull Boxes
 - h. Convenience Receptacles
 - i. Floor Mounted Receptacles and Data Outlets
 - j. Voice and Data Outlets
 - k. Local Control Switches
 - l. Individually Mounted Circuit Breaker
 - m. Panelboard
 - n. Transformer
 - o. MCC Buckets
 - p. Underground Pull Boxes
 - q. Smoke Detectors
 - r. Uni-Strut
 - s. Conduit Link Seals

PART 2 - PRODUCTS

2.01 MATERIALS

A. Conduit:

1. PVC conduit shall be Schedule 40 or Schedule 80 as indicated on the Drawings. PVC conduit shall be suitable for installation underground.

2. Rigid steel conduit shall be mild steel piping, zinc coated, and of sufficient weight and toughness to withstand cracking and peeling during bending. Galvanizing to be a coating of zinc of uniform thickness applied by either electrolytic or hot metal dip process.
3. Each piece of rigid conduit to be straight, free from blisters and defects, cut square and taper reamed, finished in 10' lengths and threaded at each end. Couplings shall be supplied at one end and a protective sleeve for the other end. All threads shall be clearly cut. Each length of conduit shall bear Underwriters' Label.
4. Electrical metallic tubing shall be open-hearth with electro-galvanized coating or hot metal dip process on exterior and of sufficient weight and strength to withstand cracking and peeling during bending. Each length of conduit shall bear the Underwriter's Label.
5. Flexible metallic conduit shall conform to Articles 350 and 351 of the NEC and shall be UL listed. All flexible metallic conduit shall have metallic screw-in type connectors and couplings. All flexible conduit shall be liquid-tight type.
6. Minimum size of rigid conduit shall be 3/4". Minimum size of flexible conduit shall be 1/2".

B. PVC Coated Galvanized Rigid Steel Conduit:

1. PVC coated galvanized rigid steel conduit shall have a permanent plastic coating factory applied to a minimum thickness of 40 mils and a urethane internal coating. PVC coated conduit shall be Robroy Industries, Permacote, or Ocal-Blue.
2. The conduit shall be "hot dipped" galvanized inside and out with galvanized threads.
3. All conduit prior to coating shall conform to: Federal Specification WW-C-581E, ANSI Specification C80.1 and UL 6.
4. The interior of the conduit shall have a urethane coating of a nominal thickness of .002" (2 mil)
5. The bond between the coatings and the metal shall be greater than the tensile strength of the coatings.
6. A .002" (2 mils) nominal thickness coating of urethane shall be applied to the interior and the threads of all conduit bodies and fittings.
7. All Form 8 and Form 7 fittings shall be UL listed and NEMA 4X rated.

8. Installation training shall be available and conducted by the manufacturer upon request by the engineer or owner to ensure proper methods and tooling are used to install PVC coated conduit and fittings without damaging the coating.

9. Conduit and conduit elbows shall have a UL label affixed to it.

C. Wire:

1. Wire shall be type THHN/THWN, except for underground wiring, which shall be type XHHW. All wiring shall be stranded copper with 600 volt insulation. Aluminum wire will not be acceptable.

2. Wire shall be 90°C, suitable for wet or dry locations.

D. Fiber Optic Cable:

1. Provide fiber optic cable to network the SCADA Server to the plant's Ethernet network as shown on the Drawings.

2. The fiber optic cable shall be 6-strand 50/125 micron, multi-mode, tight-buffered, suitable for indoor/outdoor service. The fiber optic cable shall have an orange jacket and shall be Laser Ultra-Fox Type DX06DALT9OR as manufactured by Optical Control Corporation, or equal.

E. Ethernet Cable:

1. Provide CAT6e Ethernet cable for wiring the voice and data outlets. The Ethernet cable shall be blue.

F. Cast Fittings:

1. Cast fittings for steel conduit shall be made of rust resisting alloy of iron or steel. An iron fitting shall be cast malleable iron thoroughly coated with metallic zinc or cadmium inside and outside after all machine work is completed.

2. Each cast fitting shall be provided with heavy threaded hubs to fit the conduit used. A cast fitting shall be used on all exposed conduit runs except at impractical locations where factory ells may be used.

3. All cast fittings used for PVC coated conduit shall be PVC coated and shall be Form 8 with encapsulated screws.

4. All fittings in wet locations shall be gasketed.

- G. Outlet Boxes:
1. Each outlet box shall be sized in accordance with current editions of all Federal, State and local codes.
 2. All outlet boxes shall have mounting lugs or ears for mounting wiring devices and covers. Each outlet box shall be equipped with an appropriate cover.
 3. Outlet boxes shall be cast type of same construction as cast fittings described above.
- H. Junction Boxes:
1. Junction boxes shall be cast type, and shall be of same construction as cast fittings, unless noted otherwise on the Drawings.
 2. Junction boxes identified on the Drawings as NEMA 4X aluminum shall be constructed of Type 5052 H-32 aluminum and shall have gasketed shoe box type covers with stainless steel screws.
 3. Label all junction boxes with an engraved nameplate fastened to the junction box. Nameplate shall be black with 1/4" white lettering.
- I. Pull Boxes:
1. Pull boxes shall have gasketed shoe box type covers with stainless steel screws. NEMA rating shall be as indicated on the Drawings.
 2. Label all pull boxes with an engraved nameplate fastened to the pull box. Nameplate shall be black with 1/4" white lettering.
- J. 20 Ampere, 120 Volt, Duplex Receptacles, NEMA 5-20R:
1. Duplex receptacles shall be 3 wire, U-ground, to meet Federal Specification #WC-596. Receptacle color shall be ivory.
 2. Receptacles shall be Arrow Hart #5362, Bryant #5362, Hubbell #5362, Leviton #5362, Pass & Seymour #5362, or equal.
- K. 20 Ampere, 120 Volt, Duplex Receptacles, NEMA 5-20R (G.F.I. Type):
1. All receptacles noted, as G.F.I. receptacles shall be 20 Amp ground fault circuit interrupter receptacles. Receptacles shall be the "Standard" End-of-Line type, which protects itself only. "Feed-Thru" installation will not be permitted. Devices shall be Class A, UL listed.
 2. Provide a weatherproof cover for G.F.I. receptacles, where indicated on the Drawings. Cover shall be self-closing and UL listed.

- L. 20 Ampere, 120 Volt, Duplex Floor Mounted Receptacles, NEMA 5-20R:
1. Floor mounted duplex receptacles shall be 3 wire, U-ground, to meet Federal Specification #WC-596.
 2. Receptacles shall be furnished with floor mounted box, and they shall be flush mounted with the floor. Receptacles shall be bronze with a hinged cover.
- M. Switches:
1. Local control switches, other than those mounted on a panelboard, shall be 20 ampere, 120-277 volt, AC, meeting Federal Specification #WS 896F. Switch color shall be ivory.
 2. Switches shall be single pole, double pole, three-way, four-way or type as noted. Switches shall be Arrow Hart #1221, Bryant #4901, Hubbell #1221, Leviton #1221, Pass & Seymour #20AC, or equal.
- N. Voice and Data Outlets:
1. Provide voice and data outlets as required for the Owner's system.
 2. Conduit shall be run from each outlet above the ceiling for the outlet wiring.
- O. Wall Plates:
1. Local control switches, receptacles and similar wiring devices shall be provided with stainless steel wall plates with beveled edges. Plates shall be same manufacturer as wiring device used.
 2. At locations where FS condulets are used for switches or receptacle outlets, an FS condulet plate shall be used. Plates shall have beveled or rounded edges and shall fit flush with all sides of the FS condulet.
- P. Individually Mounted Circuit Breaker:
1. The individually mounted circuit breaker shall be quick-make, quick-break, size and NEMA enclosure as indicated on the Drawings.
 2. The minimum interrupting capacity shall be 30,000 amperes rms symmetrical at voltage indicated on the Drawings.
 3. Label the circuit breaker with a permanent, engraved plastic nameplate.

4. The circuit breaker shall be Square D or Eaton.

Q. Panelboard:

1. The panelboard shall be dead front automatic circuit breaker type suitable for connection to the system characteristics and with circuit breakers as called for on the panel schedules. Circuit breakers shall be thermal-magnetic type with quick-make, quick-break operating mechanism and with trip indication. Trip indication shall be clearly indicated by breaker handle taking a position between "ON" and "OFF". All 2-pole and 3-pole breakers shall be common trip. Breakers shall be bolt-in type. Breakers used as switches shall be rated for that purpose.
2. Bus bars and lugs shall be plated copper. The ampere rating of the main bus bars and lugs on the panelboard schedule shall be considered a minimum. Larger ampere rating main bus bars and lugs may be required to accommodate the number of poles indicated on the panelboard schedules or to accommodate large wire sizes.
3. Panelboard box shall be made of code gauge galvanized steel, factory assembled as a complete unit and large enough to provide ample wiring space.
4. Panelboard front shall be complete with door and flush chrome plated pin type cylinder lock and catch. All panelboards shall be keyed alike. Front shall have adjustable indicating trim clamps which are completely concealed when the door is closed. Door shall be mounted with completely concealed hinges.
5. Unless otherwise noted on plan, panelboard shall have all breakers with a minimum interrupting capacity of 14,000 Amps symmetrical, and boxes with a minimum width of 20".
6. Panels shall be factory prime coated and finish coated with baked acrylic enamel. Label the panelboard with an engraved nameplate fastened to the front of the panel. Nameplate shall be black with 1/4" white lettering.
7. Panelboard shall be Square D or Eaton.

R. Transformer:

1. The transformer shall be size and voltage as indicated on the Drawings, dry type, ventilated, floor mounted, 115°C temperature rise with 220°C insulation system.
2. Transformer shall have aluminum windings, and shall be energy efficient, NEMA TP-1 compliant.

3. Transformer enclosure shall be painted steel.

4. Transformer shall be Square D or Eaton.

S. MCC Modifications:

1. Furnish and install a new circuit breaker bucket in existing motor control center MCC-2 as indicated on the Drawings. Provide all components, and accessories necessary for the installation of the new bucket in the existing motor control center. The AIC rating of the circuit breaker bucket shall be 42,000 amps.

T. Underground Pull Boxes:

1. Underground pull boxes shall be constructed of fiberglass and shall have a high-density polymer concrete ring and cover. The cover shall be secured with stainless steel bolts.

2. The underground pull boxes shall be Quazite or Synertech.

U. Uni-strut:

1. Uni-strut shall be used where indicated on the drawings to support conduit and electrical equipment. Uni-strut shall be 316 stainless steel unless noted otherwise on the Drawings.

2. Fiberglass uni-strut shall be manufactured by Enduro, or equal.

V. Conduit Link Seals:

1. Conduit link seals shall be installed in all core-drilled holes for sealing around the conduit. All bolts shall be stainless steel.

W. Fire Resistant Foam Sealant:

1. All penetrations through floors and walls shall be sealed with Nelson Firestop Products CLK, Cat. #AA492, silicon-based sealant, or equal.

2. All wall or floor penetration openings shall be as small as possible.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Conduit:

1. All direct buried conduit shall be PVC coated galvanized rigid steel, unless noted otherwise on Drawings.
2. Conduits embedded in concrete duct banks shall be PVC Schedule 40. Where conduits turn up out of the duct bank, they shall be PVC coated galvanized rigid steel.
3. All exposed conduit in process areas of buildings shall be PVC coated galvanized rigid steel, unless noted otherwise on the Drawings. All exposed conduit in office areas and electrical rooms, shall be galvanized rigid steel.
4. All exposed exterior conduit shall be PVC coated galvanized rigid steel.
5. All conduits run in masonry walls shall be electrical metallic tubing.
6. All wiring shall be run in conduit.
7. Install conduit so wires may be removed and replaced at a later date.
8. Short runs of flexible metallic conduit with separate ground wire shall be used for connection of motors. Approximately 18" runs of flexible metallic conduit shall be used for connection of all HVAC equipment. No rigid connection to HVAC equipment will be permitted.
9. Running threads will not be permitted. Use an approved threaded coupling or a suitable union where required. Setscrew couplings will not be permitted.
10. Space supports for conduit not more than 5' apart. Support conduit by one-hole malleable iron pipe straps or beam clamps. Where it is impractical to use beam clamps and where conduit is installed on building surfaces, use back straps and approved fastening devices with malleable iron pipe straps. All straps and clamps for PVC coated conduit shall be permanently PVC coated by same manufacturer as conduit.
11. Where it is necessary to cross building expansion joints, provide conduit runs with suitable expansion fittings.

12. All conduit penetrations into electrical equipment enclosures shall be made using conduit hubs. PVC coated rigid steel conduit systems shall use PVC coated conduit hubs.
13. Bend conduit only by use of an approved pipe bending machine or hickey so the conduit will always retain its cylindrical shape. PVC coated conduit shall be bent and threaded only with tools manufactured for that purpose.
14. If the PVC coating on conduit and fittings is damaged during installation, the damaged conduit or fitting shall be replaced in its entirety by the contractor. Repairing damaged conduit with touch-up paint will not be acceptable.
15. Install metallic electrical warning tape above all underground duct banks and conduit. Tape shall be 6" wide with red background and black letters. Letters shall read "CAUTION ELECTRICAL LINE BURIED BELOW". Install tape 6" below finished grade.

B. Outlet Boxes:

1. An outlet box shall be furnished and installed at each outlet, firmly in place, and set true and square.
2. All outlet boxes shall be supported from the building structure, independent of the entering conduit. All unused knockouts must remain closed.

C. Wiring:

1. The voltage drop at the end of any circuit shall not exceed 3% of the normal line voltage under full load. No wires smaller than #12 AWG shall be used for branch circuits; pilot and control circuits shall not be smaller than #14 AWG.
2. Care shall be exercised in pulling wire into conduit so as not to injure insulation. Use pulling compound as required.
3. Conductors to be continuous from outlet to outlet. Splice only within outlet or junction boxes.
4. Balance circuits across the phase wires of the branch and distribution panels. Run separate neutral wires for all circuits.
5. Switches shall not be connected to the neutral conductor.
6. Power and control wiring shall be run in separate conduits. AC and DC circuits shall be run in separate conduits.

7. All wiring shall conform to the following color code:
 - 480 Volt, 3 Phase: Brown, Orange, Yellow - Phase Wires
Gray - Neutral Wire
 - 208 Volt, 3 Phase: Black, Red, Blue - Phase Wires
White - Neutral Wire
 - 208 Volt, 1 Phase: Black, Red - Phase Wires
 - 120 Volt, 1 Phase: Black - Phase Wire
White - Neutral Wire
 - Control Wires: 120V AC - Red
24V dc - Blue
 - Ground Wires: Green
 8. AC control wires energized from a source external to the control panel power source shall be yellow.
 9. All control wiring shall be identified at each end with a legible permanent coded wire-marking sleeve. Sleeves shall be heat-shrink white PVC tubing with machine printed black marking, as manufactured by Brady. Markings shall be in accordance with the wire numbers and terminal numbers shown on the control panel wiring diagrams.
- D. Splices:
1. Make all splices using solderless connectors. Use wire nut connectors composed of expandable spring steel shell and PVC insulator for size #14 through #8. Temperature rating shall be 105°C.
 2. For size #6 and larger, use bolted-type tinned copper pressure connectors, either the straight coupling type or the split bolt type. All connectors #6 and larger shall be wrapped with UL approved linerless rubber splicing tape rated to 69 KV and vinyl plastic electrical tape to the same thickness as the insulation of the wire. Electrical tape shall be Scotch 33+, or equal.
- E. Lugs:
1. All lugs used with copper wire and cable shall be tinned copper. Aluminum will not be accepted.
- F. Panelboards:
1. Furnish a typed list identifying all circuits and insert in frames

provided inside of panel doors.

G. Mounting Heights:

1. Mounting heights and exact locations of all outlets and equipment shall be verified by the Owner before roughing in.
2. Unless otherwise instructed, outlets shall be located as follows:
 - a. Local Lighting Control Switches: Locate all outlets for single or gang switches 3'-4" above finished floor on strike side of door. If this location places the switch group partly in tile or other finishes, the outlet shall be lowered or raised to place the plate entirely on a flat surface.
 - b. Duplex Receptacles: 18" above finished floor, unless noted otherwise.
 - c. Individually Mounted Circuit Breakers: 6'-0" above finished floor to top of breaker enclosure.
 - d. Panelboards: 6'-0" above finished floor to top of panel.

END OF SECTION 16050

SECTION 16500
LIGHTING FIXTURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Furnish all labor and materials for a complete lighting fixture installation as indicated on the Drawings and specified herein.
2. Fixtures of size and type specified herein shall be supplied, installed and connected as indicated on the Drawings. Provide accessories for each fixture as required for a complete installation.
3. Furnish and install lamps in each fixture.

1.02 QUALITY ASSURANCE

A. Regulations, Standards and Publications:

1. Fixtures shall be U.L. listed.
2. All fixtures shall meet all Federal, State and local required criteria.
3. All light fixtures shall be mounted in accordance with manufacturer's recommendations.
4. Ballasts shall be Electrical Testing Laboratories, Inc. (E.T.L.) - Certified Ballast Manufacturers Association (C.B.M.) certified.
5. The installation must comply with the amended National Electrical Code of the National Fire Protection Association.

B. Qualification:

1. Provide manufacturer specified for each light fixture type. Substitutes will not be accepted without approval prior to the bid.

1.03 SUBMITTALS

A. Shop Drawings:

1. Submit manufacturer's latest publication of each fixture including construction details, light distribution details and/or coefficients.

PART 2 - PRODUCTS

2.01 MATERIALS

A. LED Drivers:

1. LED light driver shall be of high efficiency.
2. LED light driver shall allow continued operation of all other LEDs in the event of an LED failure.

B. Light Fixture Schedule:

1. CA: Ceiling mounted, 120 volt, low profile high efficiency LED, nominal 8" x 4', totally enclosed gasketed fixture suitable for wet locations. Fixture shall be provided with an electronic driver. Fixture shall produce a minimum of 6,000 initial lumens and have a color temperature of 4000K. Housing shall be one-piece high impact plastic to provide durability and corrosion resistance. The lens shall be one-piece, low profile, frosted acrylic, resistant to damage. Fixture shall have plastic latches to apply positive, uniform pressure on the gaskets to seal against dust and moisture. Provide gasketed conduit hubs. Fixture shall be Holophane #EMSL48-6000LM-LPAFL-MD-MVOLT-40K-80CRI-WLFEND2 or Lithonia #FEM-L48-6000LM-LPAFL-MD-MVOLT-40K-80CRI-WLFEND2.
2. FA: Flush mounted, 2' x 2', 120 volt, high efficiency LED, low-profile, recessed fixture with basket diffuser. The fixture shall produce a minimum of 4000 initial lumens and shall have a color temperature of 4000K. The fixture housing shall be constructed of cold rolled steel with a painted aluminum door frame. Lens shall be diffused acrylic. Fixture shall be suitable for recessed in-ceiling grid installation. Fixture shall be Holophane #HVT-2X2-DOP-3900LM-40K-MVOLT-MIN1-80CRI-ZT.
3. WA: Wall mounted, 120 volt, high efficiency architectural sconce LED fixture. The fixture shall produce a minimum of 3000 initial lumens and have a color temperature of 4000K. The fixture housing shall be constructed of die-cast copper-free aluminum with a bronze powder coated finish. Fixture shall be provided with photoelectric control. Fixture shall be Lithonia #WDGE2LED-P3-40K-80CRI-VW-MVOLT-SRM-PE-DDBXD.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation:

1. Contractor shall furnish supports for light fixtures of sufficient size and strength to support weight of fixtures from the building overhead structural members, independently from the ceiling system.
2. The fixture manufacturer's catalog numbers describing the various types of fixtures shall be used as a guide only and do not include all the required accessories or hardware that may be required for a complete installation. The Contractor shall be responsible for furnishing, at no additional cost to the Owner, all the required accessories and hardware for a complete installation.
3. All inoperable LEDs shall be replaced with new LEDs up to and including the date of final acceptance by the Owner and Engineer.

END OF SECTION 16500

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SECTION 16530

BATTERY EMERGENCY LIGHTING UNITS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Furnish, install, and connect a complete system of conduits, conductors, unit type battery emergency lighting units and all other materials and equipment necessary for the installation of an emergency lighting system.

1.02 QUALITY ASSURANCE

A. Regulations, Standards and Publications:

- FM Factory Mutual Engineering Corp.
- NEC National Electrical Code of National Fire Protection Association
- UL Underwriters' Laboratories

B. Qualification:

1. The complete system shall be of a type, which has been in satisfactory service for at least one year under automatic emergency lighting conditions.
2. Provide manufacturer specified for each fixture type. Substitutes will not be accepted without approval prior to the bid.

1.03 SUBMITTALS

A. Shop Drawings:

1. Submit manufacturer's latest publication of the following:
 - a. Architectural Battery Units
 - b. Fixed Heads
 - c. Remote Heads
 - d. Combination Battery Unit/Exit Fixtures

PART 2 - PRODUCTS

2.01 MATERIALS

A. Architectural Battery Units:

1. EA/EAR: Battery emergency light fixtures shall have a white nonmetallic housing. Fixture shall be provided with a test switch, status indicator and a rechargeable lithium iron phosphate battery. The battery shall provide 90 minutes of emergency illumination. Fixture shall operate on 120 volts and shall be furnished with two 3-watt LED lighting heads. Fixture shall be Holophane Cortez #CZQ4L-UVOLT-LTP-HO. Battery emergency remote heads shall be Holophane Cortez #CZQRE-SP640LSGL.

B. Combination Battery Unit/Exit Fixtures:

1. EB: Combination exit fixture/battery emergency light fixtures shall be back mounted, single faced with red (confirm color with local code) high intensity LED lamps and sealed nickel cadmium battery. The fixture housing shall be white polycarbonate. The exit fixtures shall operate on 120 VAC power. Fixture shall be Holophane Magellan #QM-LED-R-HO-SD.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Battery Unit:

1. Battery units shall be firmly fastened to walls. Mounting height to be determined in field.

B. Wiring:

1. Wiring on low voltage side of unit shall be no smaller than #10.
2. Connect battery emergency lighting units and exit fixtures to lighting circuit for area being protected ahead of all local control switches.

END OF SECTION 16530